1996

SERVICE MANUAL

Jeep®

CHEROKEE

AUTHENTIC RESTORATION PRODUCT

2 WHEEL DRIVE
4 WHEEL DRIVE

Find us on Facebook

CHRYSLER CORPORATION

BISHKO AUTOMOBILE LITERATURE

CHRYSLER CORPORATION

SERVICE MANUAL SUPPLEMENT

1996 JEEP® CHEROKEE

To order the special service tools used and illustrated, please refer to the instructions on inside back cover.

CHRYSLER CORPORATION

NO PART OF THIS PUBLICATION MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED, IN ANY FORM OR BY ANY MEANS, ELECTRONIC, MECHANICAL, PHOTOCOPYING, RECORDING, OR OTHERWISE, WITHOUT THE PRIOR WRITTEN PERMISSION OF CHRYSLER CORPORATION.

Chrysler Corporation reserves the right to make changes in design or to make additions to or improvements in its products without imposing any obligations upon itself to install them on its products previously manufactured.

Litho in U.S.A. Copyright © 1996 Chrysler Corporation 15M0996

Mopar | AUTHENTIC RESTORATION™ PRODUCT

MOPAR, JEEP, DODGE, HEMI, PLYMOUTH and CHRYSLER are trademarks of Chrysler LLC under license. © Chrysler LLC 2008

THIS SHOP MANUAL, OWNERS MANUAL OR PARTS BOOK IS A REPRINT OF AN ORIGINAL CHRYSLER LLC SHOP MANUAL, OWNERS MANUAL OR PARTS BOOK. IT IS REPRINTED AND PUBLISHED BY R&B HOLT ENTERPRISES, UNDER LICENSE AND WITH PERMISSION FROM CHRYSLER LLC. THE REPRESENTATIONS AND SPECIFICATIONS HAVE NOT BEEN UPDATED OR MODIFIED SINCE THE ORIGINAL PUBLICATION DATE AND SHOULD NOT BE RELIED UPON FOR CURRENT APPLICATION. CHRYSLER LLC DISCLAIMS ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS INCLUDING ANY MISLEADING INFORMATION OR INCORRECT STATEMENTS MADE HERIN. © Chrysler LLC 2008

Paper Content 50% Recycled

FOREWORD

The information contained in this service manual has been prepared for the professional automotive technician involved in daily repair operations. This manual does not cover theory of operation, which is addressed in service training material. Information describing the operation and use of standard and optional equipment is included in the Owner's Manual provided with the vehicle.

This manual is designed as a supplement to be used along with the 1996 Cherokee service manual. It includes information related to engineering changes made during the model year.

Information in this manual is divided into groups. These groups contain general information, diagnosis, testing, adjustments, removal, installation, disassembly, and assembly procedures for the systems and components. To assist in locating a group title page, use the Group Tab Locator on the following page. The solid bar after the group title is aligned to a solid tab on the first page of each group. The first page of the group has a contents section that lists major topics within the group. If you are not sure which Group contains the information you need, look up the Component/System in the alphabetical index located in the rear of this manual.

A Service Manual Comment form is included at the rear of this manual. Use the form to provide Chrysler Corporation with your comments and suggestions.

Tightening torques are provided as a specific value throughout this manual. This value represents the midpoint of the acceptable engineering torque range for a given fastener application. These torque values are intended for use in service assembly and installation procedures using the correct OEM fasteners. When replacing fasteners, always use the same type (part number) fastener as removed.

Chrysler Corporation reserves the right to change testing procedures, specifications, diagnosis, repair methods, or vehicle wiring at any time without prior notice or incurring obligation.

Navigation Tools: Click on the “Table of Contents” below, or use the Bookmarks to the left.

GROUP TAB LOCATOR

3	Differential and Driveline
8W	Wiring Diagrams
21	Transmission and Transfer Case
	Component and System Index
	Service Manual Comment Forms (Rear of Manual)

Mopar AUTHENTIC RESTORATION PRODUCT

DIFFERENTIAL AND DRIVELINE

CONTENTS

	page		page
8 1/4 REAR AXLE	68	TUBE AND DANA 30 FRONT AXLE	1
DANA 35 AXLE	33		

TUBE AND DANA 30 FRONT AXLE

INDEX

	page		page
GENERAL INFORMATION		HUB BEARING AND AXLE SHAFT	9
DANA 30 FRONT AXLE	1	PINION GEAR	16
LUBRICANT SPECIFICATIONS	2	PINION SHAFT SEAL	8
DESCRIPTION AND OPERATION		RING GEAR	15
STANDARD DIFFERENTIAL	2	STEERING KNUCKLE AND BALL STUDS	11
DIAGNOSIS AND TESTING		TUBE AXLE ASSEMBLY	7
BEARING NOISE	3	**DISASSEMBLY AND ASSEMBLY**	
DRIVELINE SNAP	3	FINAL ASSEMBLY	21
FRONT AXLES	4	STANDARD DIFFERENTIAL	20
GEAR NOISE	3	**CLEANING AND INSPECTION**	
GENERAL INFORMATION	2	AXLE COMPONENTS	21
LOW SPEED KNOCK	3	CARDAN U-JOINT	21
VIBRATION	3	**ADJUSTMENTS**	
SERVICE PROCEDURES		DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH	24
LUBRICANT CHANGE	6	GEAR CONTACT PATTERN ANALYSIS	27
REMOVAL AND INSTALLATION		PINION GEAR DEPTH	22
AXLE BUSHING REPLACEMENT	12	**SPECIFICATIONS**	
AXLE SHAFT OIL SEAL	15	DANA 30 AXLE	29
AXLE SHAFT—CARDAN U-JOINT	7	DANA 30 AXLE	29
DIFFERENTIAL SIDE BEARINGS	14	**SPECIAL TOOLS**	
DIFFERENTIAL	12	DANA 30 AXLE	29
DRIVE AXLE ASSEMBLY	6		

GENERAL INFORMATION

DANA 30 FRONT AXLE

The Dana 30 front axle consists of a cast iron differential housing with axle shaft tubes extending from either side. The tubes are pressed into the differential housing and welded.

The integral type housing, hypoid gear design has the centerline of the pinion set above the centerline of the ring gear.

The axle has a fitting for a vent hose used to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the hub bearings. The axle shafts are retained by nuts at the hub bearings. The hub bearings are bolted to the steering knuckle at the outboard end of the axle tube yoke. The hub bearings are serviced as an assembly.

For vehicles with ABS brakes, the ABS wheel speed sensors are attached to the knuckle assemblies. The tone rings for the ABS system are pressed onto the axle shaft. **Do not damage ABS tone wheel or the sensor when removing axle shafts.**

The stamped steel cover provides a means for inspection and servicing the differential.

GENERAL INFORMATION (Continued)

The Dana 30 front axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover by a cover bolt. Build date identification codes are stamped on the cover side of the axle shaft tube.

The differential case is a one–piece design. The differential pinion mate shaft is retained with a roll pin. Differential bearing preload and ring gear backlash is adjusted by the use of shims (select thickness). The shims are located between the differential bearing cones and case. Pinion bearing preload is set and maintained by the use of shims (select thickness).

LUBRICANT SPECIFICATIONS

A multi–purpose, hypoid gear lubricant which conforms to the following specifications should be used. Mopar® Hypoid Gear Lubricant conforms to all of these specifications.

- The lubricant should have MIL–L–2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 80W–90 gear lubricant.
- Lubricant for axles intended for heavy-duty or trailer tow use is SAE 75W–140 SYNTHETIC gear lubricant.

The Dana 30 front axle lubricant capacity is 1.48 L (3.13 pts.).

CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

DESCRIPTION AND OPERATION

STANDARD DIFFERENTIAL

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 1).

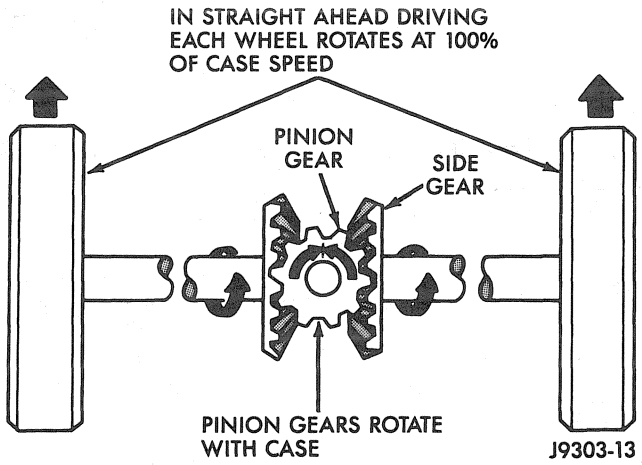


Fig. 1 Differential Operation—Straight Ahead Driving

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

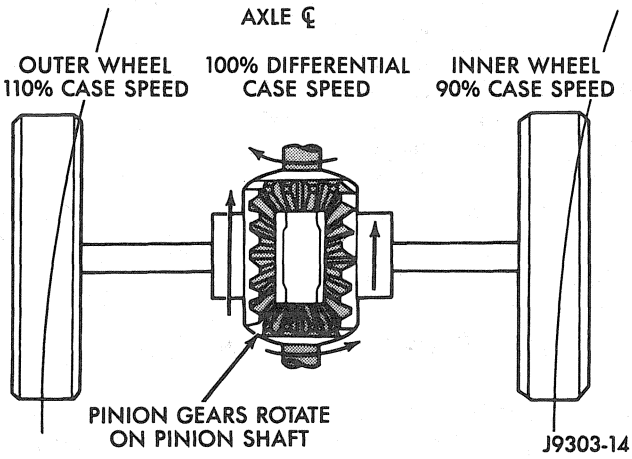


Fig. 2 Differential Operation—On Turns

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.

DIAGNOSIS AND TESTING (Continued)

- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.
- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak–noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise during straight–ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion gear bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion gear bearings have a constant–pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U–joint or by worn side–gear thrust washers. A worn pinion gear shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out–of–balance wheels.
- Loose wheel lug nuts.
- Worn U–joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front–end components or engine/transmission mounts. These components can contribute to what appears to be a rear–end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed
- Loose engine/transmission/transfer case mounts
- Worn U–joints
- Loose spring mounts
- Loose pinion gear nut and yoke
- Excessive ring gear backlash
- Excessive side gear/case clearance

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSIS AND TESTING (Continued)

FRONT AXLES

DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces.	1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONTINUED

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed.	2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts	1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

AUTHENTIC RESTORATION

SERVICE PROCEDURES

LUBRICANT CHANGE

(1) Raise and support the vehicle.
(2) Remove the lubricant fill hole plug from the differential housing cover.
(3) Remove the differential housing cover and drain the lubricant from the housing.
(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**
(5) Remove the sealant from the housing and cover surfaces. Use solvent to clean the mating surfaces.
(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 3).

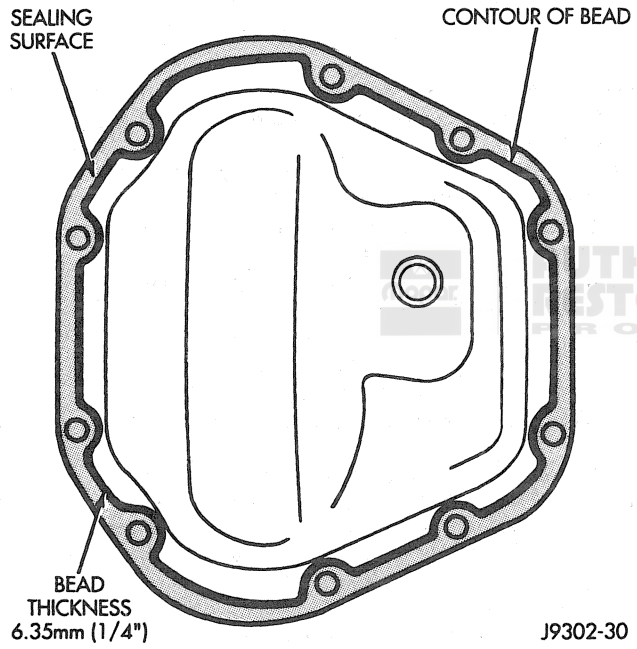


Fig. 3 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant.
(7) Install the cover and any identification tag. Tighten the cover bolts in a criss–cross pattern to 41 N·m (30 ft. lbs.) torque.
(8) Refill the differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications in this group for the quantity necessary.
(9) Install the fill hole plug and lower the vehicle.

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY

REMOVAL

(1) Raise and support the vehicle.
(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Remove the brake rotors and calipers from the axle. Refer to Group 5, Brakes, for proper procedures.
(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness, if necessary.
(7) Disconnect the vent hose from the axle shaft tube.
(8) Mark the propeller shaft and yoke for installation alignment reference.
(9) Remove propeller shaft.
(10) Disconnect stabilizer bar links at the axle.
(11) Disconnect shock absorbers from axle brackets.
(12) Disconnect track bar.
(13) Disconnect the tie rod and drag link from the steering knuckle. Refer to Group 2, Suspension, for proper procedures.
(14) Disconnect the steering damper from the axle bracket.
(15) Disconnect the upper and lower suspension arms from the axle brackets.
(16) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.
(17) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.
(2) Support the axle on a suitable lifting device and position axle under the vehicle.
(3) Raise the axle and align it with the spring pads.
(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.
(5) Connect the vent hose to the axle shaft tube.
(6) Connect the track bar to the axle bracket. Loosely install the bolt to hold the track bar to the axle bracket.
(7) Install the shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.) torque.
(8) Install the stabilizer bar links to the axle brackets. Tighten the nut to 95 N·m (70 ft. lbs.) torque.
(9) Install the drag link and tie rod to the steering knuckles. Refer to Group 2, Suspension, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

(10) Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.

(11) Install the brake rotors and calipers. Refer to Group 5, Brakes, for the proper procedures.

(12) Connect the wheel speed sensor wiring harness to the vehicle wiring harness, if necessary.

(13) Align the previously made marks on the propeller shaft and the yoke.

(14) Install the straps and bolts to hold the propeller shaft to the yoke.

(15) Check and fill axle lubricant. Refer to the Lubricant Specifications in this group for the quantity necessary.

(16) Install the wheel and tire assemblies.

(17) Remove the lifting device from the axle and lower the vehicle.

(18) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.

(19) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.

(20) Check the front wheel alignment.

TUBE AXLE ASSEMBLY

REMOVAL

(1) Raise and support the vehicle.

(2) Position a suitable lifting device under the axle.

(3) Secure axle to device.

(4) Remove the wheels and tires.

(5) Remove the brake rotors and calipers from the axle. Refer to Group 5, Brakes, for proper procedures.

(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness, if necessary.

(7) Disconnect stabilizer bar links at the axle.

(8) Disconnect shock absorbers from axle brackets.

(9) Disconnect track bar.

(10) Disconnect the tie rod and drag link from the steering knuckle. Refer to Group 2, Suspension, for proper procedures.

(11) Disconnect the steering damper from the axle bracket.

(12) Disconnect the upper and lower suspension arms from the axle brackets.

(13) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.

(14) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.

(2) Support the axle on a suitable lifting device and position axle under the vehicle.

(3) Raise the axle and align it with the spring pads.

(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.

(5) Connect the track bar to the axle bracket. Loosely install the bolt to hold the track bar to the axle bracket.

(6) Install the shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.) torque.

(7) Install the stabilizer bar links to the axle brackets. Tighten the nut to 95 N·m (70 ft. lbs.) torque.

(8) Install the drag link and tie rod to the steering knuckles. Refer to Group 2, Suspension, for proper procedures.

(9) Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.

(10) Install the brake rotors and calipers. Refer to Group 5, Brakes, for the proper procedures.

(11) Connect the wheel speed sensor wiring harness to the vehicle wiring harness, if necessary.

(12) Install the wheel and tire assemblies.

(13) Remove the lifting device from the axle and lower the vehicle.

(14) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.

(15) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.

(16) Check the front wheel alignment.

AXLE SHAFT—CARDAN U-JOINT

Single cardan U–joint components are not serviceable. If defective, they must be replaced as a unit. If the bearings, seals, spider, or bearing caps are damaged or worn, replace the complete U–joint.

REMOVAL

CAUTION: Clamp only the narrow forged portion of the yoke in the vise. Also, to avoid distorting the yoke, do not over tighten the vise jaws.

(1) Remove axle shaft.

(2) Remove the bearing cap retaining snap rings (Fig. 4).

It can be helpful to saturate the bearing caps with penetrating oil prior to removal.

(3) Locate a socket where the inside diameter is larger in diameter than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed.

REMOVAL AND INSTALLATION (Continued)

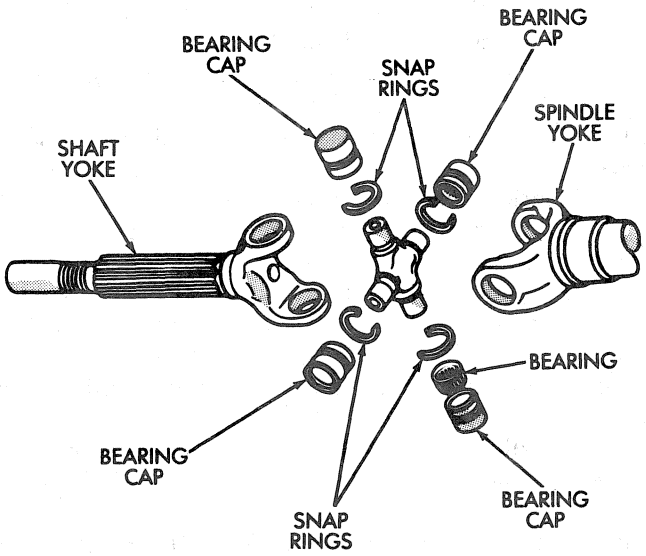


Fig. 4 Axle Shaft Outer U–Joint

(4) Locate a socket where the outside diameter is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap.

(5) Position the yoke with the sockets in a vise (Fig. 5).

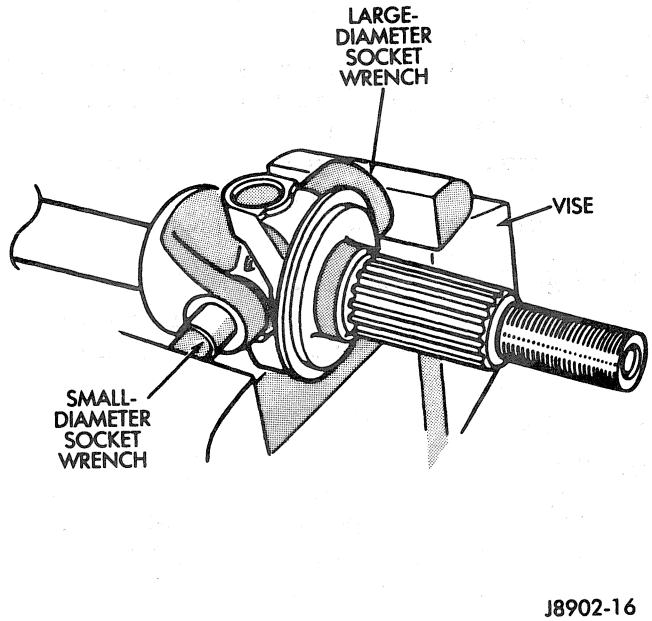


Fig. 5 Yoke Bearing Cap Removal

(6) Compress the vise jaws to force the bearing cap into the larger socket (receiver).

(7) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.

(8) Repeat the above procedure for the remaining bearing cap.

(9) Remove the remaining bearing cap, bearings, seals and spider from the propeller shaft yoke.

INSTALLATION

(1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium–base lubricant to aid in installation.

(2) Position the spider in the yoke. Insert the seals and bearings. Tap the bearing caps into the yoke bores far enough to hold the spider in position.

(3) Place the socket (driver) against one bearing cap. Position the yoke with the socket wrench in a vise.

(4) Compress the vise to force the bearing caps into the yoke. Force the caps enough to install the retaining clips.

(5) Install the bearing cap retaining clips.

(6) Install axle shaft.

PINION SHAFT SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 6).

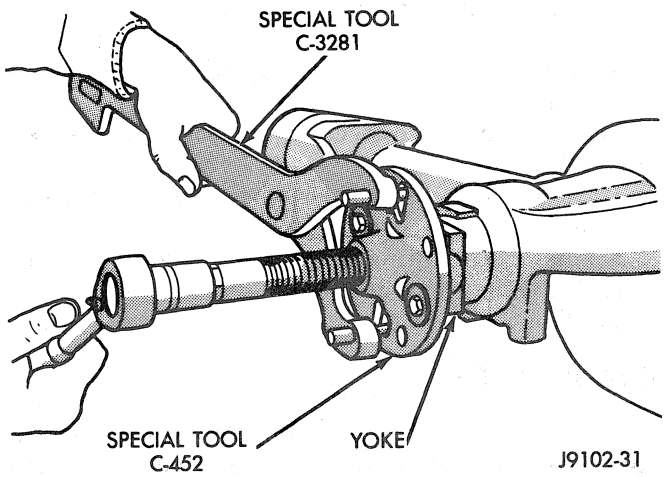


Fig. 6 Pinion Yoke Removal

REMOVAL AND INSTALLATION (Continued)

(10) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion shaft seal.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 7).

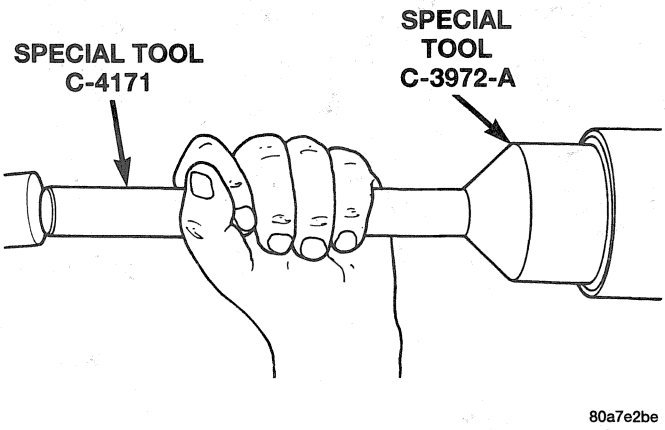


Fig. 7 Pinion Seal Installation

(2) Install yoke on the pinion gear with Installer W-162–D, Cup 8109, and Holder 6958 (Fig. 8).

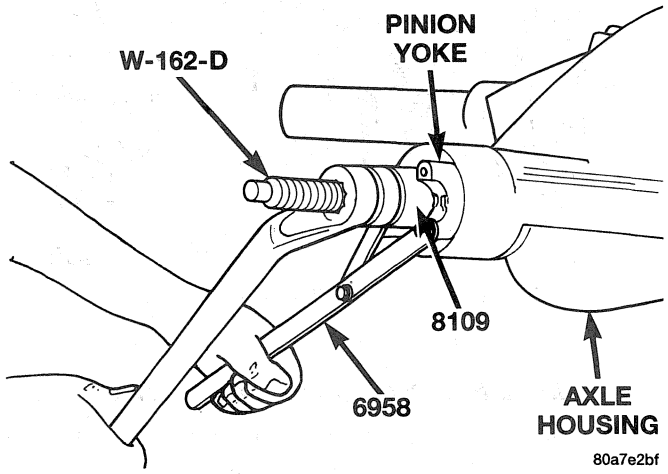


Fig. 8 Pinion Yoke Installation

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to the pinion bearings may result.

(3) Install the pinion washer and a new nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

(4) Tighten pinion nut to 217 N·m (160 ft. lbs.).

(5) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 9).

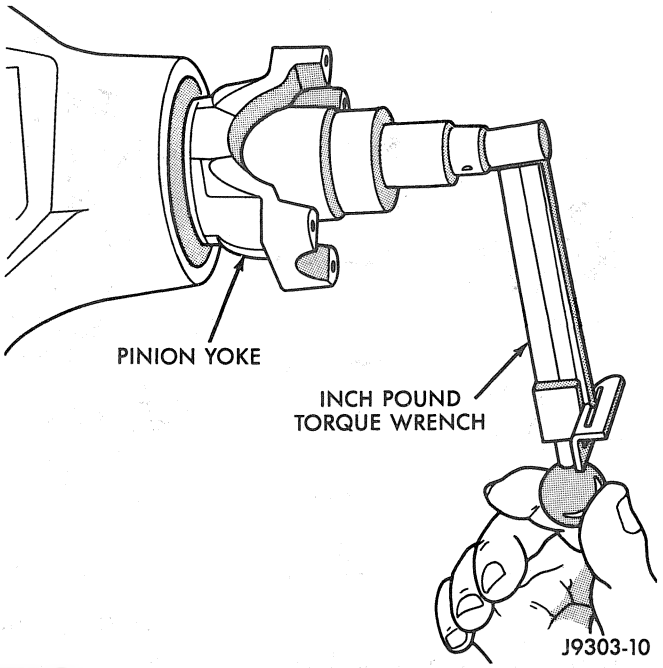


Fig. 9 Check Pinion Rotation Torque

(6) If the rotating torque is low, use Holder 6958 to hold the pinion yoke, and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

(7) Align the installation reference marks on the propeller shaft and yoke, and install the propeller shaft.

(8) Check and fill the gear lubricant. Refer to the Lubricant Specifications for gear lubricant requirements.

(9) Install the brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

HUB BEARING AND AXLE SHAFT

If the axle shaft and hub bearing are being removed in order to service another component, the axle shaft and hub bearing can be removed as an assembly.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire assembly.

(3) Remove the brake caliper and rotor. Refer to Group 5, Brakes, for proper procedures.

(4) Remove ABS wheel speed sensor, if necessary. Refer to Group 5, Brakes, for proper procedures.

(5) Remove the cotter pin, nut retainer, and axle hub nut (Fig. 10), if necessary.

(6) Remove the hub to knuckle bolts (Fig. 11).

REMOVAL AND INSTALLATION (Continued)

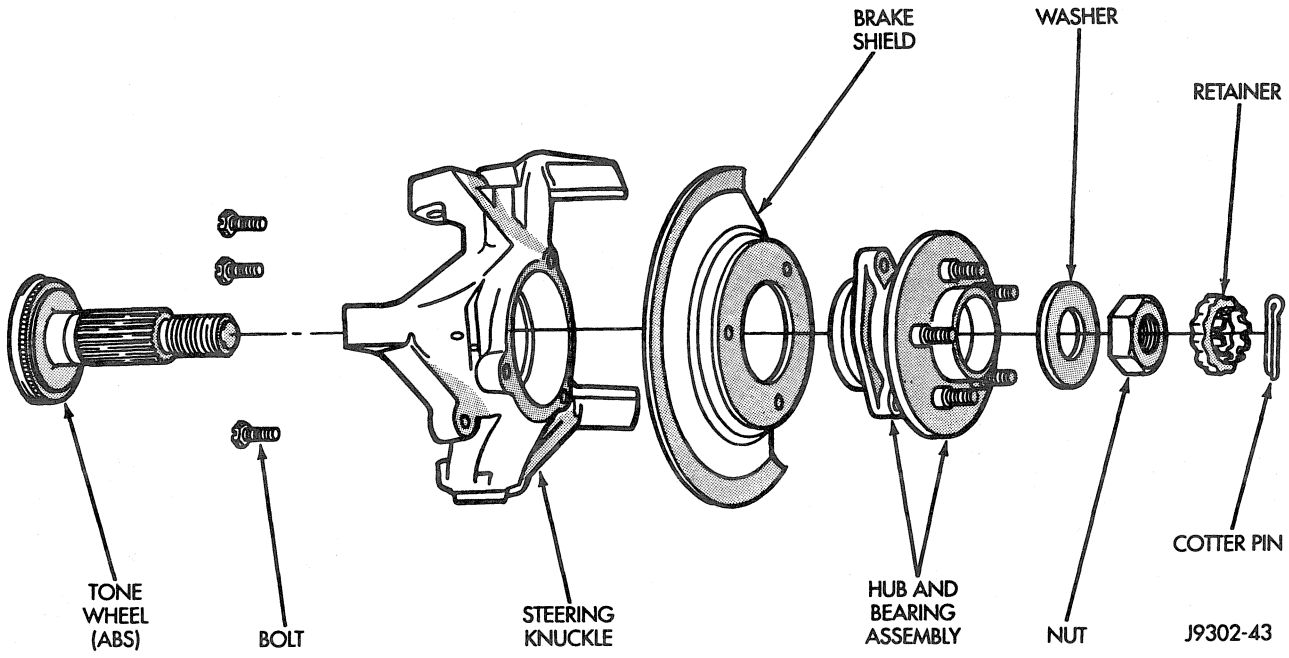


Fig. 10 Hub, Knuckle and Axle Shaft

(7) Remove the hub from the steering knuckle and axle shaft, if necessary.

(8) Remove hub bearing and axle shaft assembly (Fig. 12), or axle shaft from axle. **Avoid damaging the axle shaft oil seals in the axle housing.**

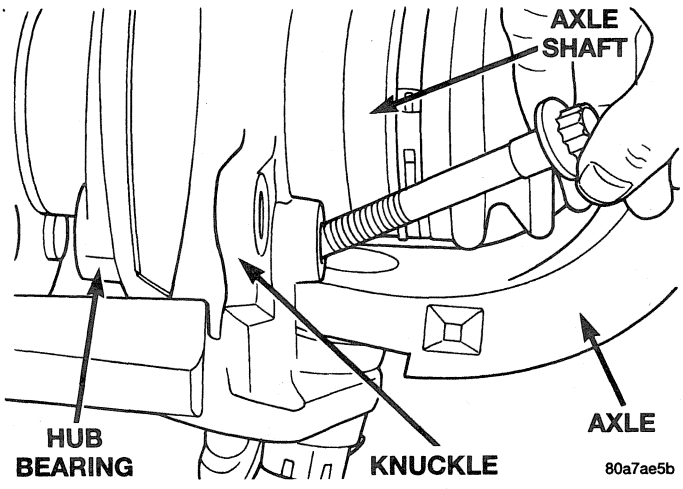


Fig. 11 Hub Bearing Bolts

(9) Remove the brake rotor shield from the hub bearing or knuckle (Fig. 10).

INSTALLATION

(1) Thoroughly clean the axle shaft (Fig. 10) and apply a thin film of Mopar® Wheel Bearing Grease, or equivalent, to the shaft splines, seal contact surface, and hub bore.

(2) Install the brake rotor shield to the knuckle.

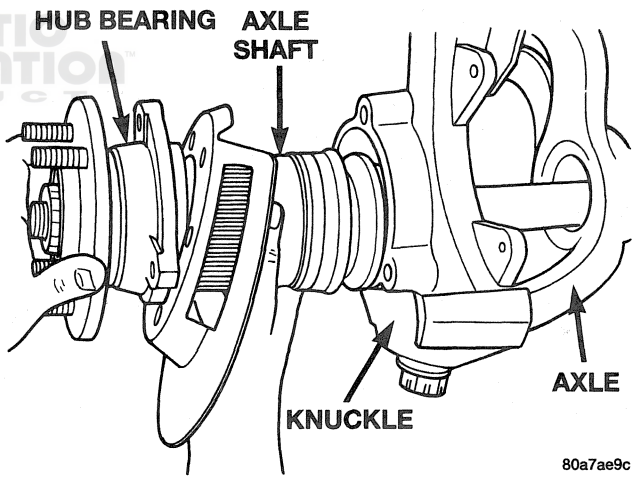


Fig. 12 Hub Bearing and Axle Assembly

(3) Install the hub bearing and axle shaft assembly, or axle shaft, into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the axle housing.

(4) Install the hub bearing, if necessary.

(5) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.) torque.

(6) Install the hub washer and nut, if necessary. Tighten the hub nut to 237 N·m (175 ft. lbs.) torque. Install the nut retainer and a new cotter pin (Fig. 10).

(7) Install ABS wheel speed sensor, if necessary. Refer to Group 5, Brakes, for proper procedures.

(8) Install the brake rotor and caliper. Refer to Group 5, Brakes, for proper procedures.

(9) Install the wheel and tire assembly.

REMOVAL AND INSTALLATION (Continued)

(10) Remove support and lower the vehicle.

STEERING KNUCKLE AND BALL STUDS

Ball stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball studs require the use of Tool Kit 6289.

KNUCKLE REMOVAL

(1) Remove hub bearing and axle shaft.
(2) Disconnect the tie-rod or drag link from the steering knuckle arm. Refer to Group 2, Suspension, for proper procedures.
(3) Remove the cotter pins from the upper and lower ball studs.
(4) Remove the upper and lower ball stud nuts.
(5) Strike the steering knuckle with a brass hammer to loosen knuckle from the ball studs. Remove knuckle from ball studs (Fig. 13).

UPPER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 14).

LOWER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 15).

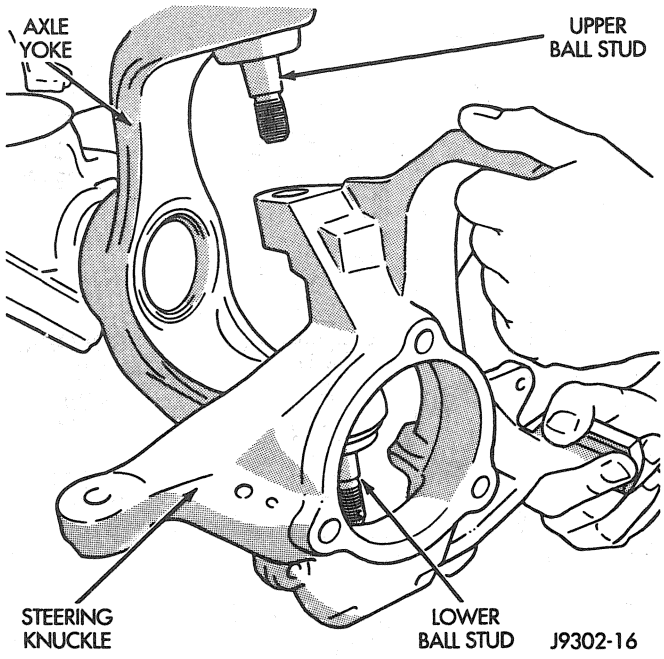


Fig. 13 Steering Knuckle Removal/Installation

KNUCKLE INSTALLATION

(1) Position the steering knuckle on the ball studs.

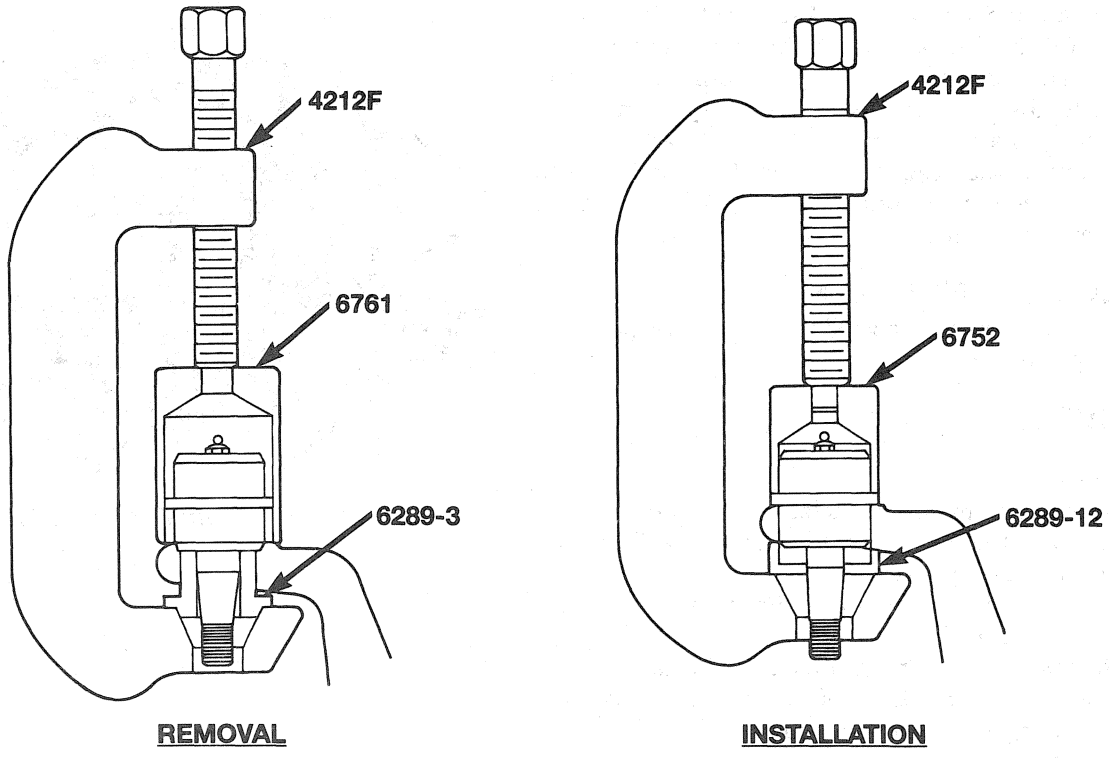


Fig. 14 Upper Ball Stud Remove/Install

REMOVAL AND INSTALLATION (Continued)

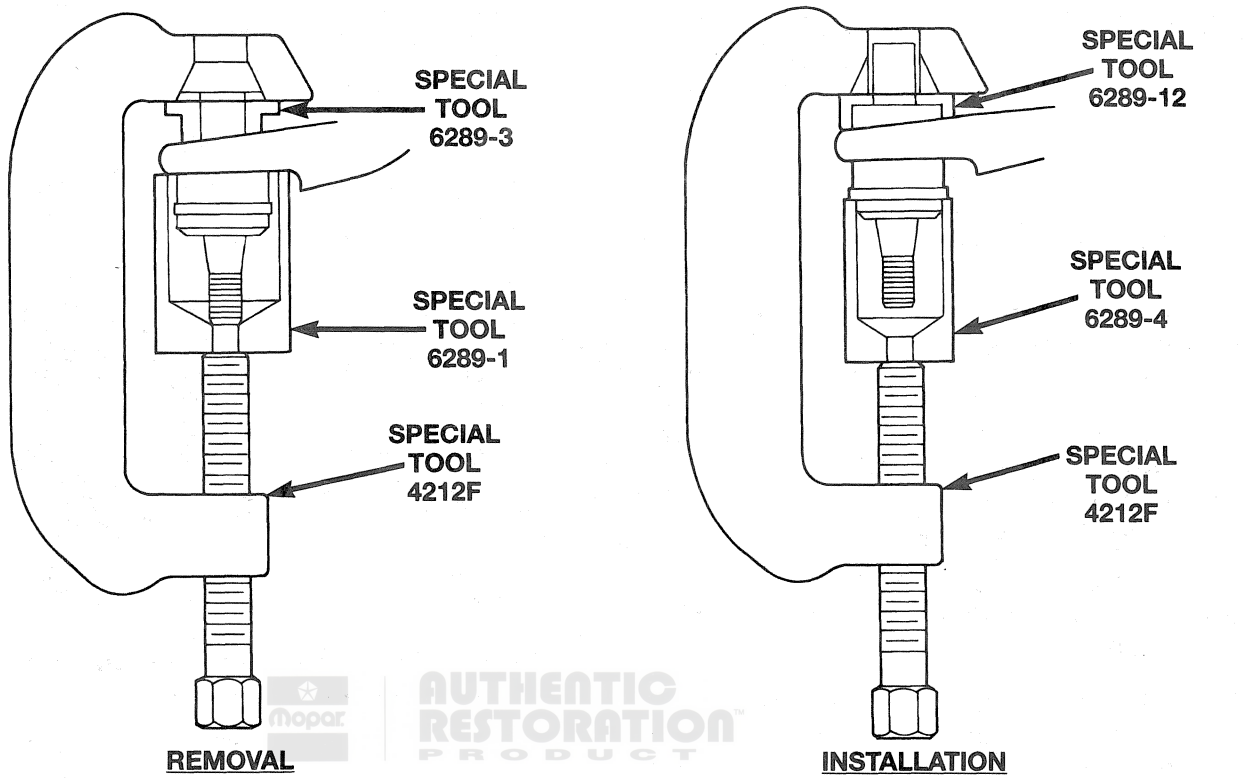


Fig. 15 Lower Ball Stud Remove/Install

(2) Install and tighten the bottom retaining nut to 109 N·m (80 ft. lbs.) torque. Install new cotter pin.

(3) Install and tighten the top retaining nut to 101 N·m (75 ft. lbs.) torque. Install new cotter pin.

(4) Install the hub bearing and axle shaft.

(5) Connect the tie-rod or drag link end to the steering knuckle arm. Refer to Group 2, Suspension, for proper procedures.

AXLE BUSHING REPLACEMENT

Refer to Group 2, Suspension, for the proper axle bushing procedures.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and allow fluid to drain.

(4) Remove hub bearings and axle shafts.

(5) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 16).

(6) Loosen the differential bearing cap bolts.

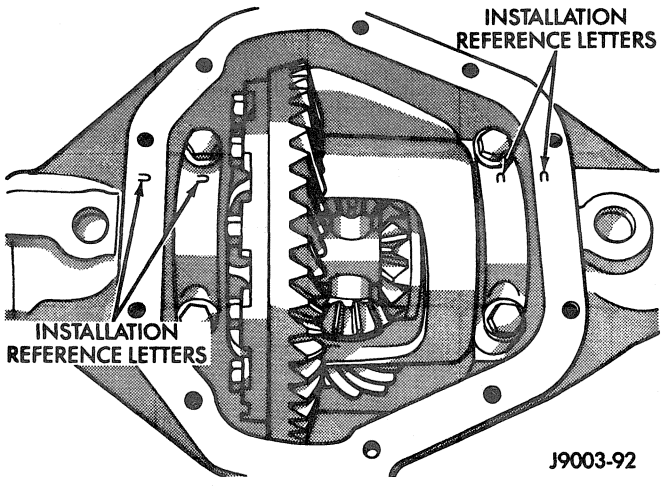


Fig. 16 Bearing Cap Identification

REMOVAL AND INSTALLATION (Continued)

(7) Position Spreader W–129–B, utilizing some items from Adapter Kit 6987, with the tool dowel pins seated in the locating holes (Fig. 17). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

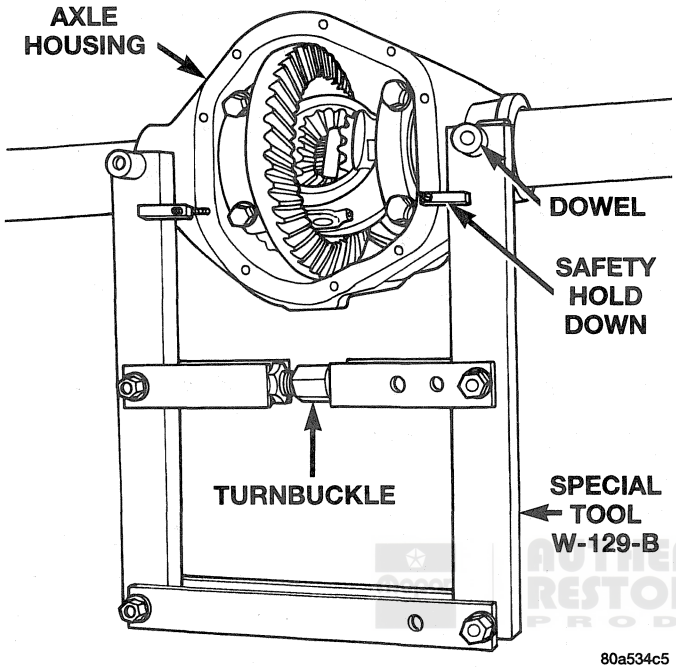


Fig. 17 Install Axle Housing Spreader

(8) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to guide pin. Load the lever adapter against the opposite side of the housing (Fig. 18) and zero the indicator.

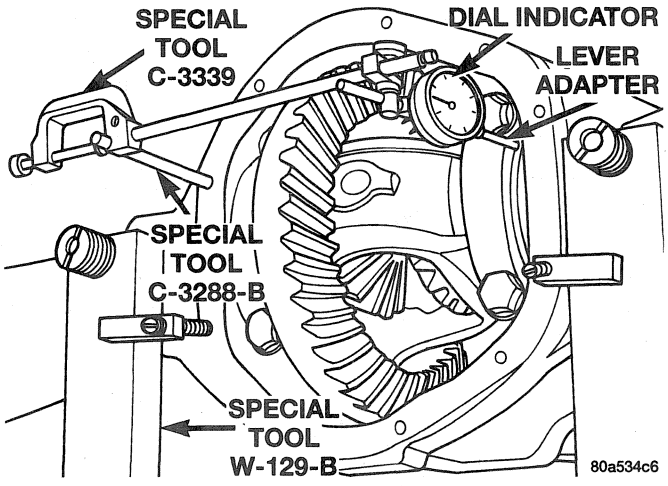


Fig. 18 Install Dial Indicator

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 19).

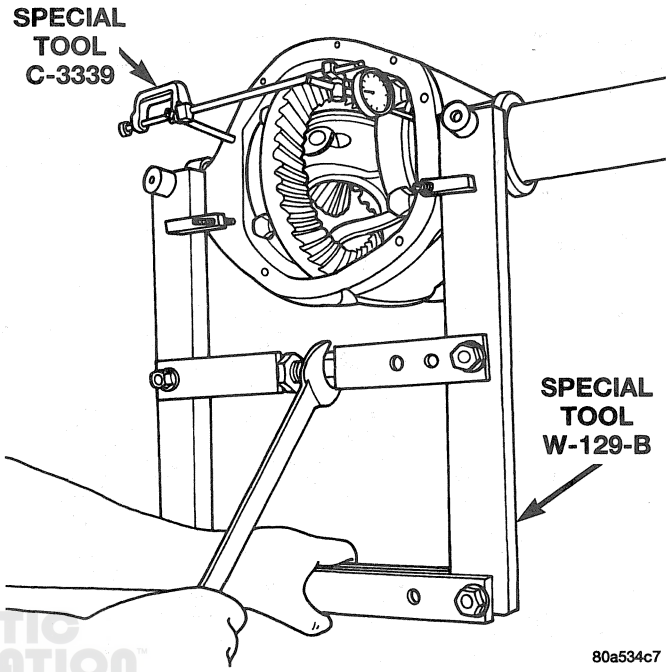


Fig. 19 Spread Axle Housing

(10) Remove the dial indicator.

(11) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(12) Remove the differential from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 20).

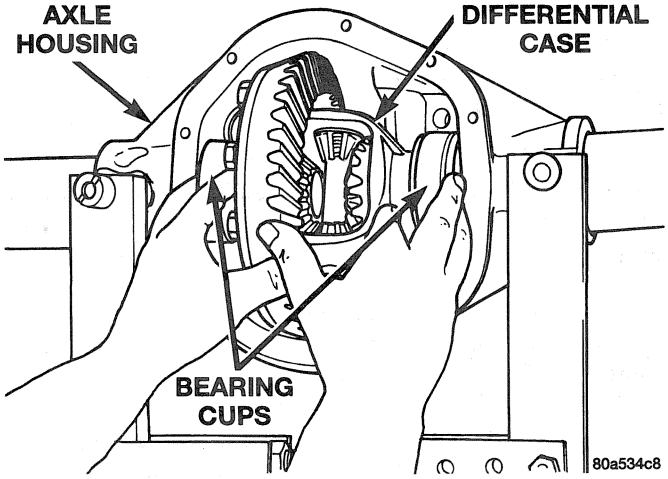


Fig. 20 Differential Case Removal

(13) Mark or tag the differential bearing cups to indicate which side of the differential they were removed from.

(14) Remove spreader from housing.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Position Spreader W-129-B, utilizing some items from Adapter Kit 6987, with the tool dowel pins seated in the locating holes (Fig. 21). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

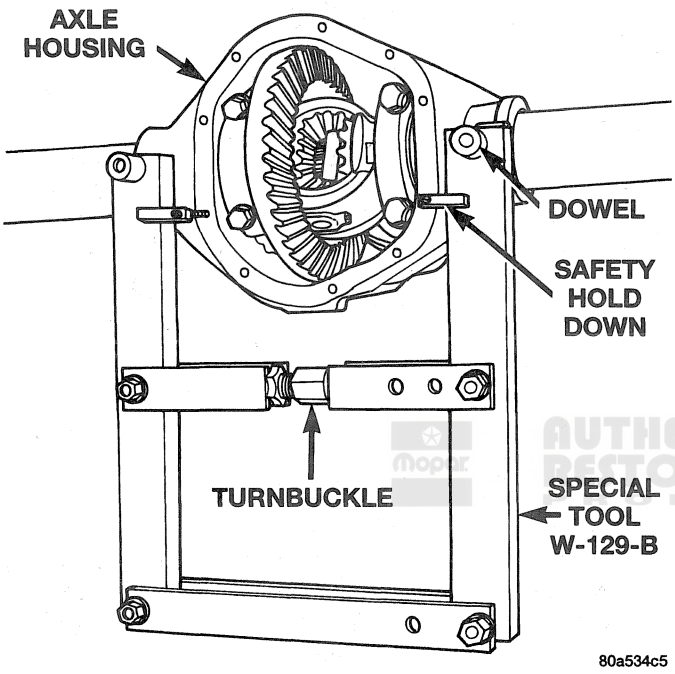


Fig. 21 Install Axle Housing Spreader

(2) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to guide pin. Load the lever adapter against the opposite side of the housing (Fig. 18) and zero the indicator.

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 19).

(4) Remove the dial indicator.

(5) Install differential case in the housing. Ensure that the differential bearing cups remain in position on the differential bearings. Tap the differential case to ensure the bearings cups are fully seated in the housing.

(6) Install the bearing caps at their original locations (Fig. 22).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

(9) Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.) torque.

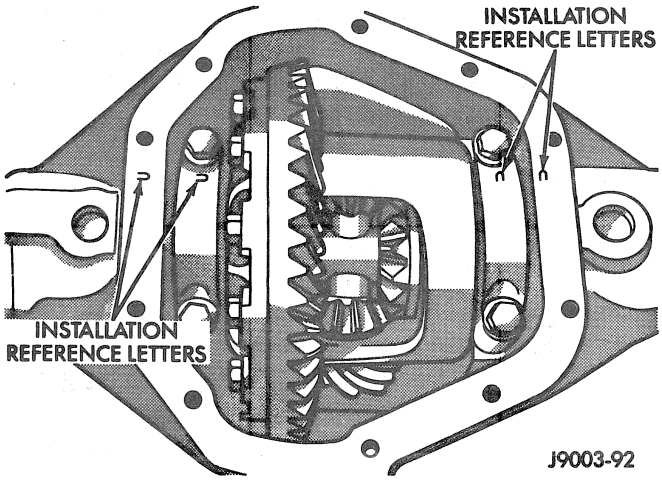


Fig. 22 Differential Bearing Cap Reference Letters

(10) Install the hub bearings and axle shafts.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, C-293-39 Blocks, and Plug SP-3289 (Fig. 23).

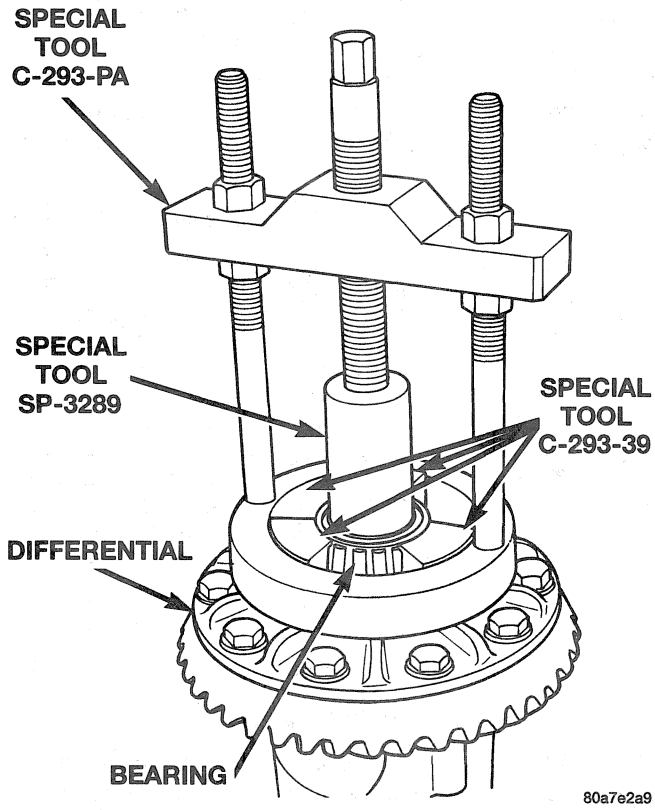


Fig. 23 Differential Bearing Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

If replacement differential side bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Using Installer C-3716-A and Handle C-4171, install differential side bearings (Fig. 24).

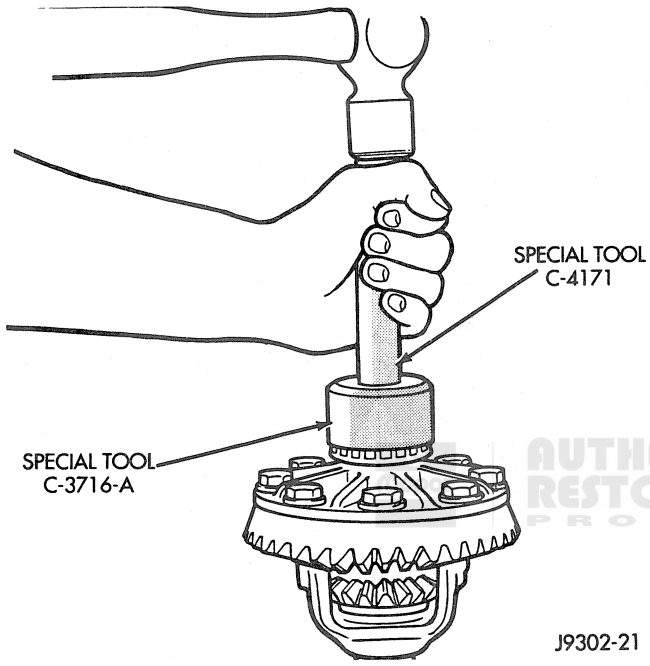


Fig. 24 Differential Side Bearing Installation

(2) Install differential in axle housing.

AXLE SHAFT OIL SEAL

REMOVAL

(1) Raise and support vehicle.
(2) Remove differential assembly.
(3) Remove the inner axle shaft seals with a pry bay.

INSTALLATION

(1) Remove any sealer remaining from original seals.
(2) Remove sealer from axle tube to housing junction, if necessary.
(3) Install oil seals with Discs 8110 and Turnbuckle 6797 (Fig. 25). Tighten tool until disc bottoms in housing.
(4) Install differential assembly.

RING GEAR

The ring and pinion gears are service in a matched set. Do not replace the ring gear without replacing the pinion gear.

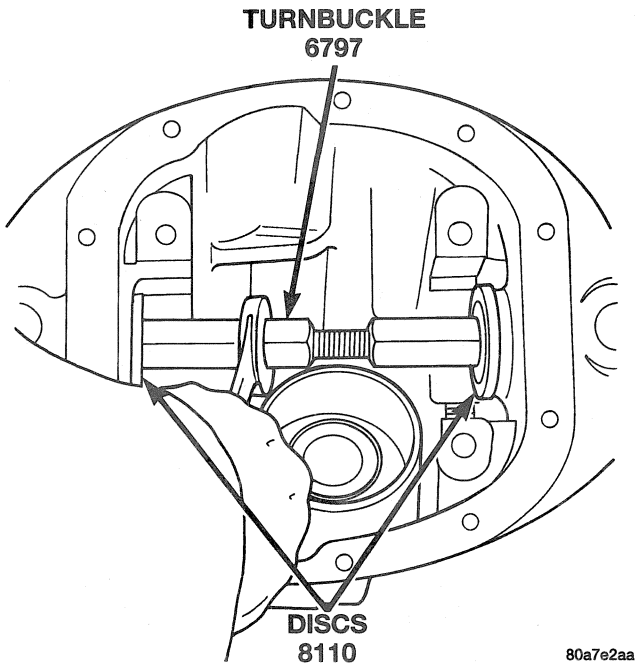


Fig. 25 Axle Seal Installation

REMOVAL

(1) Remove differential from axle housing.
(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 26)
(3) Remove bolts holding ring gear to differential case.
(4) Using a soft hammer, drive ring gear from differential case (Fig. 26).

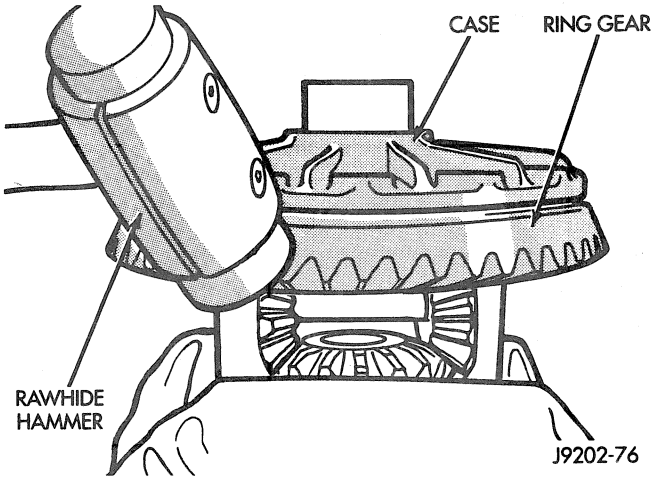


Fig. 26 Ring Gear Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

CAUTION: Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

(1) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
(2) Invert the differential case in the vise.
(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 27).
(4) Install differential in axle housing and verify gear mesh and contact pattern.

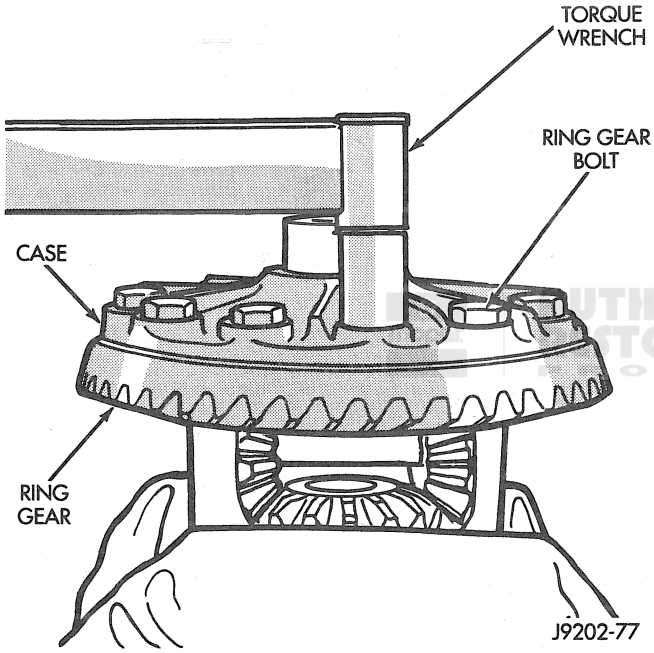


Fig. 27 Ring Gear Bolt Installation

PINION GEAR

The ring and pinion gears are serviced as a matched set. Do not replace the pinion gear without replacing the ring gear.

REMOVAL

(1) Remove differential assembly from axle housing.
(2) Mark pinion yoke and propeller shaft for installation alignment.
(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.
(4) Using Holder 6958 to hold yoke, remove the pinion nut and washer (Fig. 28).
(5) Using Remover C-452 and Holder C-3281, remove the pinion yoke from pinion shaft (Fig. 29).
(6) Remove the pinion gear and preload shims from housing (Fig. 30). Catch the pinion with your hand to prevent it from falling and being damaged.

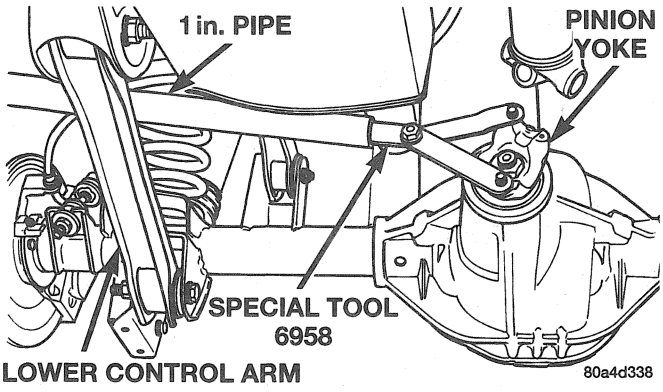


Fig. 28 Pinion Yoke Holder—Typical

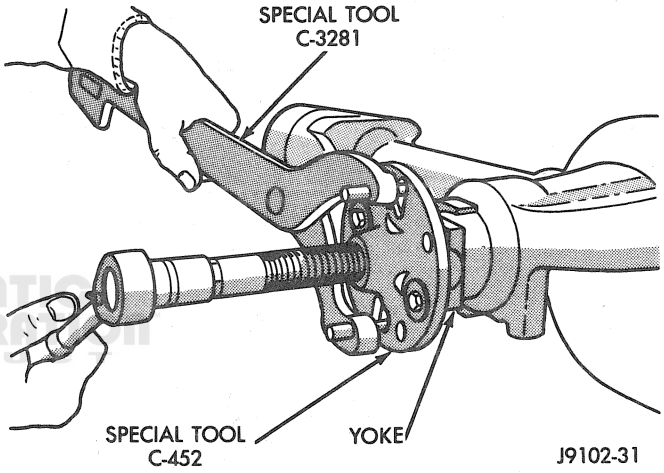


Fig. 29 Pinion Yoke Removal

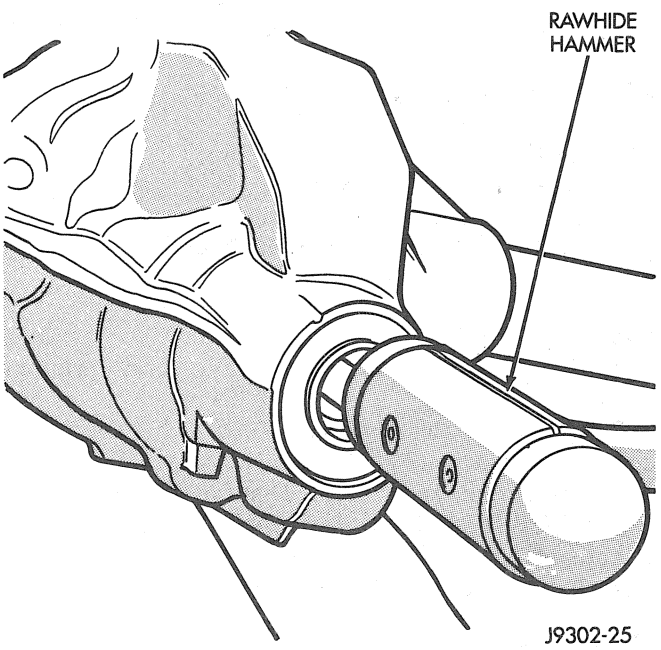


Fig. 30 Remove Pinion Gear

REMOVAL AND INSTALLATION (Continued)

(7) Remove the front pinion bearing cup, bearing, oil slinger, if equipped, and pinion seal with Remover D-147 and Handle C–4171 (Fig. 31).

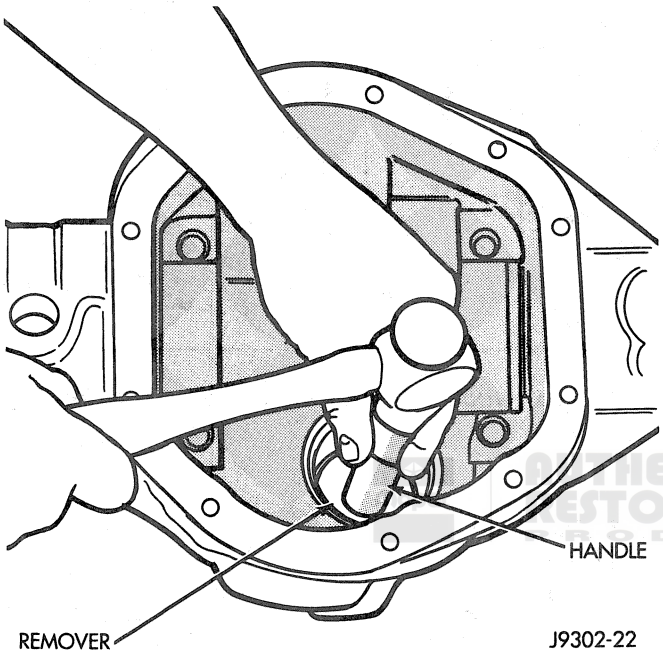


Fig. 31 Front Bearing Cup Removal

(8) Remove the rear pinion bearing cup from axle housing (Fig. 32). Use Remover D-149 and Handle C–4171.

(9) Remove the depth shims from rear pinion bearing cup bore in axle housing. Record the thickness of the depth shims.

NOTE: The pinion depth shims can be very thin. Verify that all shims have been removed before proceeding.

(10) Remove the rear pinion bearing from the pinion with Puller/Press C–293-PA and Adapters C-293-39 (Fig. 33).

Place 4 adapter blocks so they do not damage the bearing cage.

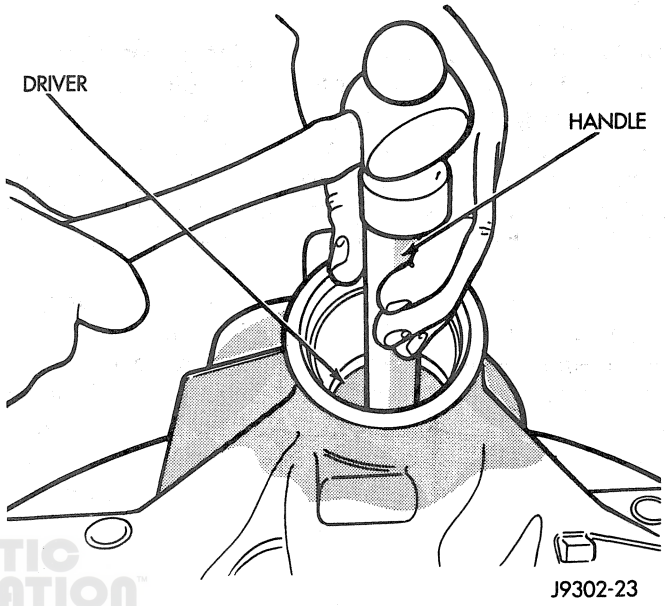


Fig. 32 Rear Bearing Cup Removal

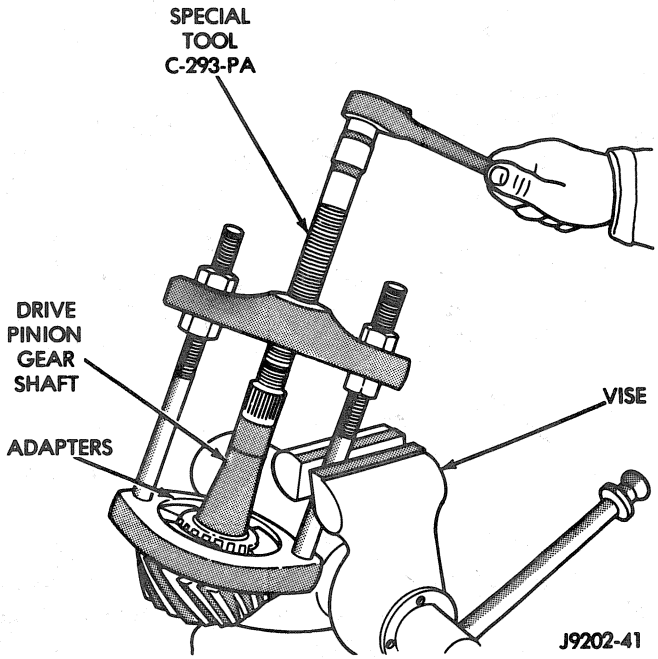


Fig. 33 Inner Bearing Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

NOTE: Pinion depth shims are placed between the rear pinion bearing cup and axle housing to achieve proper ring and pinion gear mesh. If the factory installed ring and pinion gears are reused, the pinion depth shim should not require replacement. Refer to Pinion Gear Depth to select the proper thickness shim before installing pinion gear.

(1) Place proper thickness depth shim in rear pinion bearing cup bore in the axle housing.

(2) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of rear pinion bearing cup. Install the bearing cup with Installer D-146 and Handle C–4171 (Fig. 34). Verify cup is correctly seated.

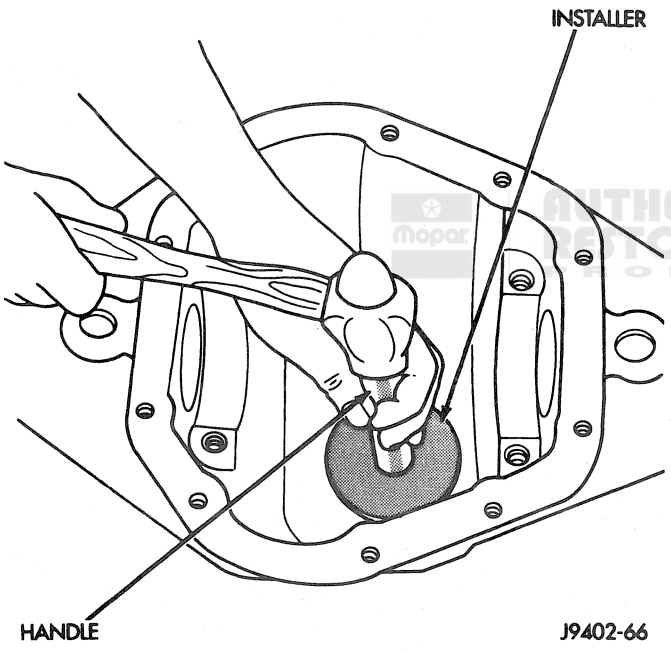


Fig. 34 Rear Pinion Bearing Cup Installation

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of front pinion bearing cup. Install the bearing cup with Installer D-144 and Handle C–4171 (Fig. 35).

(4) Install front pinion bearing, and oil slinger, if equipped.

(5) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 36).

(6) Install the rear pinion bearing and oil slinger, if equipped, on the pinion gear with Installer W-262 and a shop press (Fig. 37).

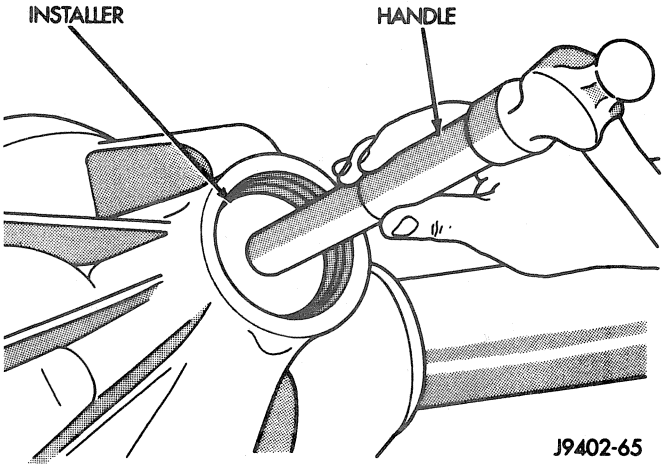


Fig. 35 Pinion Outer Bearing Cup Installation

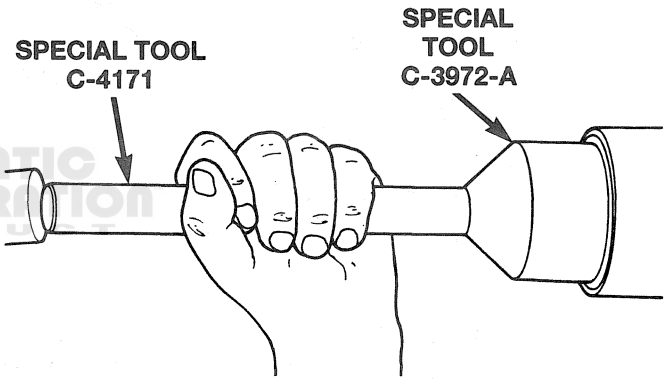


Fig. 36 Pinion Seal Installation

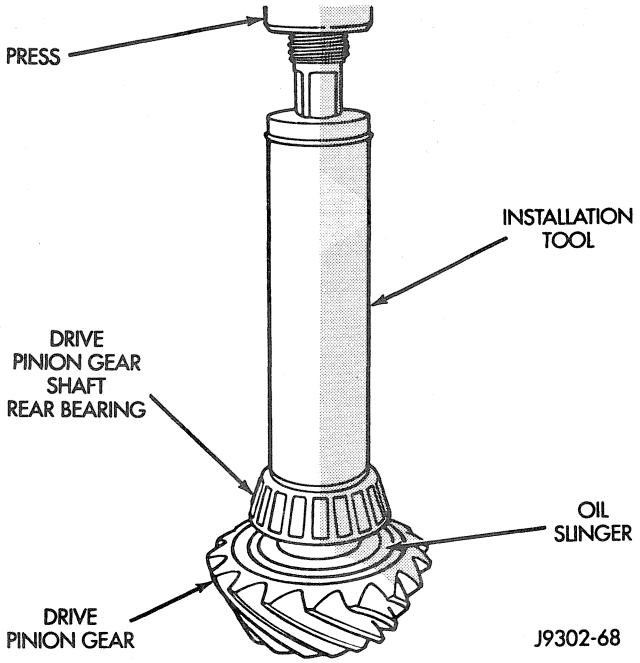


Fig. 37 Rear Pinion Bearing Installation

REMOVAL AND INSTALLATION (Continued)

(7) Install pinion bearing preload shims onto the pinion gear (Fig. 38).

(8) Install pinion gear in housing.

(9) Install yoke with Installer W-162-B, Cup 8109, and Holder 6958 (Fig. 39).

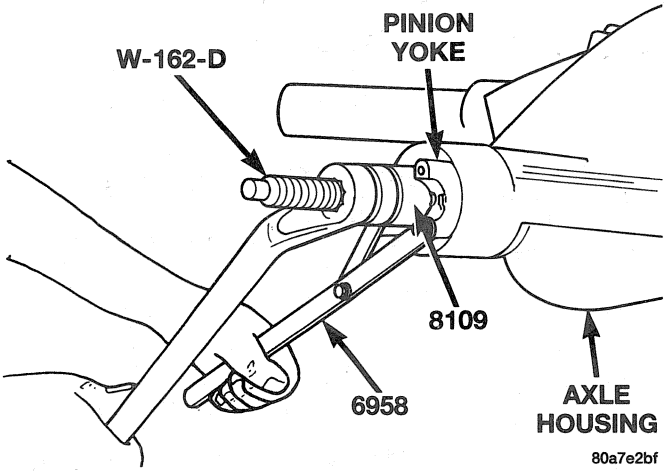


Fig. 39 Pinion Yoke Installation

(10) Install the pinion washer and a new nut on the pinion gear. Tighten the nut to 217 N·m (160 ft. lbs.) (Fig. 40).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload rotating torque.

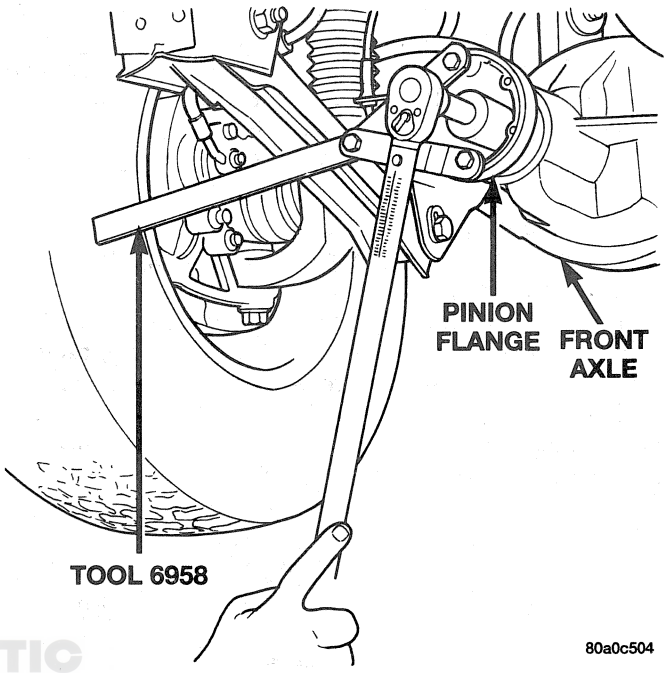


Fig. 40 Tightening Pinion Nut

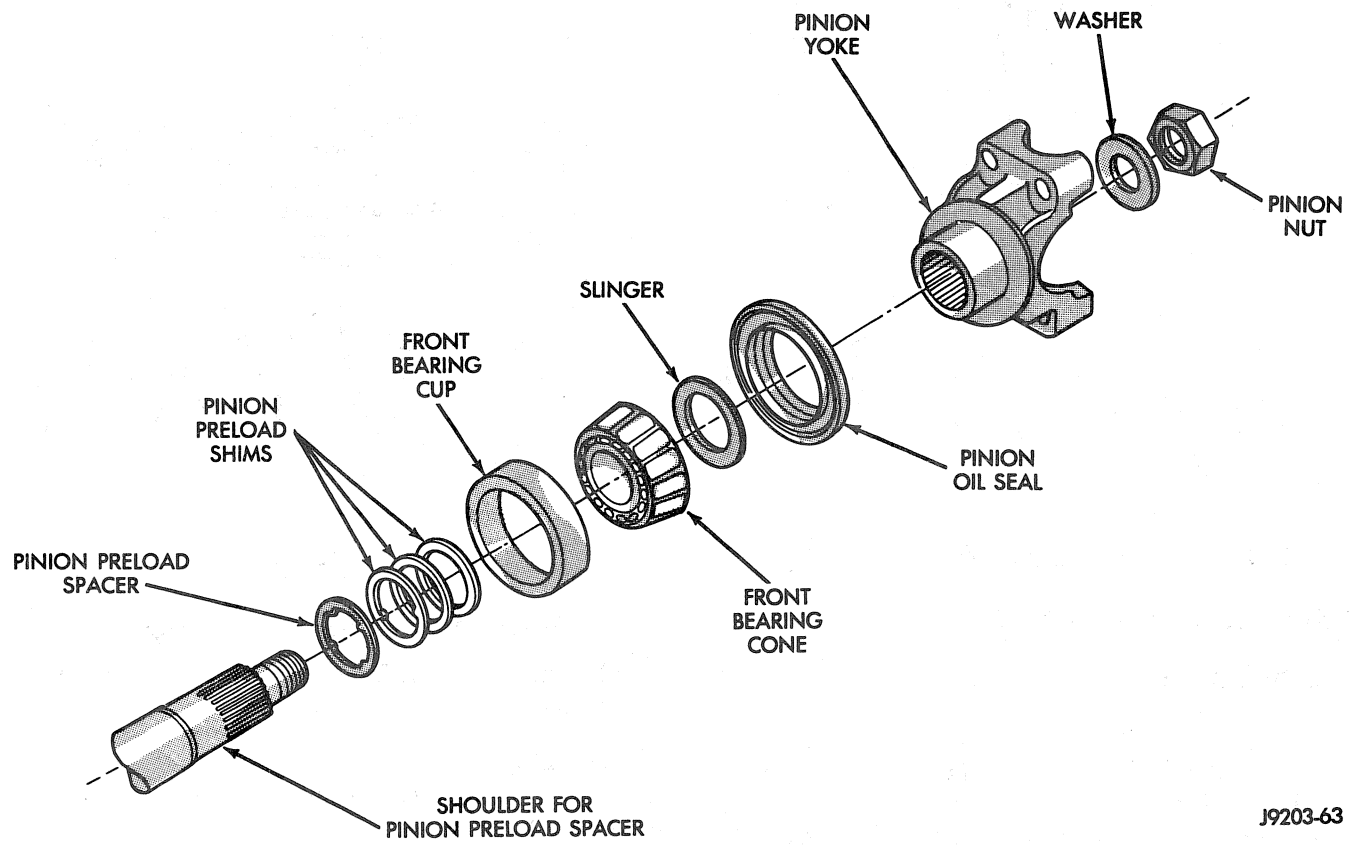


Fig. 38 Pinion Preload Shims–Typical

REMOVAL AND INSTALLATION (Continued)

(11) Check bearing preload torque with an inch pound torque wrench (Fig. 41). The torque necessary to rotate the pinion gear should be:

- Original Bearings—1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings—2 to 5 N·m (15 to 35 in. lbs.).

(12) If rotating torque is above the desired amount, remove the pinion yoke and increase the preload shim pack thickness. Increasing the shim pack thickness 0.025 mm (0.001 in.) will decrease the rotating torque approximately 0.9 N·m (8 in. lbs.).

(13) Tighten pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until the maximum tightening or desired rotating torque is reached.

(14) If the maximum tightening torque is reached prior to achieving the desired rotating torque, remove the pinion yoke and decrease the thickness of the preload shim pack. Decreasing the shim pack thickness 0.025 mm (0.001 in.) will increase the rotating torque approximately 0.9 N·m (8 in. lbs.).

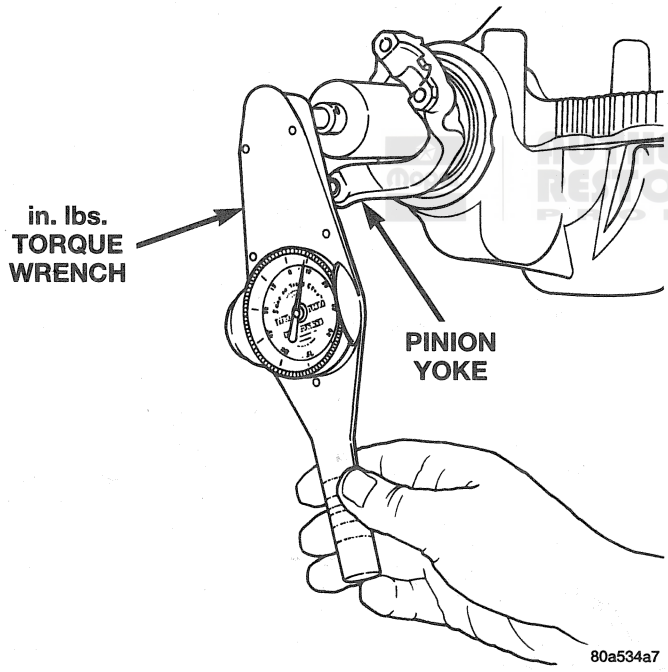


Fig. 41 Check Pinion Gear Rotating Torque

(15) Install differential assembly.

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove the ring gear.

(2) Using a suitable roll pin punch, drive out the roll pin holding pinion gear mate shaft in the differential case (Fig. 42).

(3) Remove the pinion gear mate shaft from the differential case and the pinion mate gears.

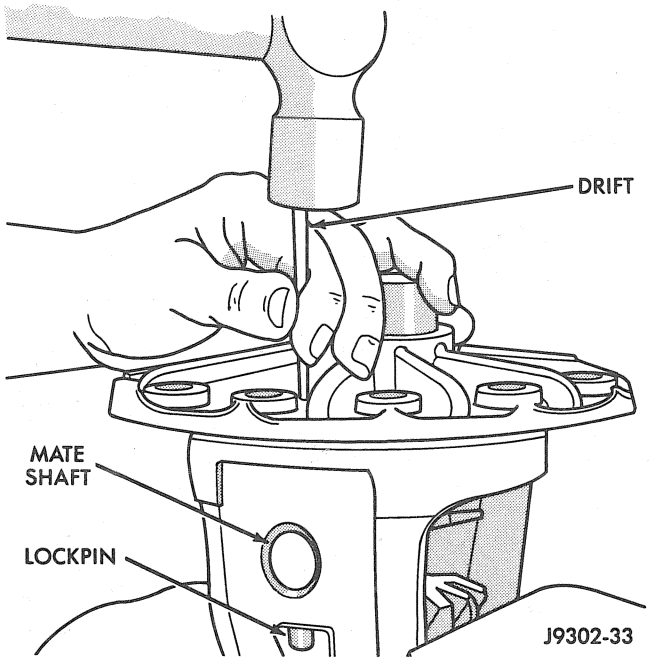


Fig. 42 Mate Shaft Roll Pin Removal

(4) Rotate differential side gears and remove the pinion mate gears and thrust washers (Fig. 43).

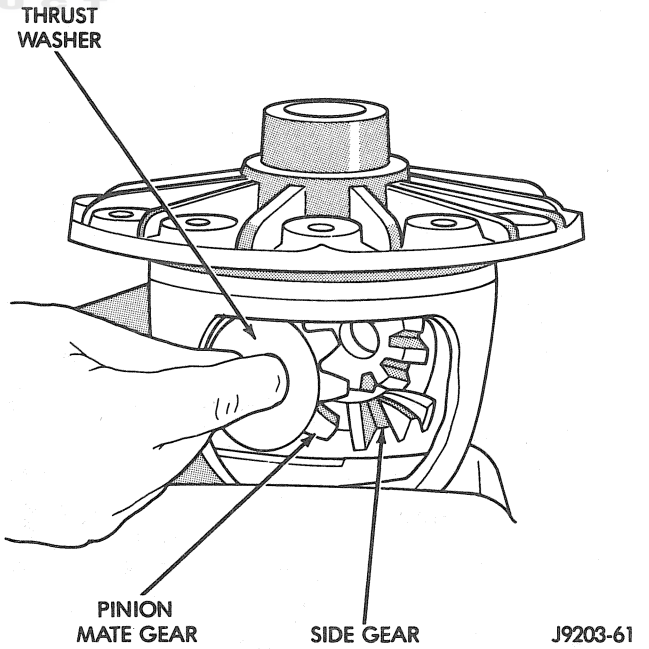


Fig. 43 Pinion Mate Gear Removal

(5) Remove the differential side gears and thrust washers.

ASSEMBLY

(1) Install the differential side gears and thrust washers.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Install the pinion mate gears and thrust washers.

(3) Install the pinion gear mate shaft. Align the roll pin holes in shaft and the differential case.

(4) Install the roll pin to hold the pinion mate shaft in the differential case (Fig. 44).

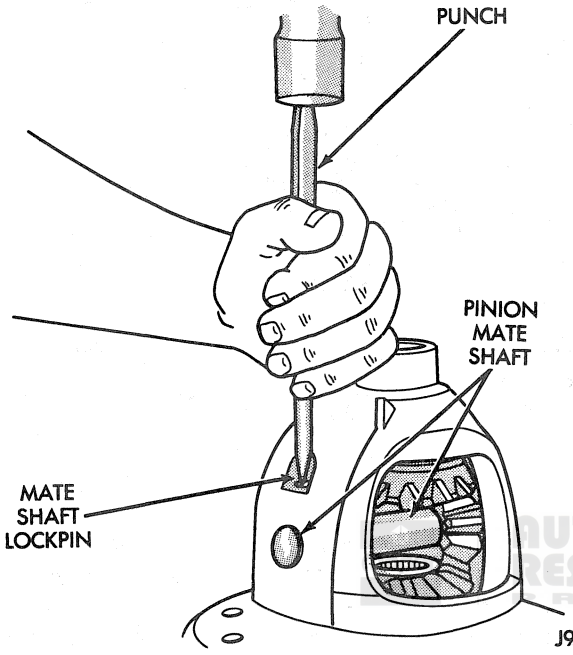


Fig. 44 Mate Shaft Roll Pin Installation

(5) Install the ring gear.

(6) Lubricate all differential components with hypoid gear lubricant.

FINAL ASSEMBLY

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 45).

Install the housing cover within 5 minutes after applying the sealant.

(2) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(3) Refill the differential housing with gear lubricant. Refer to the Lubricant Specifications section of this group for the gear lubricant requirements.

(4) Install the fill hole plug.

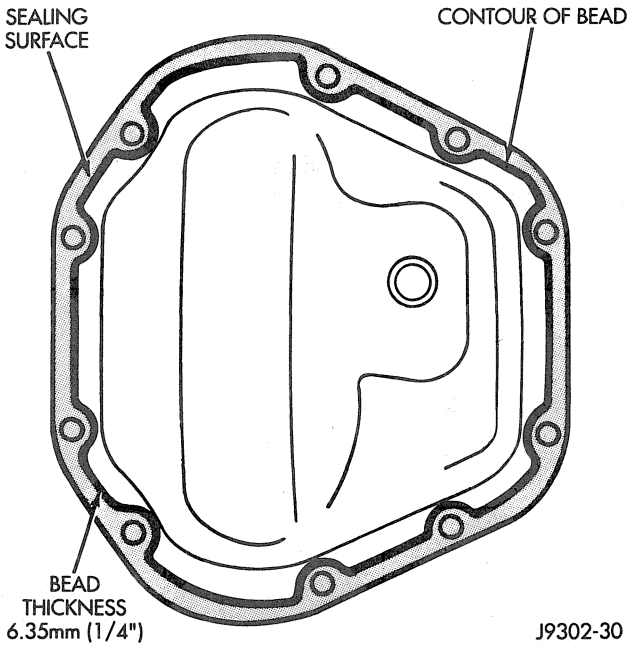


Fig. 45 Typical Housing Cover With Sealant

CLEANING AND INSPECTION

CARDAN U-JOINT

Clean all the U–joint yoke bores with cleaning solvent and a wire brush. Ensure that all the rust and foreign matter are removed from the bores.

Inspect the yokes for distortion, cracks and worn bearing cap bores.

Replace the complete U–joint if any of the components are defective.

AXLE COMPONENTS

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing.

Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.

CLEANING AND INSPECTION (Continued)

- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims, if necessary.

ADJUSTMENTS

PINION GEAR DEPTH

GENERAL INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 46). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 92.08 mm (3.625 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

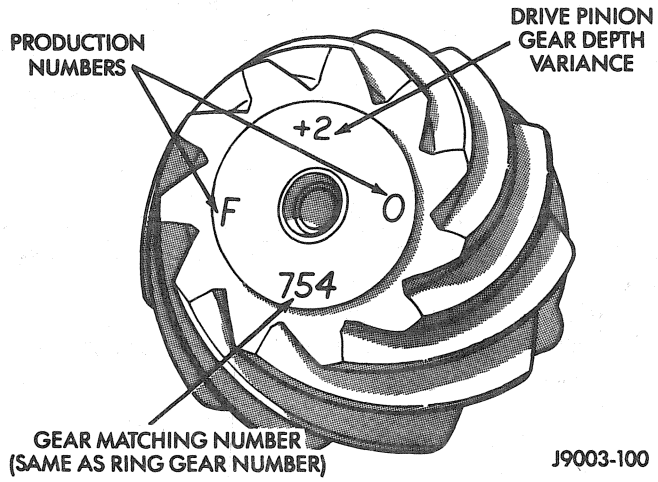


Fig. 46 Pinion Gear ID Numbers

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing cup (Fig. 47).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance chart.

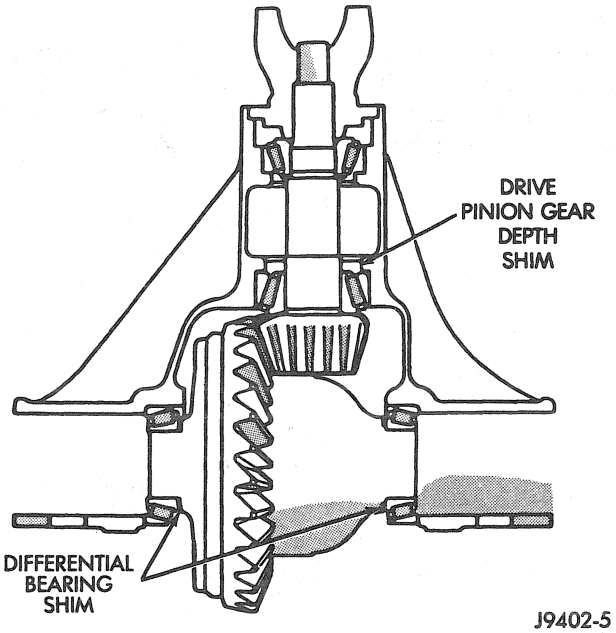


Fig. 47 Shim Locations

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the etched number on the face of the drive pinion gear (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing without any shims placed behind the rear pinion bearing cup. Take measurements with Pinion Gauge Set 6774 and Dial Indicator C-3339 (Fig. 48).

(1) Assemble Pinion Height Block 6739, Pinion Block 6733, and rear pinion bearing onto Screw 6741 (Fig. 48).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 49).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 48).

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 50). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

ADJUSTMENTS (Continued)

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

J8902-46

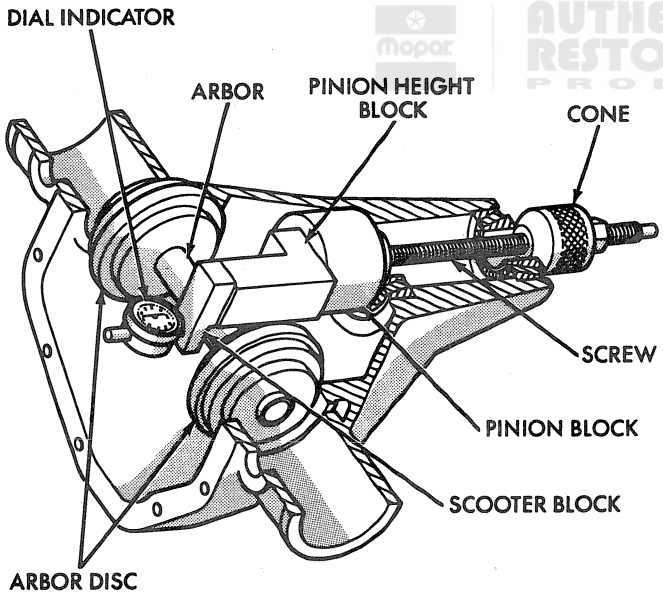


Fig. 48 Pinion Gear Depth Gauge Tools—Typical

NOTE: Arbor Discs 6732 has different step diameters to fit other axles. Choose proper step for axle being serviced.

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 48). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

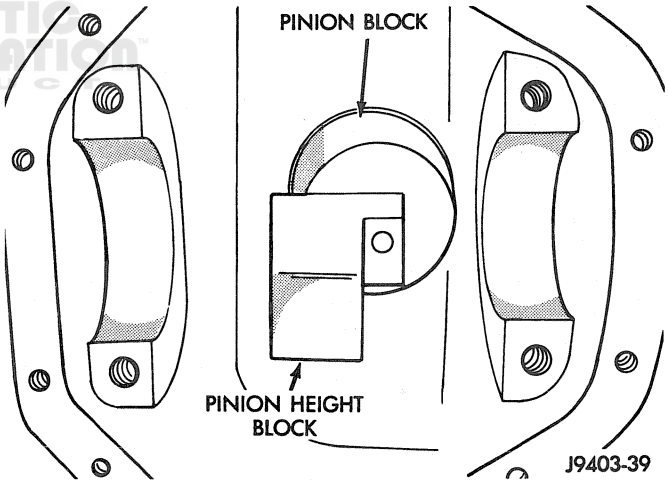


Fig. 49 Pinion Height Block—Typical

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 51). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading,

ADJUSTMENTS (Continued)

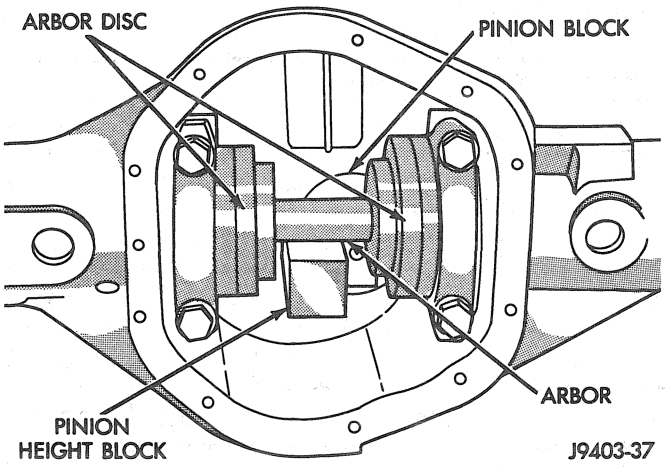


Fig. 50 Gauge Tools In Housing—Typical

the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 46). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

NOTE: If an oil slinger is used behind the inner pinion bearing, deduct the thickness of the slinger from the dial indicator reading and use that total for shim selection.

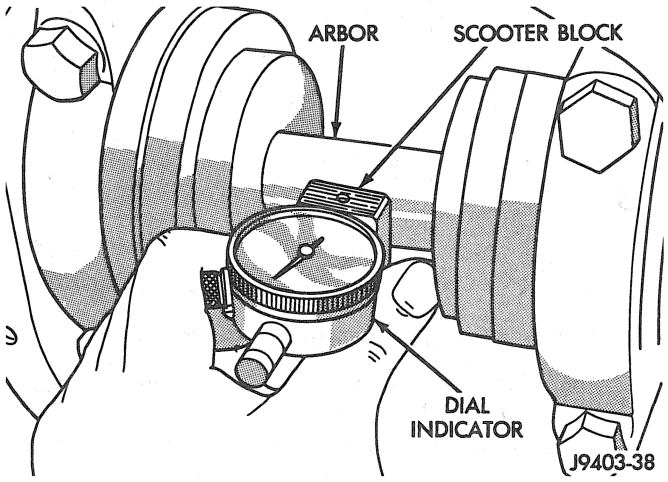


Fig. 51 Pinion Gear Depth Measurement—Typical

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

INTRODUCTION

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit dummy bearings D-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion gear for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion gear is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 52). Differential shim measurements are performed with axle spreader W-129-B removed.

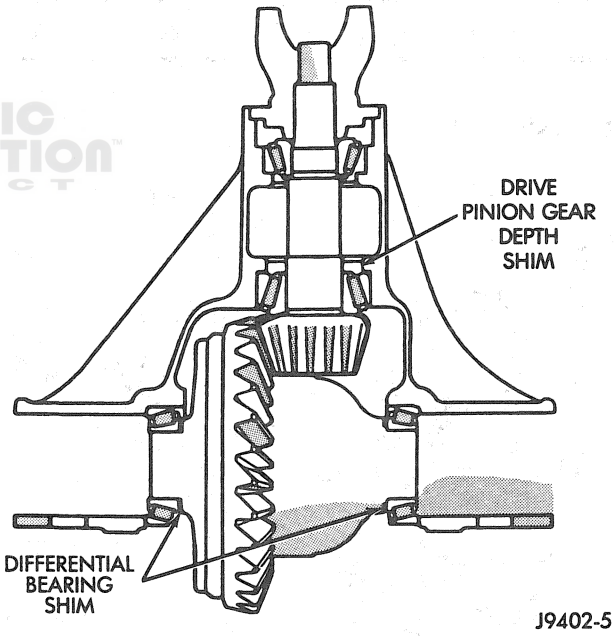


Fig. 52 Axle Adjustment Shim Locations

SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

(1) Remove differential side bearings from differential case.

(2) Remove factory installed shims from differential case.

(3) Install ring gear on differential case and tighten bolts to specification.

(4) Install dummy side bearings D-348 on differential case.

ADJUSTMENTS (Continued)

(5) Install differential case in axle housing.

(6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 53).

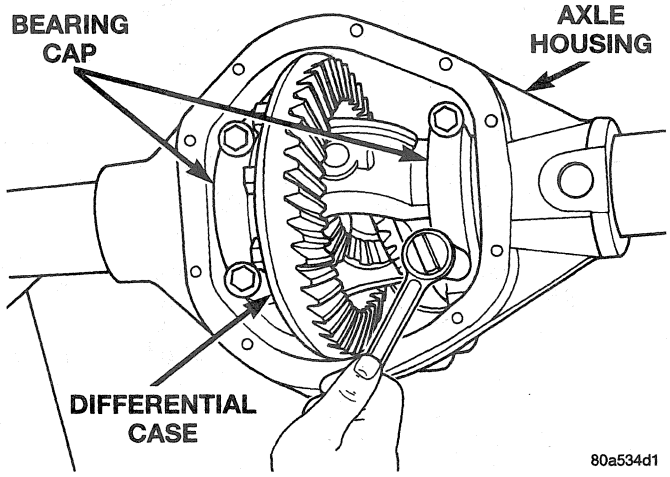


Fig. 53 Tighten Bolts Holding Bearing Caps

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 54) and (Fig. 55).

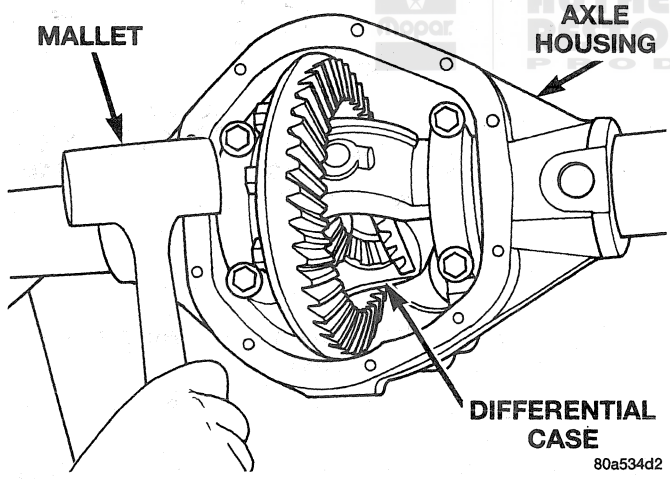


Fig. 54 Seat Pinion Gear Side Differential Dummy Side Bearing

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 56).

(9) Attach a dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 56).

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 57).

(11) Zero dial indicator face to pointer (Fig. 57).

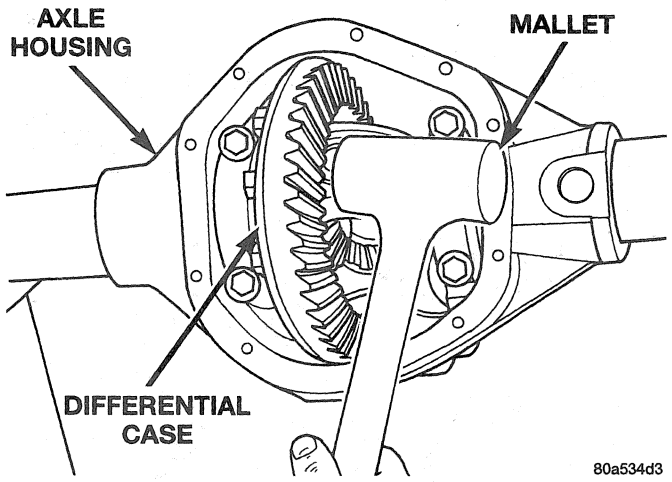


Fig. 55 Seat Ring Gear Side Differential Dummy Side Bearing

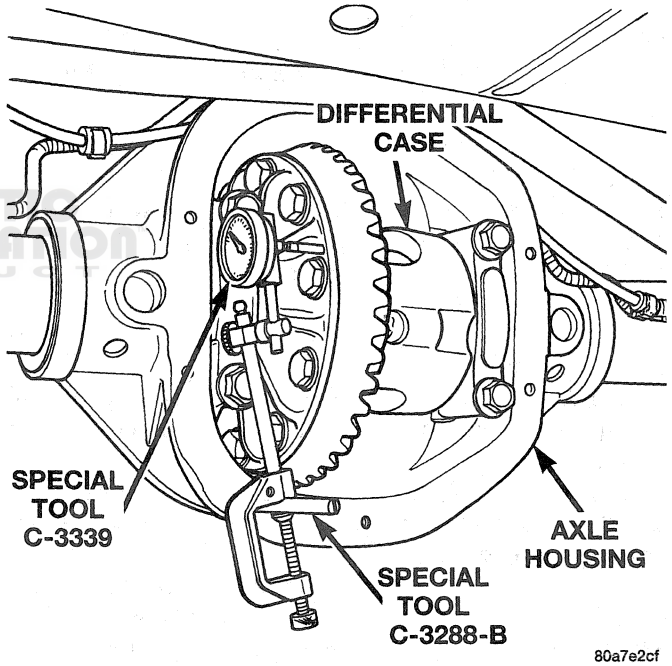


Fig. 56 Differential Side play Measurement

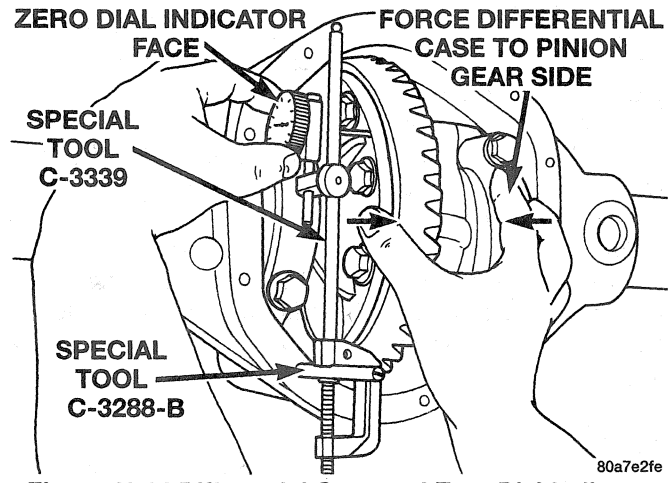


Fig. 57 Hold Differential Case and Zero Dial Indicator

ADJUSTMENTS (Continued)

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 58).

(13) Record dial indicator reading (Fig. 58).

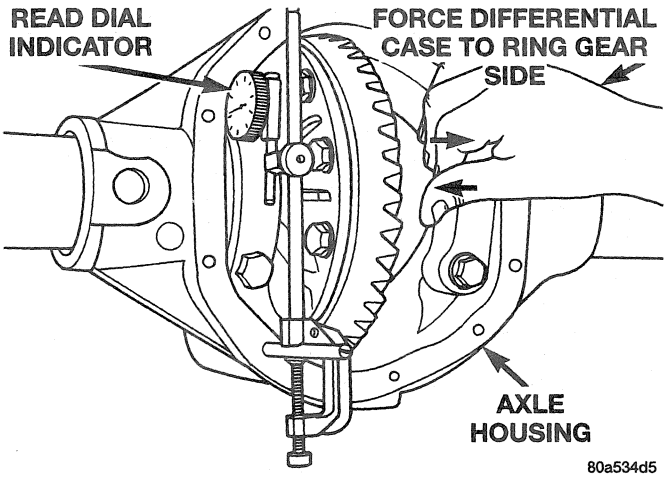


Fig. 58 Hold Differential Case and Read Dial Indicator

(14) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.

(15) Rotate dial indicator out of the way on the guide stud.

(16) Remove differential case and dummy bearings from axle housing.

(17) Install the pinion gear in axle housing. Install the pinion yoke and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings D-348 in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 55).

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 56).

(21) Push and hold differential case toward pinion gear (Fig. 59).

(22) Zero dial indicator face to pointer (Fig. 59).

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 60).

(24) Record dial indicator reading (Fig. 60).

(25) Subtract 0.002 in. (0.05 mm) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

(26) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(27) Rotate dial indicator out of the way on guide stud.

(28) Remove differential case and dummy bearings from axle housing.

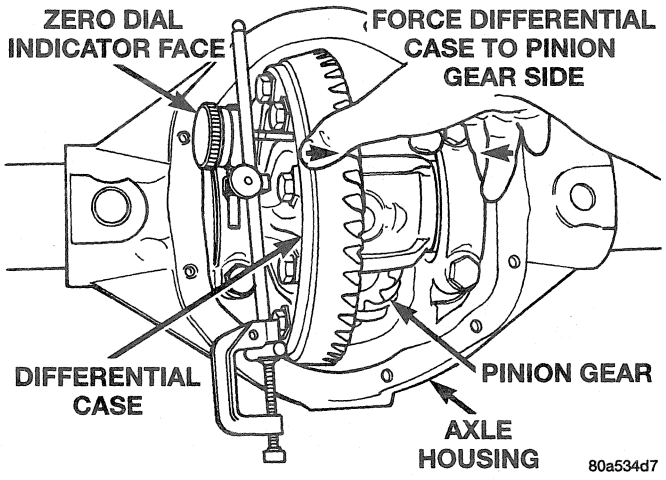


Fig. 59 Hold Differential Case and Zero Dial Indicator

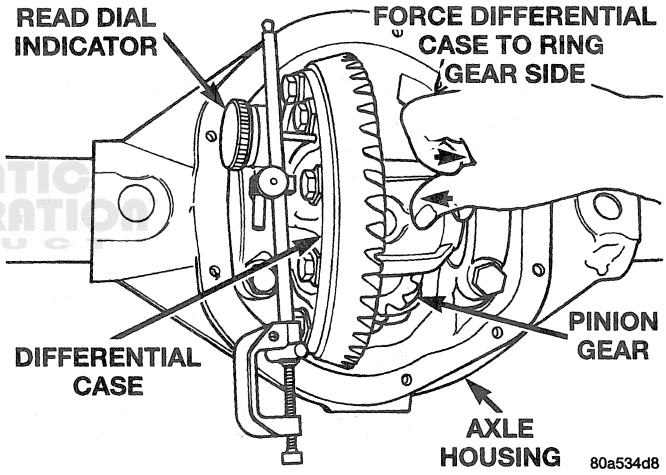


Fig. 60 Hold Differential Case and Read Dial Indicator

(29) Install side bearing shims on differential case hubs.

(30) Install side bearings and cups on differential case.

(31) Install spreader W-129-B, utilizing some items from Adapter Set 6987, on axle housing and spread axle opening enough to receive differential case.

(32) Install differential case in axle housing.

(33) Remove spreader from axle housing.

(34) Rotate the differential case several times to seat the side bearings.

(35) Position the indicator plunger against a ring gear tooth (Fig. 61).

(36) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(37) Zero dial indicator face to pointer.

(38) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifi-

ADJUSTMENTS (Continued)

cations transfer the necessary amount of shim thickness from one side of the axle housing to the other (Fig. 62).

(39) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at several locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern Analysis procedure.

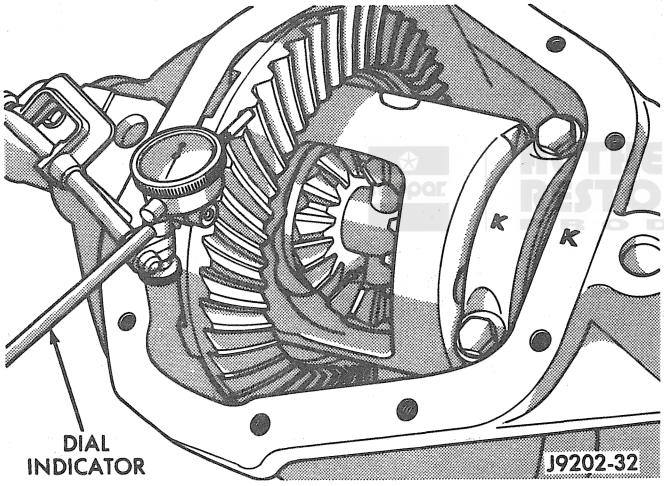


Fig. 61 Ring Gear Backlash Measurement

GEAR CONTACT PATTERN ANALYSIS

The ring and pinion gear teeth contact patterns will show if the pinion gear depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the

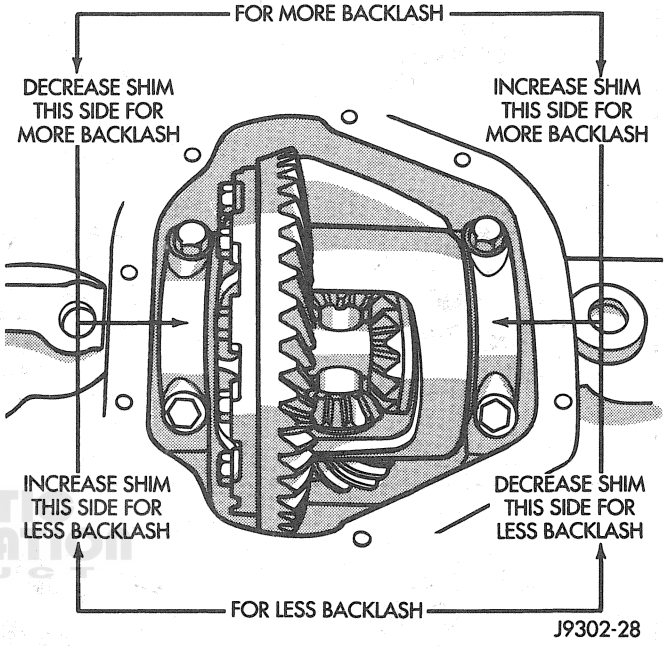


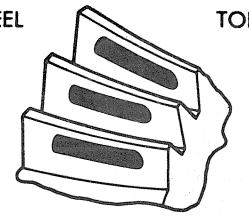
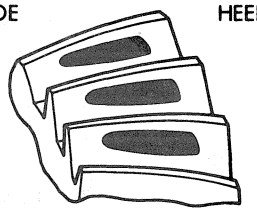
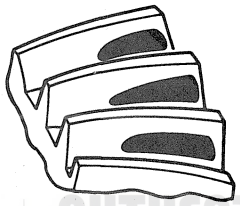
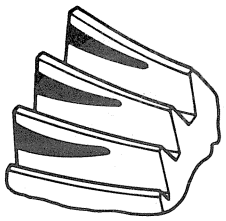
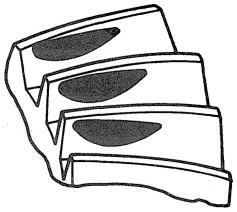
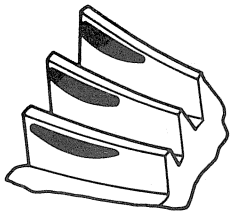
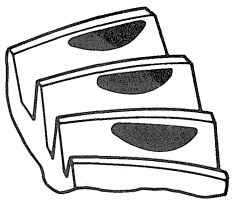
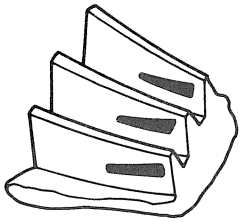
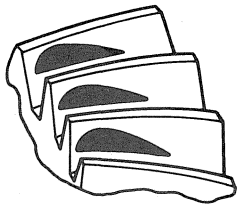
Fig. 62 Backlash Shim Adjustment

pinion gear. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion gear teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 63) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 63 Gear Tooth Contact Patterns

SPECIFICATIONS

DANA 30 AXLE

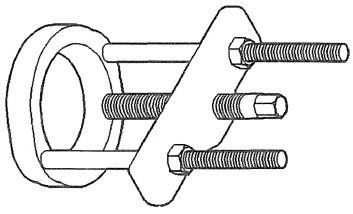
Axle Type . . . . . .Hypoid
Lubricant. . . . . .SAE Thermally Stable 80W–90
Lube Capacity . . . . . .1.2 L (2.5 pts.)
Axle Ratio 3.07, 3.31, 3.54, 3.55, 3.73, 4.10
Differential Side Gear
Clearance . . . . . .0.12–0.20 mm (0.005–0.008 in.)
Ring Gear Diameter . . . . . .18.09 cm (7.125 in.)
Backlash . . . . . .0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth . . . . . .92.1 mm (3.625 in.)
Pinion Bearing Rotating Torque. . . . . .
Original Bearings . . . . . .1–2 N·m (10–20 in. lbs.)
New Bearings . . . . . .1.5–4 N·m (15–35 in. lbs.)

DANA 30 AXLE

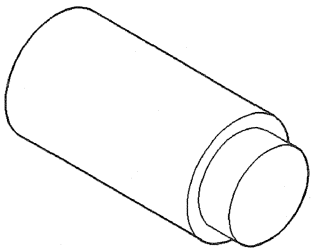
DESCRIPTION	TORQUE
Fill Hole Plug	.34 N·m (25 ft. lbs.)
Diff. Cover Bolt	.41 N·m (30 ft. lbs.)
Bearing Cap Bolt	.61 N·m (45 ft. lbs.)
Ring Gear Bolt	.95–122 N·m (70–90 ft. lbs.)
Axle Nut	.237 N·m (175 ft. lbs.)
Hub Brg. Bolt	.102 N·m (75 ft. lbs.)
Lower Ball Stud	.108 N·m (80 ft. lbs.)
Upper Ball Stud	.101 N·m (75 ft. lbs.)

SPECIAL TOOLS

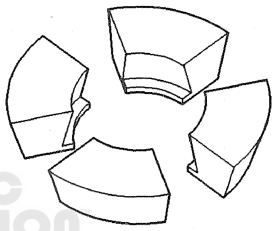
DANA 30 AXLE



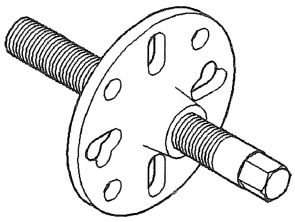
Puller—C-293-PA



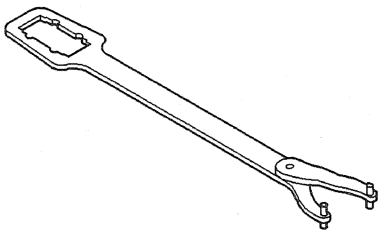
Plug—SP-3289



Adapter—C-293-39

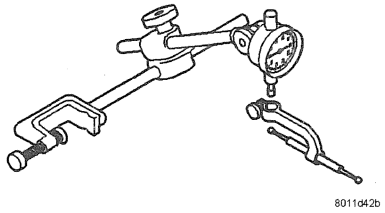


Puller—C-452

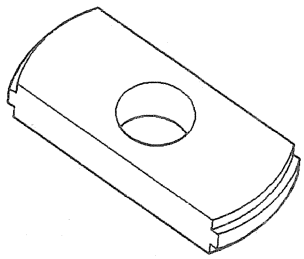


Wrench—C-3281

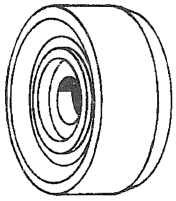
SPECIAL TOOLS (Continued)



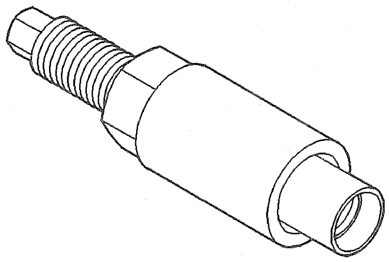
Dial Indicator—C-3339



Remover—D-149

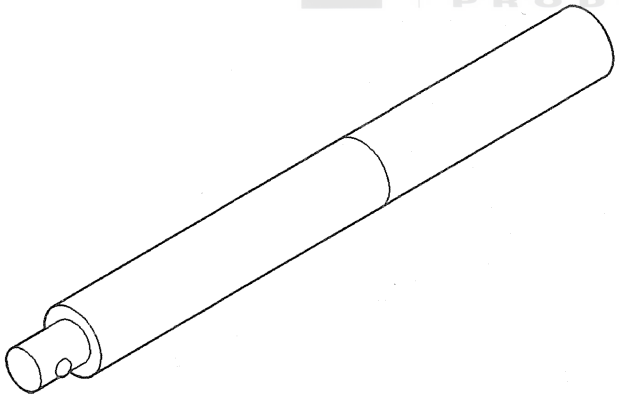


Driver—C-3716-A

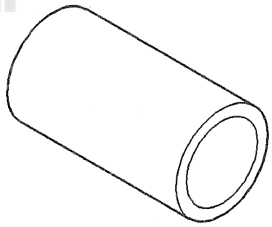


Installer—W-162-D

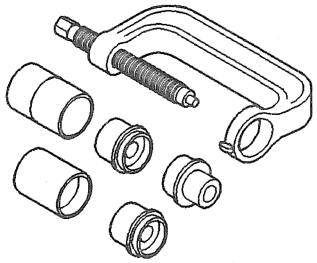
AUTHENTIC RESTORATION PRODUCT



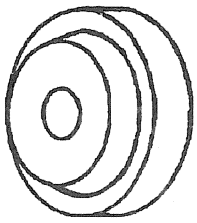
Handle—C-4171



Cup—8109

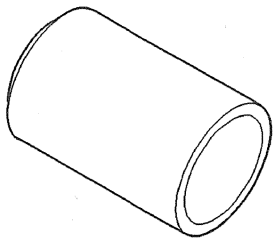


Remover/Installer—6289

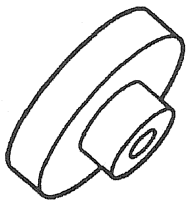


Installer—D-146

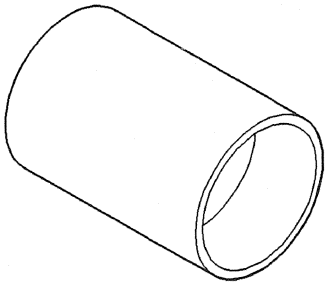
SPECIAL TOOLS (Continued)



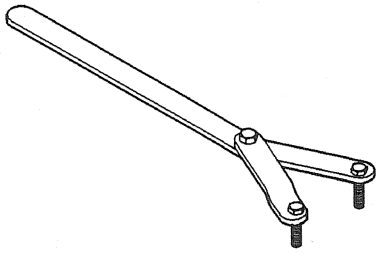
Installer—6761



Gauge Block—6733

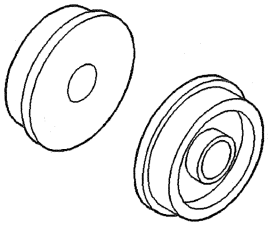


Installer—6752

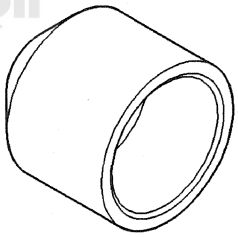


Spanner—6958

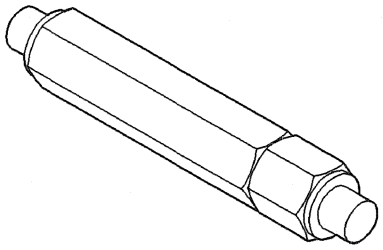
Mopar AUTHENTIC RESTORATION PRODUCT



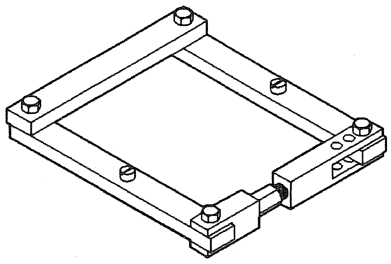
Installer Discs—8110



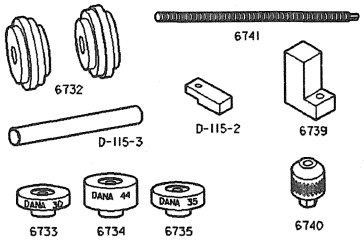
Installer—C-3972-A



Turnbuckle—6797

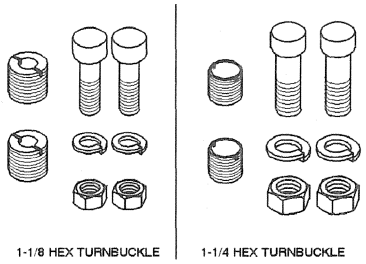


Spreader—W-129-B

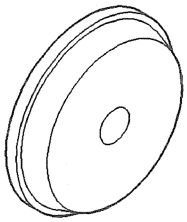


Tool Set, Pinion Depth—6774

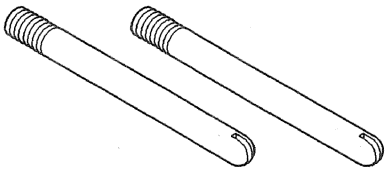
SPECIAL TOOLS (Continued)



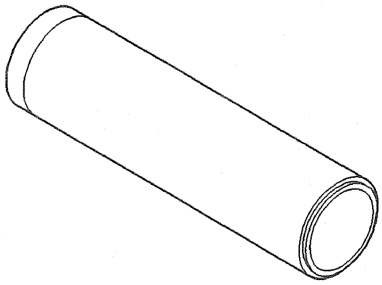
Adapter Kit—6987



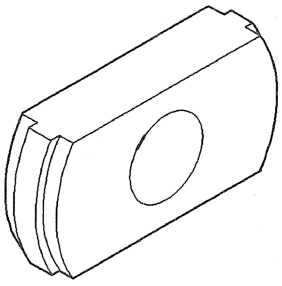
Installer—D-144



Pilot Stud—C-3288-B



Installer—W-262



Remover—D-147

Mopar AUTHENTIC RESTORATION PRODUCT

DANA 35 AXLE

INDEX

	page
GENERAL INFORMATION	
DANA 35 AXLE	33
LUBRICANT SPECIFICATIONS	33
DESCRIPTION AND OPERATION	
STANDARD DIFFERENTIAL	34
TRAC-LOK OPERATION	34
DIAGNOSIS AND TESTING	
BEARING NOISE	35
DRIVELINE SNAP	36
GEAR NOISE	35
GENERAL INFORMATION	35
LOW SPEED KNOCK	36
TRAC–LOK DIFFERENTIAL NOISE	36
TRAC–LOK TEST	39
VIBRATION	36
SERVICE PROCEDURES	
LUBRICANT CHANGE	39
REMOVAL AND INSTALLATION	
AXLE SHAFT SEAL AND BEARING	45
AXLE SHAFT	44
COLLAPSIBLE SPACER	42
DIFFERENTIAL SIDE BEARINGS	47
DIFFERENTIAL	45
FINAL ASSEMBLY	52
PINION GEAR	48
PINION SHAFT SEAL	40
REAR AXLE	39
RING GEAR	48
DISASSEMBLY AND ASSEMBLY	
STANDARD DIFFERENTIAL	52
TRAC-LOK DIFFERENTIAL	53
CLEANING AND INSPECTION	
AXLE COMPONENTS	57
TRAC-LOK	57
ADJUSTMENTS	
DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH	60
GEAR CONTACT PATTERN ANALYSIS	62
PINION GEAR DEPTH	57
SPECIFICATIONS	
DANA 35 AXLE	64
DANA 35 AXLE	64
SPECIAL TOOLS	
DANA 35 AXLE	64

GENERAL INFORMATION

DANA 35 AXLE

The Dana 35 axle housing has an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing.

The integral type, hypoid gear design, housing has the centerline of the pinion set below the centerline of the ring gear.

The axle has a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the axle shaft and bearings. The axle shafts are retained by C–clips in the differential side gears.

The cover provides a means for servicing the differential without removing the axle.

For vehicles equipped with ABS brakes, the axles have a tone ring pressed onto the axle shaft. Use care when removing axle shafts to ensure that the tone wheel or the wheel speed sensor are not damaged.

The Dana 35 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the differential housing by a cover bolt. Build date identification codes are stamped on the cover side of an axle shaft tube.

The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash is adjusted by the use of selective spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer (Fig. 1).

LUBRICANT SPECIFICATIONS

A multi-purpose, hypoid gear lubricant which conforms to the following specifications should be used. Mopar® Hypoid Gear Lubricant conforms to all of these specifications.

- The lubricant should have MIL–L–2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 80W–90 gear lubricant.
- Lubricant for axles intended for heavy-duty or trailer tow use is SAE 75W–140 SYNTHETIC gear lubricant.

Trac-lok differentials require the addition of 4 oz. of friction modifier to the axle lubricant. The Dana

GENERAL INFORMATION (Continued)

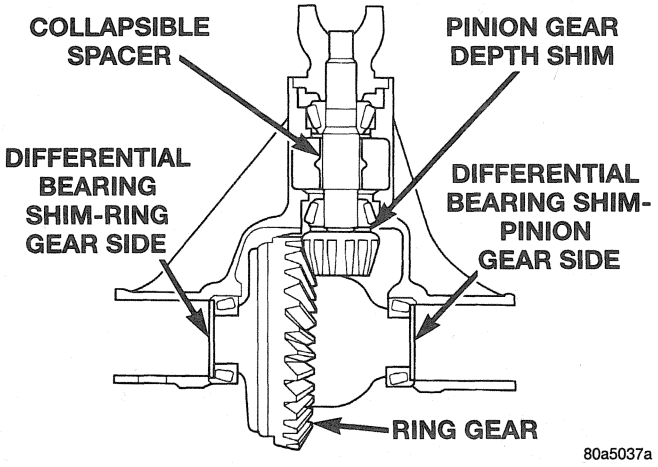


Fig. 1 Shim Locations

35 axle lubricant capacity is 1.66L (3.50 pts.) total, including the friction modifier if necessary.

CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

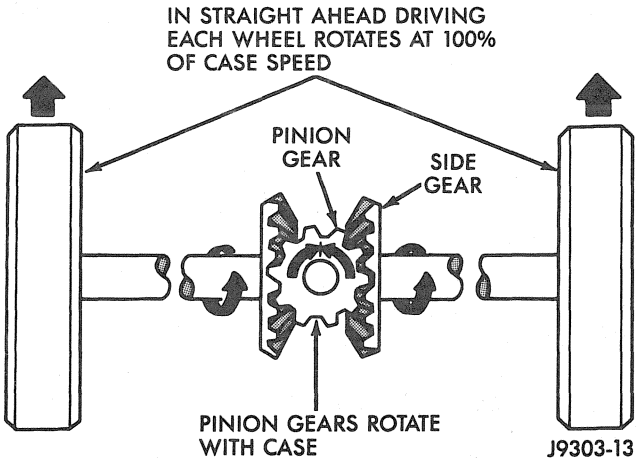


Fig. 2 Differential Operation—Straight Ahead Driving

DESCRIPTION AND OPERATION

STANDARD DIFFERENTIAL

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 2).

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 3). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

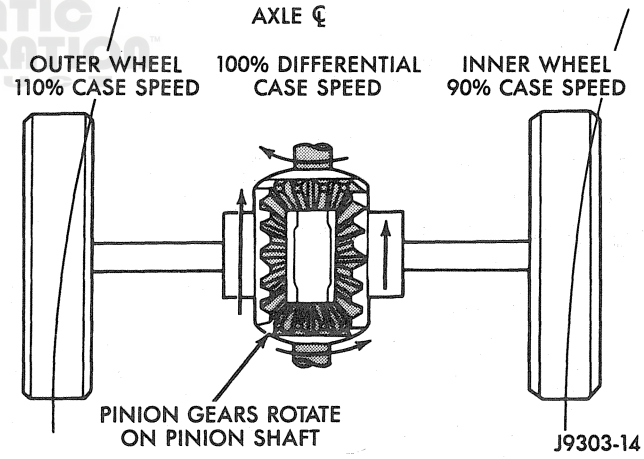


Fig. 3 Differential Operation—On Turns

TRAC-LOK OPERATION

In a conventional differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

In the Trac-lok differential, part of the ring gear torque is transmitted through clutch packs which contain multiple discs. The clutches will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material that is smooth in appearance.

In operation, the Trac-lok clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 4).

DESCRIPTION AND OPERATION (Continued)

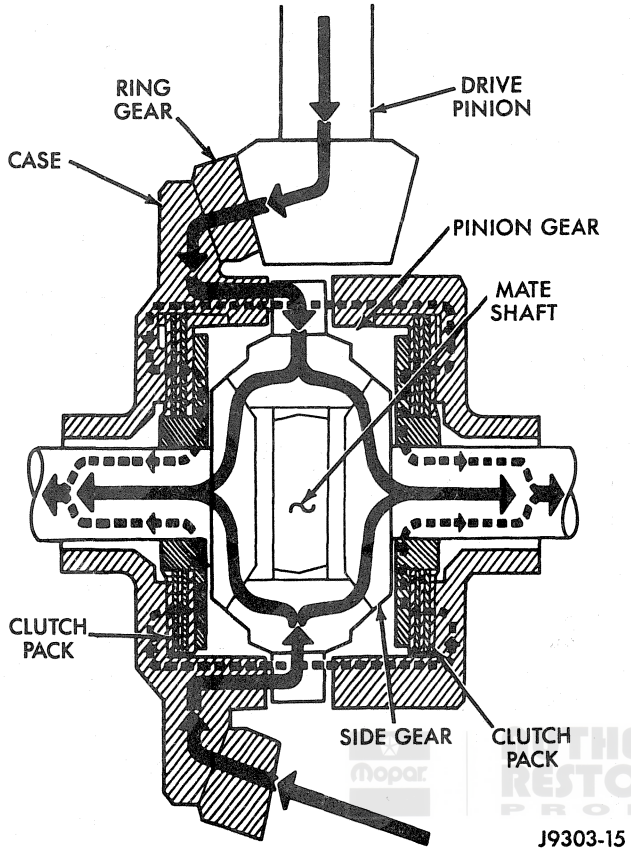


Fig. 4 Trac-lok Limited Slip Differential Operation

The Trac-lok design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. Trac-lok differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.
- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak–noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise during straight–ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion gear bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion gear bearings have a constant–pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise

DIAGNOSIS AND TESTING (Continued)

level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U–joint or by worn side–gear thrust washers. A worn pinion gear shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out–of–balance wheels.
- Loose wheel lug nuts.
- Worn U–joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front–end components or engine/transmission mounts. These components can contribute to what appears to be a rear–end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed
- Loose engine/transmission/transfer case mounts
- Worn U–joints
- Loose spring mounts
- Loose pinion gear nut and yoke
- Excessive ring gear backlash
- Excessive side gear/case clearance

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

TRAC–LOK DIFFERENTIAL NOISE

The most common problem is a chatter noise when turning corners. Before removing a Trac-lok unit for repair, drain, flush and refill the axle with the specified lubricant. Refer to Lubricant change in this Group.

A container of Mopar® Trac-lok Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces.	1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed.	2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts	1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

Mopar AUTHENTIC RESTORATION PRODUCTS

DIAGNOSIS AND TESTING (Continued)

TRAC–LOK TEST

WARNING: WHEN SERVICING VEHICLES WITH A TRAC–LOK DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A TRAC–LOK AXLE CAN EXERT ENOUGH FORCE IF ONE WHEEL IS IN CONTACT WITH A SURFACE TO CAUSE THE VEHICLE TO MOVE.

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 5).

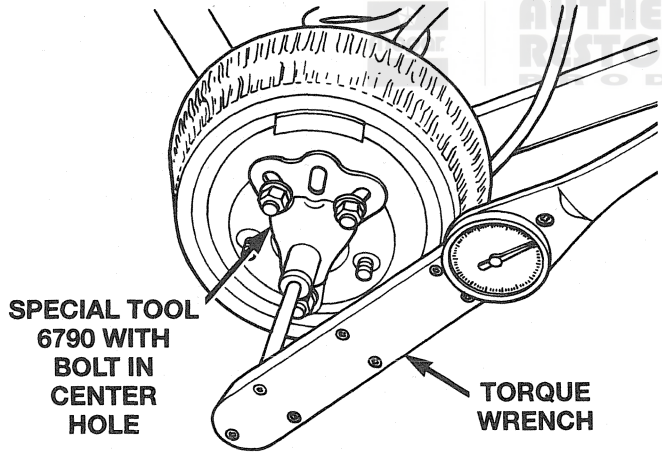


Fig. 5 Trac-lok Test —Typical

(6) If rotating torque is less than 22 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

SERVICE PROCEDURES

LUBRICANT CHANGE

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

(5) Remove the original sealant from the housing and cover surfaces.

(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 6).

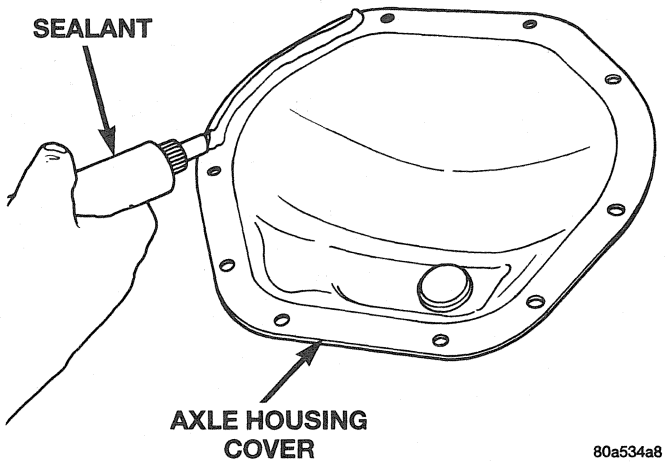


Fig. 6 Apply Sealant

Install the housing cover within 5 minutes after applying the sealant.

(7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

(8) For Trac–lok differentials, a quantity of Mopar® Trac–lok lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

(9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(10) Install the fill hole plug and lower the vehicle.

(11) Trac–lok differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

(1) Raise and support the vehicle.

(2) Position a suitable lifting device under the axle.

(3) Secure axle to device.

(4) Remove the wheels and tires.

REMOVAL AND INSTALLATION (Continued)

(5) Remove the brake drums from the axle. Refer to Group 5, Brakes, for proper procedures.

(6) Disconnect parking brake cables from brackets and lever.

(7) Remove wheel speed sensors, if necessary. Refer to Group 5, Brakes, for proper procedures.

(8) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.

(9) Disconnect the vent hose from the axle shaft tube.

(10) Mark the propeller shaft and yokes for installation alignment reference.

(11) Remove propeller shaft.

(12) Disconnect stabilizer bar links.

(13) Disconnect shock absorbers from axle.

(14) Remove the U-bolts which hold the axle to the spring brackets.

(15) Separate the axle from the vehicle.

INSTALLATION

NOTE: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, vehicle ride height and handling could be affected.

(1) Raise the axle with lifting device and align the spring centering bolts with the mating holes in the axle spring perch.

(2) Install the U-bolts which hold the axle to the spring brackets. Tighten nuts to 70 N·m (52 ft. lbs.).

(3) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.) torque.

(4) Install stabilizer bar links and tighten nuts to 74 N·m (55 ft. lbs.) torque.

(5) Install the wheel speed sensors, if necessary. Refer to Group 5, Brakes, for proper procedures.

(6) Connect parking brake cable to brackets and lever.

(7) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.

(8) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.

(9) Install axle vent hose.

(10) Align propeller shaft and pinion yoke reference marks. Install U-joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.

(11) Install the wheels and tires.

(12) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(13) Remove lifting device from axle and lower the vehicle.

PINION SHAFT SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove the brake drums. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation alignment reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 7).

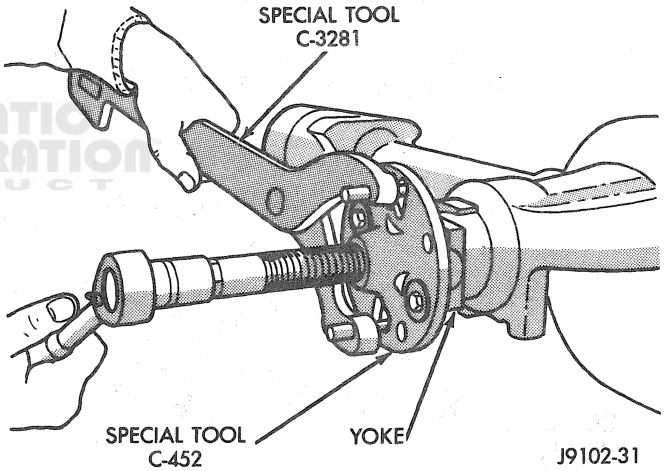


Fig. 7 Pinion Yoke Removal

(10) Use a suitable pry tool or slide hammer mounted screw to remove the pinion gear seal.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 8).

(2) Install yoke on the pinion gear with Screw 8112, Cup 8109, and Holder 6958 (Fig. 9).

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke at this point. Damage to the collapsible spacer or bearings may result.

(3) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

(4) Tighten the nut to 271 N·m (200 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

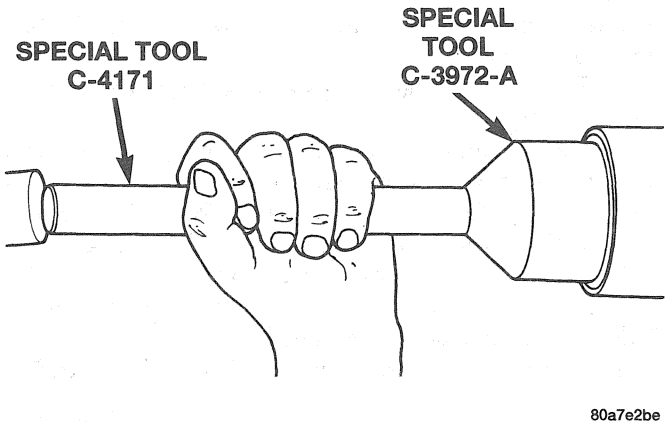


Fig. 8 Pinion Seal Installation

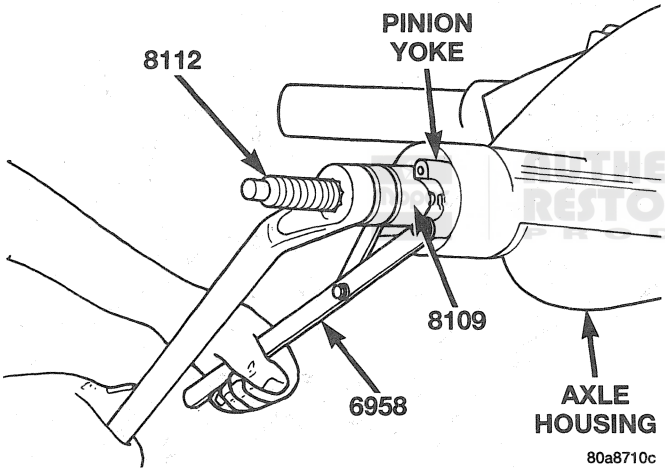


Fig. 9 Pinion Yoke Installation

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(5) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.) (Fig. 10).

(6) If the rotating torque is low, use Holder 6958 to hold the pinion yoke (Fig. 11), and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until the proper rotating torque is achieved.

CAUTION: If the maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

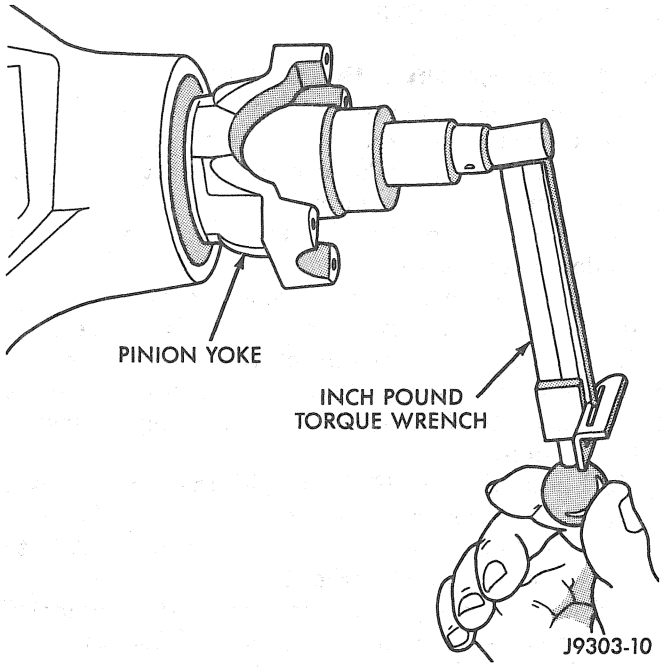


Fig. 10 Check Pinion Rotation Torque

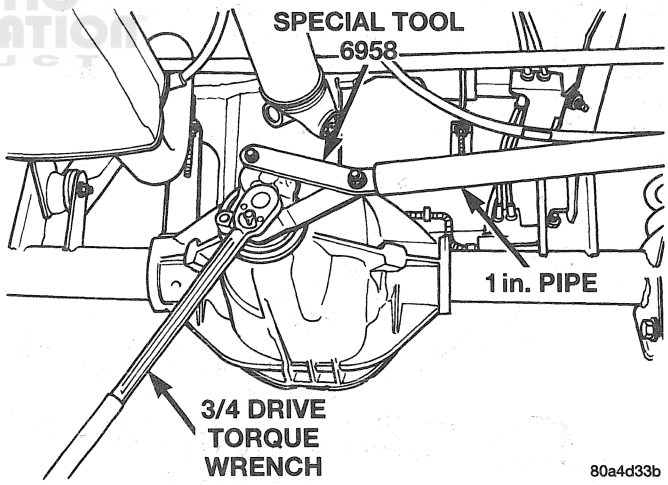


Fig. 11 Tightening Pinion Shaft Nut

(7) Align the installation reference marks on the propeller shaft and yoke and install the propeller shaft.

(8) Add gear lubricant to the differential housing, if necessary. Refer to the Lubricant Specifications for gear lubricant requirements.

(9) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

REMOVAL AND INSTALLATION (Continued)

COLLAPSIBLE SPACER

REMOVAL W/PINION INSTALLED

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake drums. Refer to Group 5, Brakes, for proper procedures.
(4) Mark the propeller shaft and pinion yoke for installation reference.
(5) Remove the propeller shaft from the yoke.
(6) Rotate the pinion gear three or four times.
(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.
(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 12).
(10) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion shaft seal.
(11) Remove the front pinion bearing using a pair of suitable pick tools to pull the bearing straight off the pinion gear shaft. It may be necessary to lightly tap the end of the pinion gear with a rawhide or rubber mallet if the bearing becomes bound on the pinion shaft.
(12) Remove the collapsible spacer.

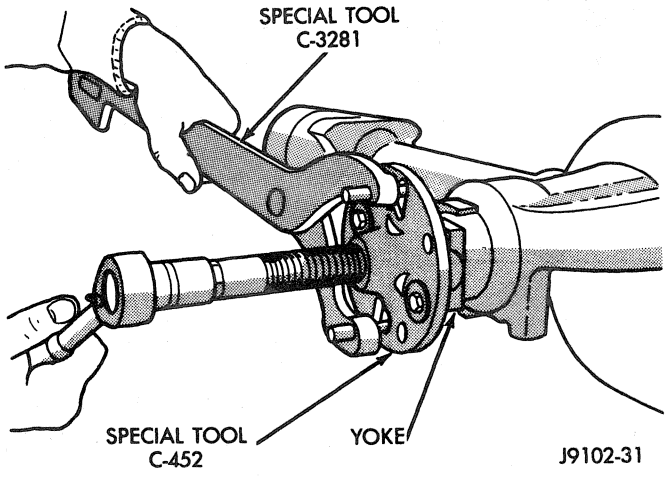


Fig. 12 Pinion Yoke Removal

REMOVAL W/PINION REMOVED

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake drums. Refer to Group 5, Brakes, for proper procedures.
(4) Mark the propeller shaft and pinion yoke for installation reference.
(5) Remove the propeller shaft from the yoke.
(6) Rotate the pinion gear three or four times.
(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
(8) Remove differential assembly from axle housing.
(9) Using Holder 6958 to hold yoke, remove the pinion yoke nut and washer.
(10) Using Remover C–452 and Wrench C–3281, remove the pinion yoke from pinion shaft (Fig. 12).
(11) Remove the pinion gear from housing (Fig. 13). Catch the pinion with your hand to prevent it from falling and being damaged.
(12) Remove collapsible spacer from pinion shaft.

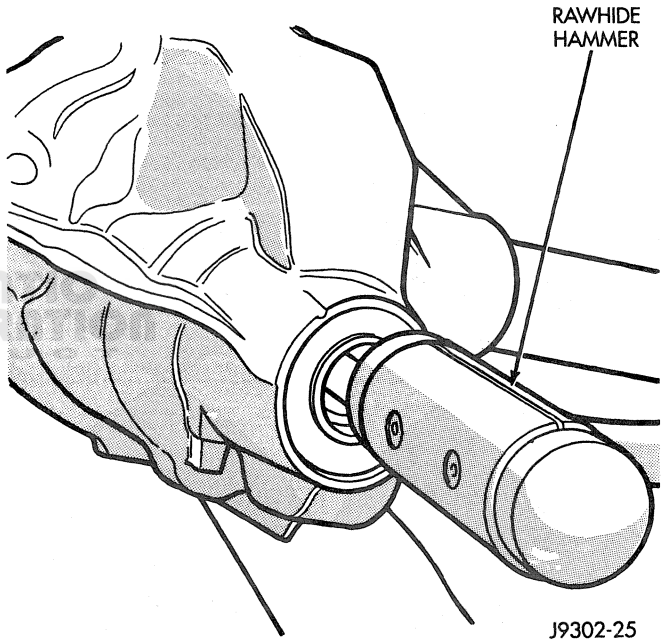


Fig. 13 Remove Pinion Gear

INSTALLATION

(1) Install a new collapsible preload spacer on pinion shaft (Fig. 14).
(2) If pinion gear was removed, install pinion gear in housing.
(3) Install pinion front bearing, if necessary.
(4) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 15).
(5) Install yoke with Screw 8112, Cup 8109, and Holder 6958 (Fig. 16).
(6) If the original pinion bearings are being used, install differential assembly and axle shafts, if necessary.

NOTE: If new pinion bearings were installed, do not install the differential assembly and axle shafts until after the pinion bearing preload and rotating torque are set.

REMOVAL AND INSTALLATION (Continued)

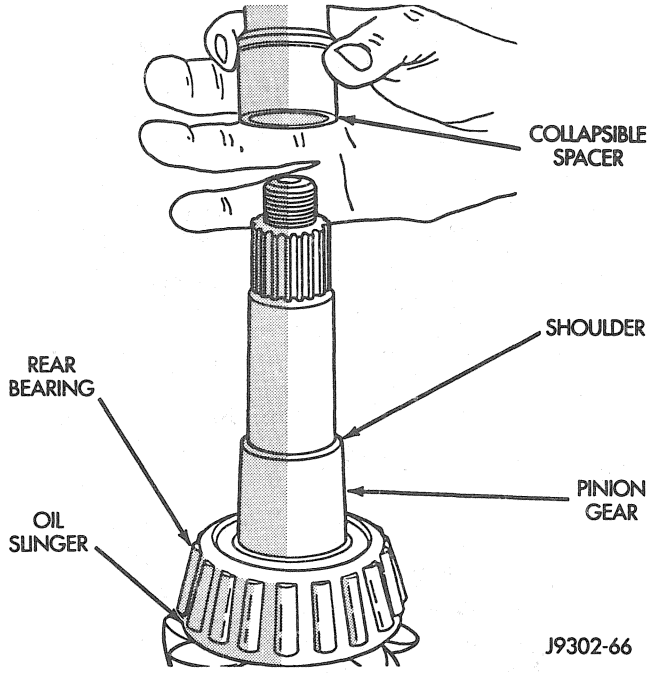


Fig. 14 Collapsible Preload Spacer

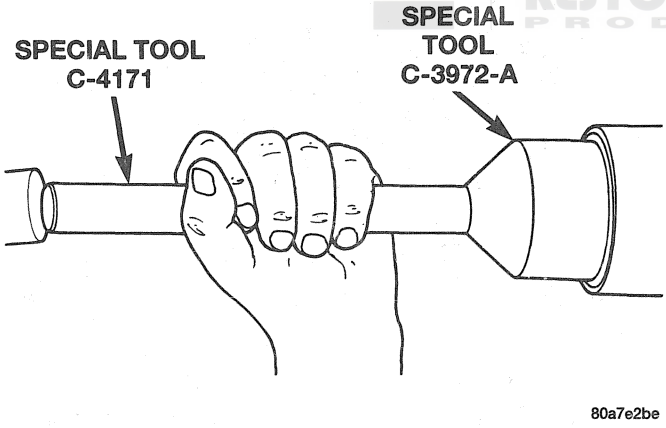


Fig. 15 Pinion Seal Installation

(7) Install the yoke washer and a new nut on the pinion gear. Tighten the pinion nut until there is zero bearing end-play.

(8) Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(9) Using yoke holder 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 17).

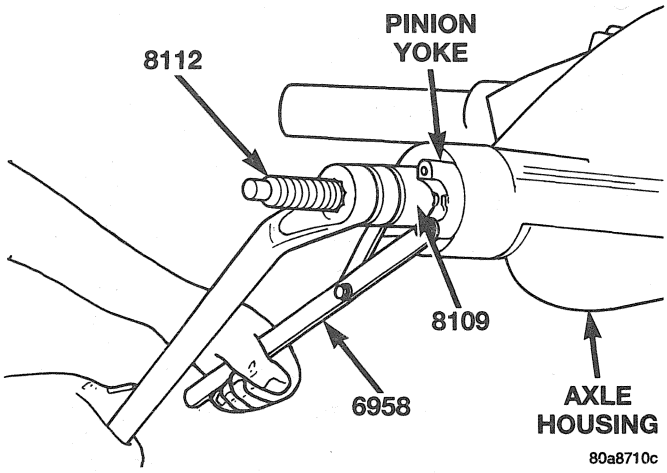


Fig. 16 Pinion Yoke Installation

NOTE: If more than 474 N·m (350 ft. lbs.) of torque is necessary to remove the bearing end play, the collapsible spacer is defective and must be replaced.

(10) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 18).

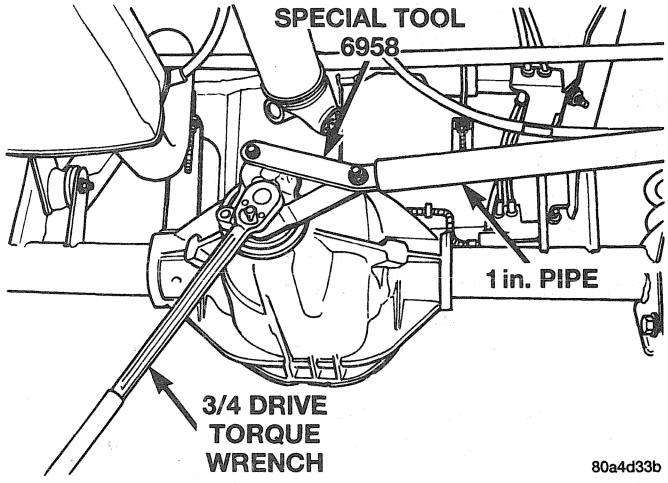


Fig. 17 Tightening Pinion Nut

(11) Check rotating torque with a (in. lbs.) torque wrench (Fig. 18). The torque necessary to rotate the pinion gear should be:

- Original Bearings — The reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.).
- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

(12) Install differential assembly and axle shafts, if necessary.

(13) Align marks made previously on yoke and propeller shaft and install propeller shaft.

(14) Install rear brake drums. Refer to Group 5, Brakes, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

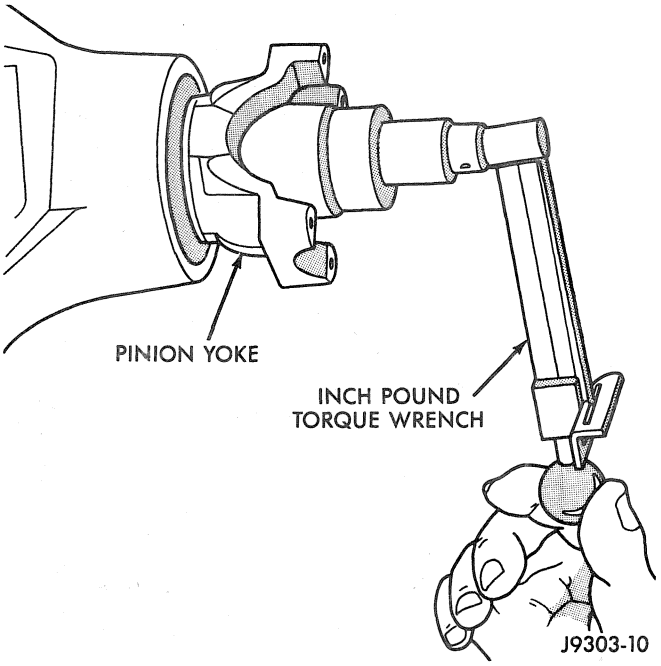


Fig. 18 Check Pinion Gear Rotation Torque

(15) Add gear lubricant, if necessary. Refer to Lubricant Specifications of this section for lubricant requirements.

(16) Install wheel and tire assemblies.

(17) Lower vehicle.

AXLE SHAFT

REMOVAL

(1) Raise and support vehicle. Ensure that the transmission is in neutral.

(2) Remove wheel and tire assembly.

(3) Remove brake drum. Refer to Group 5, Brakes, for proper procedure.

(4) Clean all foreign material from housing cover area.

(5) Loosen housing cover bolts. Drain lubricant from the housing and axle shaft tubes. Remove housing cover.

(6) Rotate differential case so that pinion mate gear shaft lock screw is accessible. Remove lock screw and pinion mate gear shaft from differential case (Fig. 19).

(7) Push axle shaft inward and remove axle shaft C–clip lock from the axle shaft (Fig. 20).

(8) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube. Also, exercise care not to damage the wheel speed sensor on vehicles equipped with ABS brakes.

(9) Inspect axle shaft seal for leakage or damage.

(10) Inspect roller bearing contact surface on axle shaft for signs of brinelling, galling and pitting. If any of these conditions exist, the axle shaft and/or bearing and seal must be replaced.

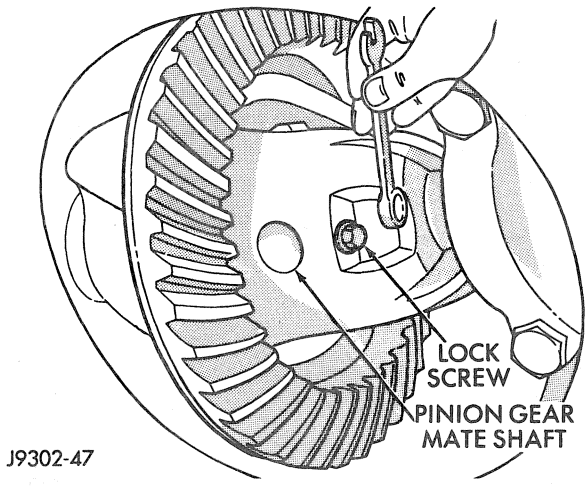


Fig. 19 Mate Shaft Lock Screw

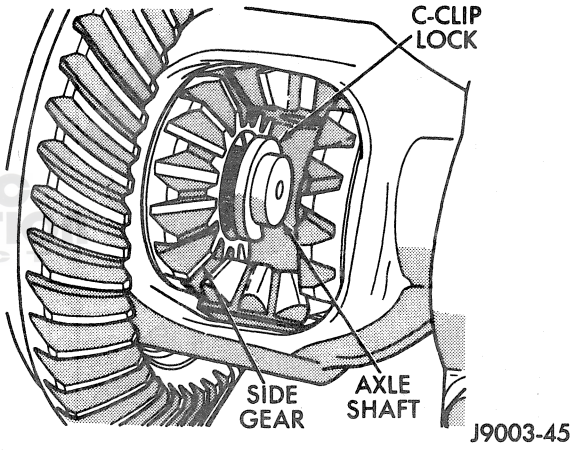


Fig. 20 Axle Shaft C–Clip Lock

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing, and engage it into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip. Also, exercise care not to damage the wheel speed sensor on vehicles equipped with ABS brakes

(2) Insert C–clip lock in end of axle shaft. Push axle shaft outward to seat C–clip lock in side gear.

(3) Insert pinion mate shaft into differential case and through thrust washers and pinion gears.

(4) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 19 N·m (14 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

(5) Install cover and add fluid. Refer to Lubricant Change procedure in this section for procedure and lubricant requirements.
(6) Install brake drum. Refer to Group 5, Brakes, for proper procedures.
(7) Install wheel and tire.
(8) Lower vehicle.

AXLE SHAFT SEAL AND BEARING

REMOVAL

(1) Remove the axle shaft.
(2) Remove the axle shaft seal from the end of the axle shaft tube with a small pry bar.

NOTE: The seal and bearing can be removed at the same time with the bearing removal tool.

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool Set 6310 using Adapter Foot 6310-5 (Fig. 21).

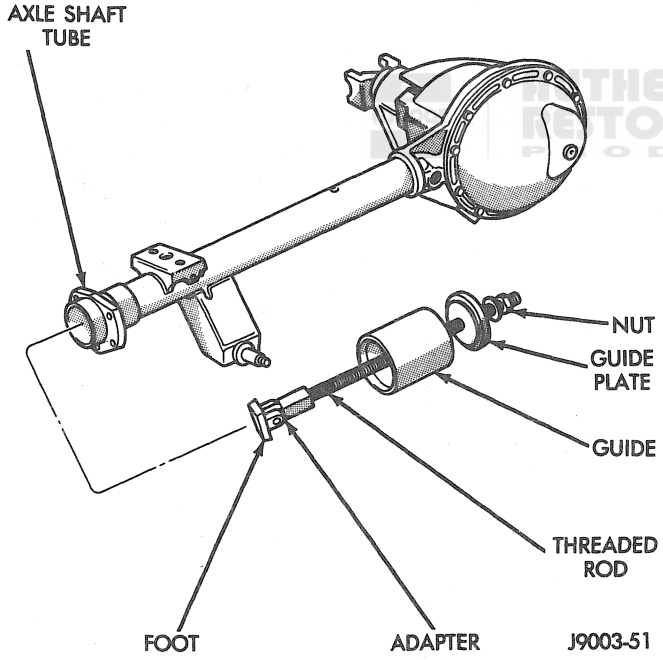


Fig. 21 Axle Shaft Bearing Removal

(4) Inspect the axle shaft tube bore for roughness and burrs. Remove as necessary.

INSTALLATION

Do not install the original axle shaft seal. Always install a new seal.

(1) Wipe the axle shaft tube bore clean.
(2) Install axle shaft bearing with Installer 6436 and Handle C–4171. Ensure that the part number on the bearing is against the installer.
(3) Install the new axle shaft seal with Installer 6437 and Handle C–4171 (Fig. 22).

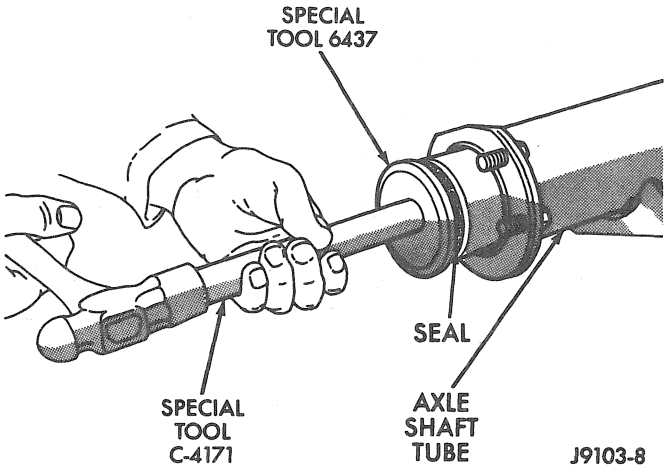


Fig. 22 Axle Shaft Seal Installation

(4) Install the axle shaft.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.
(2) Remove the lubricant fill hole plug from the differential housing cover.
(3) Remove the differential housing cover and allow fluid to drain.
(4) Remove axle shafts.
(5) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 23).

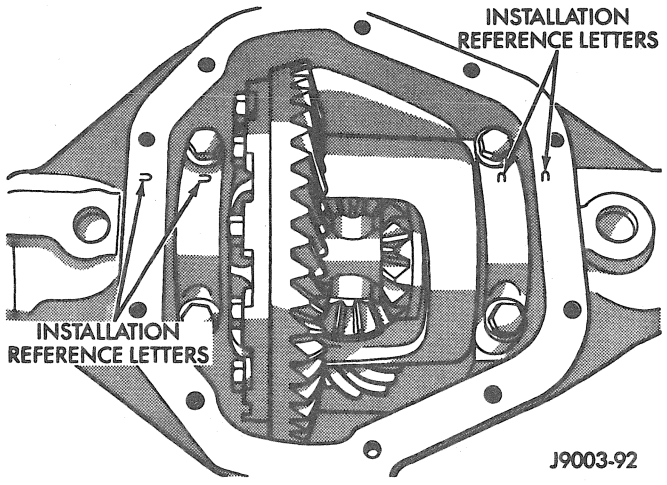


Fig. 23 Bearing Cap Identification

(6) Loosen the differential bearing cap bolts.
(7) Position Spreader W–129–B, utilizing some items from Adapter set 6987, with the tool dowel pins seated in the locating holes (Fig. 24). Install the hold-down clamps and tighten the tool turnbuckle finger–tight.

REMOVAL AND INSTALLATION (Continued)

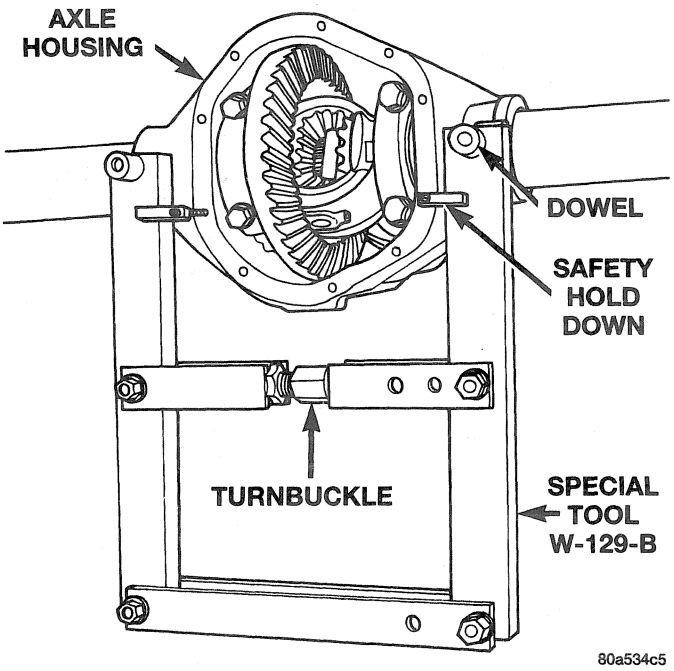


Fig. 24 Install Axle Housing Spreader

(8) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 25) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–spread, it could be distorted or damaged.

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 26).

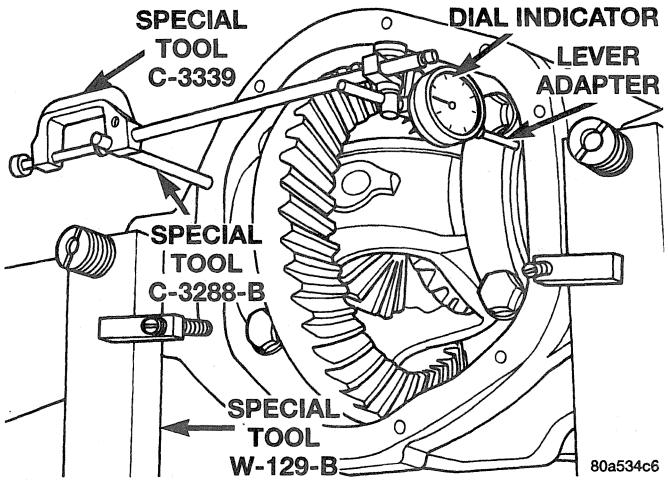


Fig. 25 Install Dial Indicator

(10) Remove the dial indicator.

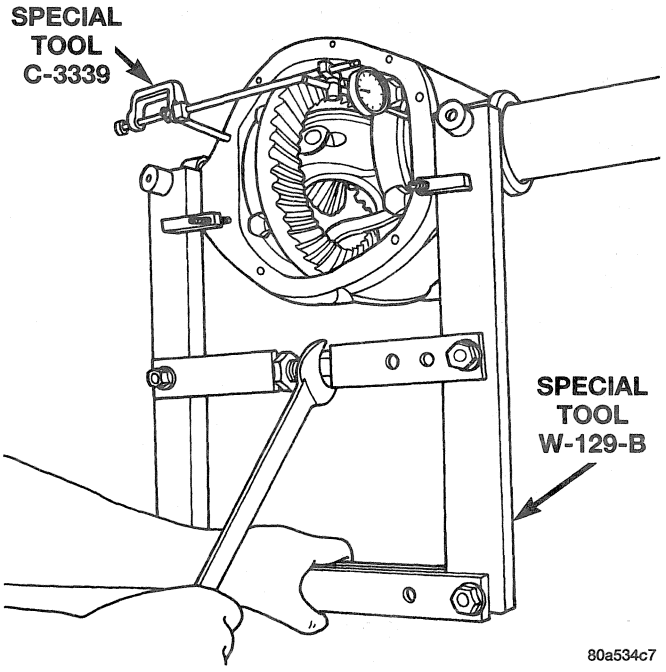


Fig. 26 Spread Axle Housing

(11) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(12) Remove the differential from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 27).

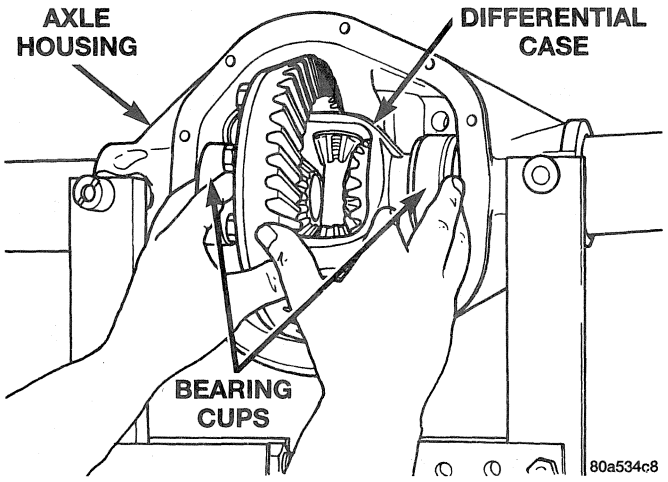


Fig. 27 Differential Case Removal

(13) Mark or tag the differential bearing cups to indicate which side of the differential they were removed from.

(14) Retrieve differential case preload shims from axle housing. Mark or tag the differential case preload shims to indicate which side of the differential they were removed from.

(15) Remove spreader from housing.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Position Spreader W–129–B, utilizing some items from Adapter set 6987, with the tool dowel pins seated in the locating holes (Fig. 28). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

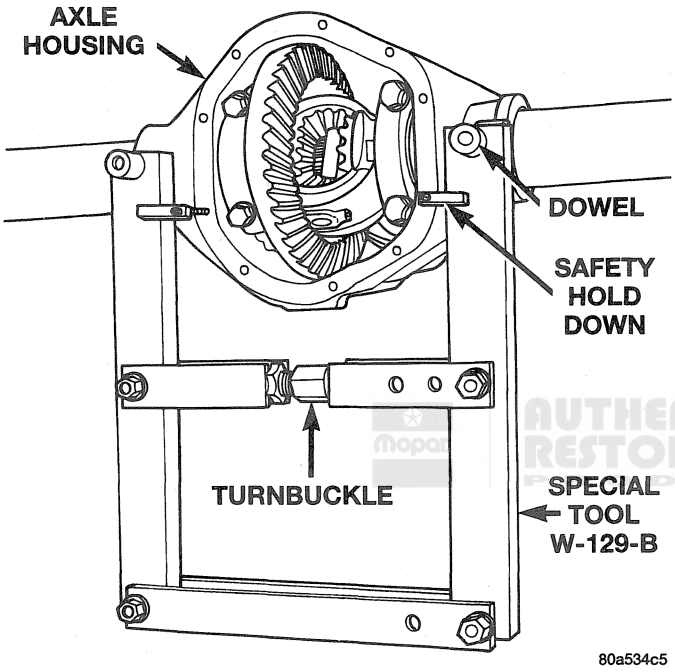


Fig. 28 Install Axle Housing Spreader

(2) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 25) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–spread, it could be distorted or damaged.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 26).

(4) Remove the dial indicator.

(5) Install differential case in the housing. Ensure that the differential bearing cups remain in position on the differential bearings and that the preload shims remain between the face of the bearing cup and the housing. Tap the differential case to ensure the bearings cups and shims are fully seated in the housing.

(6) Install the bearing caps at their original locations (Fig. 29).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

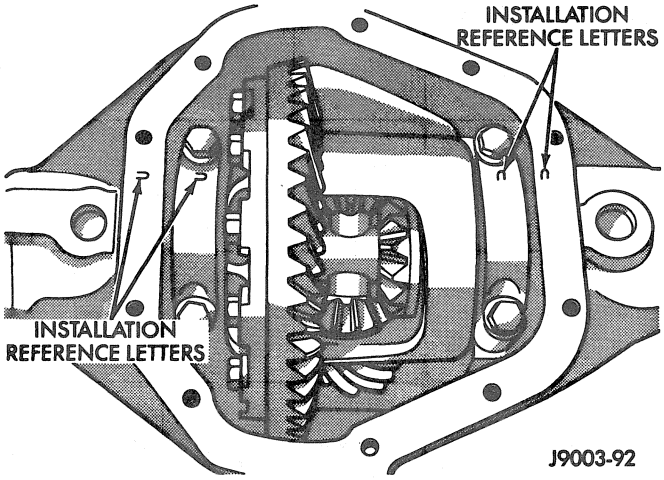


Fig. 29 Differential Bearing Cap Reference Letters

(9) Tighten the bearing cap bolts to 77 N·m (57 ft. lbs.) torque.

(10) Install the axle shafts.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, C-293-39 Blocks, and Plug SP-3289 (Fig. 30).

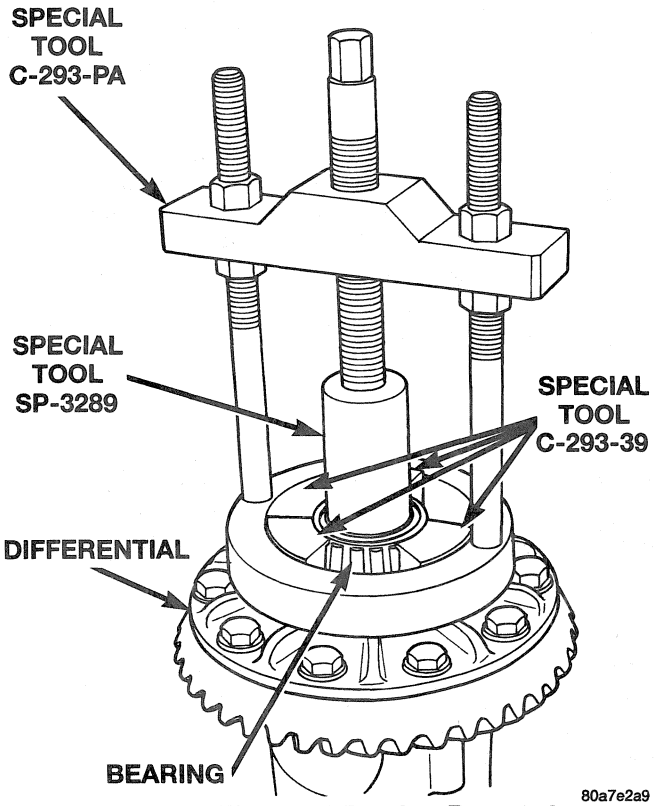


Fig. 30 Differential Bearing Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Using tool C-3716-A with handle C-4171, install differential side bearings (Fig. 31).

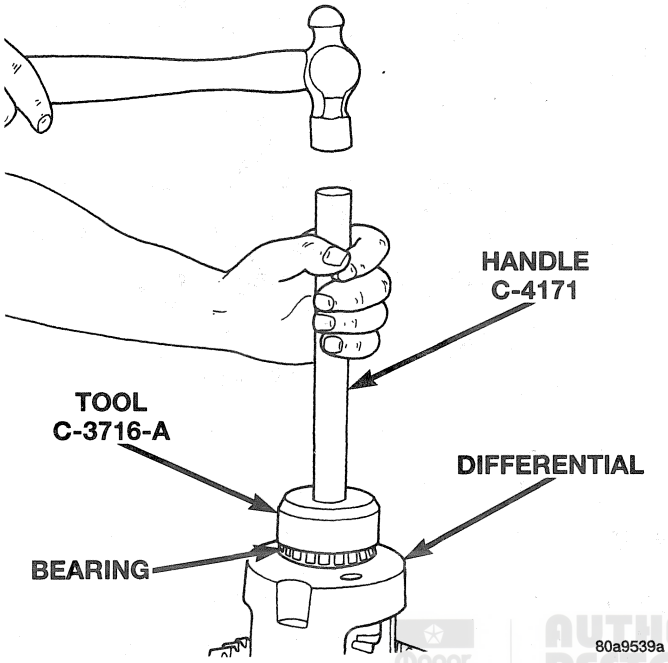


Fig. 31 Install Differential Side Bearings

(2) Install differential in axle housing.

RING GEAR

The ring and pinion gears are service in a matched set. Do not replace the ring gear without replacing the pinion gear.

REMOVAL

(1) Remove differential from axle housing.
(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 32)
(3) Remove bolts holding ring gear to differential case.
(4) Using a soft hammer, drive ring gear from differential case (Fig. 32).

INSTALLATION

CAUTION: Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

(1) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
(2) Invert the differential case in the vise.
(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 33).

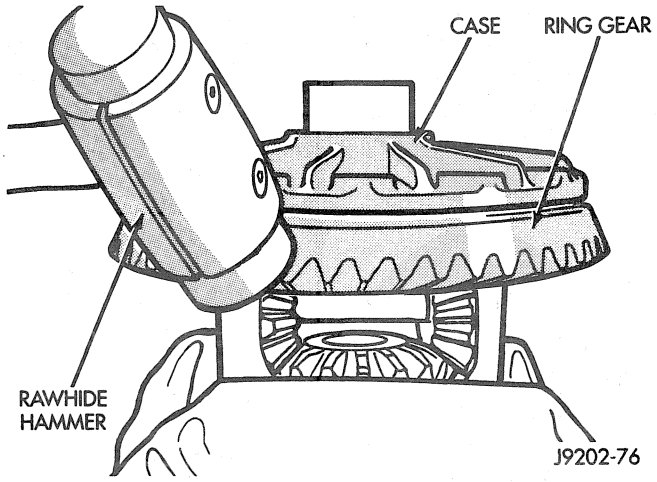


Fig. 32 Ring Gear Removal

(4) Install differential in axle housing and verify gear mesh and contact pattern.

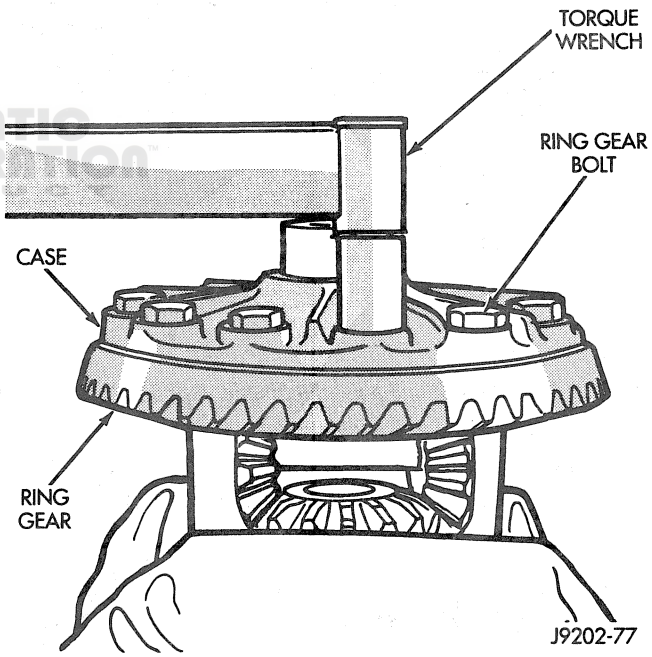


Fig. 33 Ring Gear Bolt Installation

PINION GEAR

The ring and pinion gears are serviced in a matched set. Do not replace the pinion gear without replacing the ring gear.

REMOVAL

(1) Remove differential from the axle housing.
(2) Mark pinion yoke and propeller shaft for installation alignment.
(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.
(4) Using Holder 6958 to hold yoke, remove the pinion yoke nut and washer.

REMOVAL AND INSTALLATION (Continued)

(5) Using Remover C–452 and Wrench C–3281, remove the pinion yoke from pinion shaft (Fig. 34).

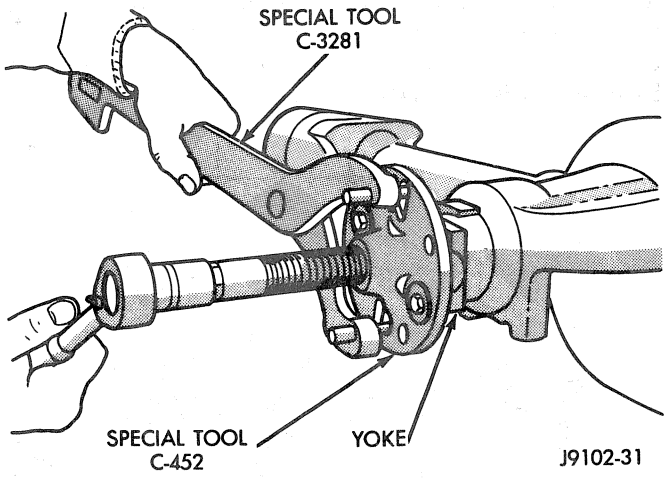


Fig. 34 Pinion Yoke Removal

(6) Remove the pinion gear from housing (Fig. 35). Catch the pinion with your hand to prevent it from falling and being damaged.

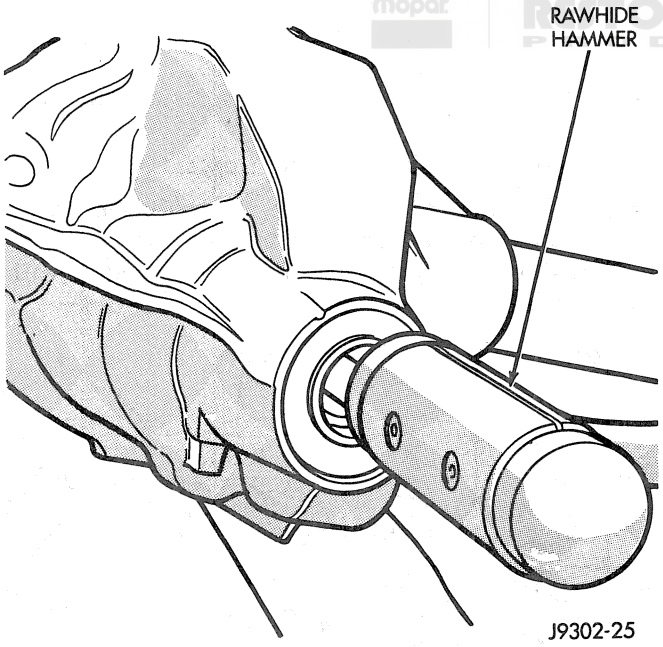


Fig. 35 Remove Pinion Gear

(7) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion shaft seal.

(8) Remove oil slinger, if equipped, and front pinion bearing.

(9) Remove the front pinion bearing cup with Remover C-4345 and Handle C–4171 (Fig. 36).

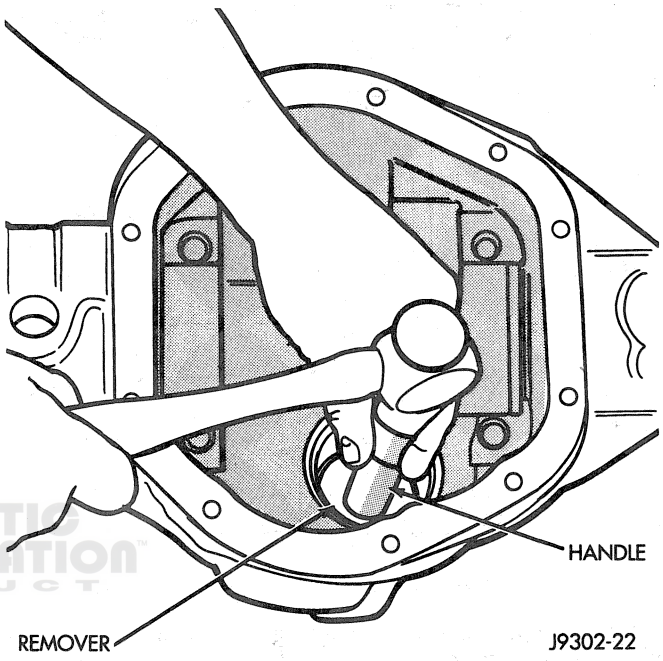


Fig. 36 Front Bearing Cup Removal

(10) Remove the rear bearing cup from housing (Fig. 37). Use Remover D-149 and Handle C–4171.

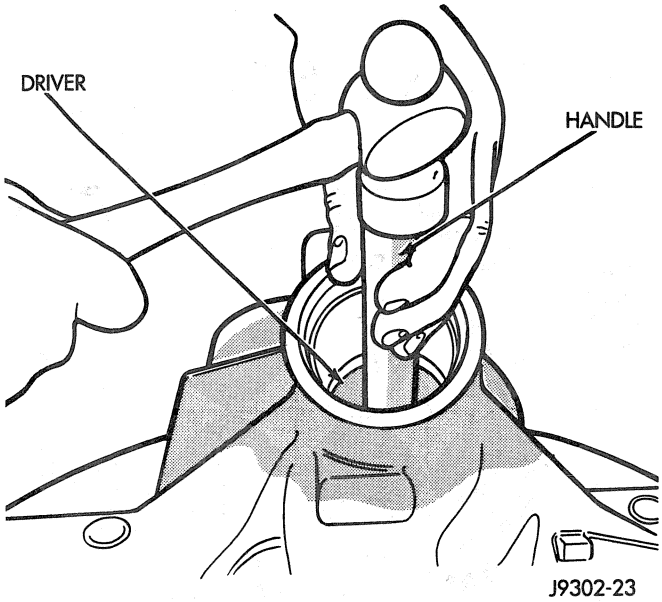


Fig. 37 Rear Bearing Cup Removal

REMOVAL AND INSTALLATION (Continued)

(11) Remove the collapsible preload spacer (Fig. 38).

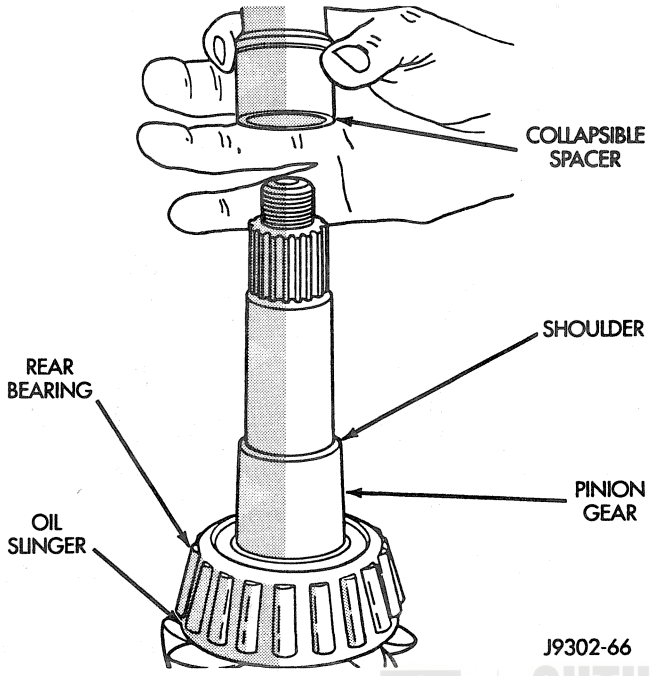


Fig. 38 Collapsible Spacer

(12) Remove the rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-40 (Fig. 39).

Place 4 adapter blocks so they do not damage the bearing cage.

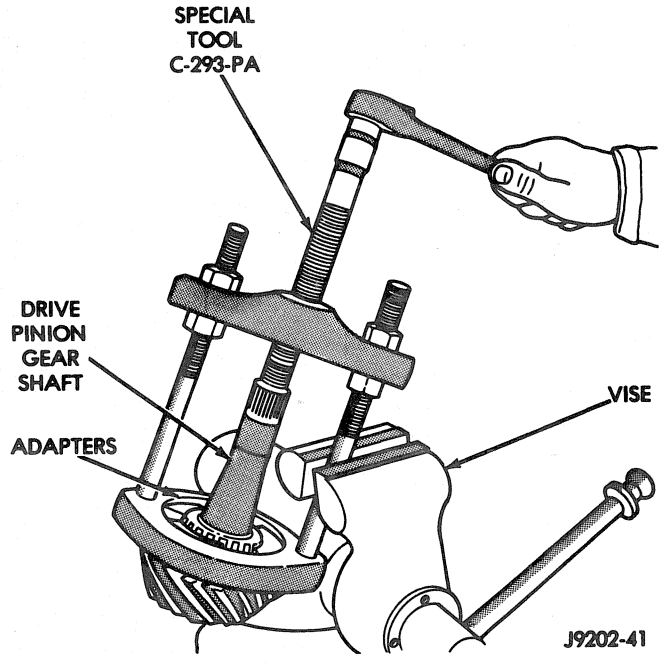


Fig. 39 Rear Bearing Removal

(13) Remove the depth shims from the pinion gear shaft. Record the thickness of the depth shims.

INSTALLATION

(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(2) Install the pinion rear bearing cup with Installer D-146 and Driver Handle C–4171 (Fig. 40). Ensure cup is correctly seated.

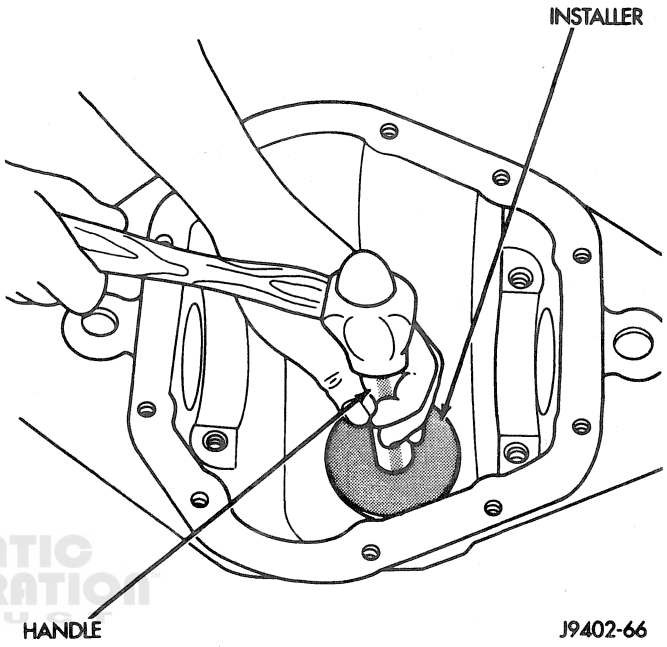


Fig. 40 Pinion Rear Bearing Cup Installation

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(4) Install the pinion front bearing cup with Installer D–130 and Handle C–4171 (Fig. 41).

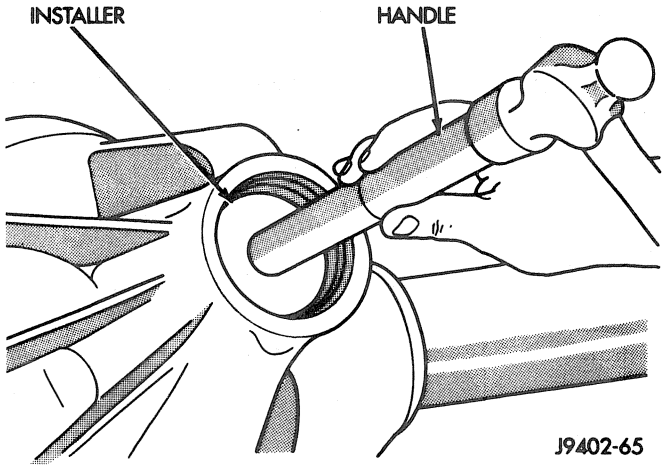


Fig. 41 Pinion Front Bearing Cup Installation

REMOVAL AND INSTALLATION (Continued)

(5) Install pinion front bearing, and oil slinger, if equipped.

(6) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 42).

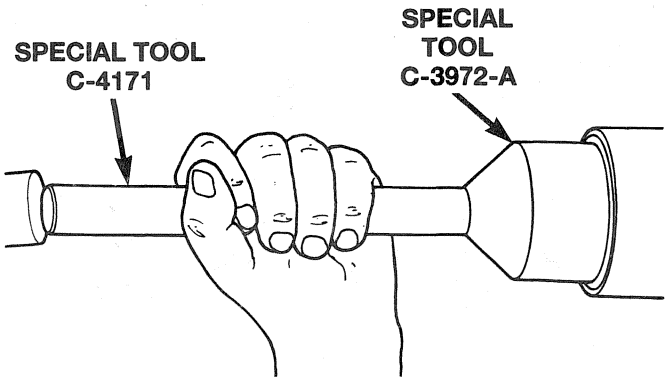


Fig. 42 Pinion Seal Installation

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and pinion gear to achieve proper ring and pinion gear mesh. If the factory installed ring and pinion gears are reused, the pinion depth shim should not require replacement. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

(7) Place the proper thickness depth shim on the pinion gear.

(8) Install the rear bearing and slinger, if equipped, on the pinion gear with Installer W-262 (Fig. 43).

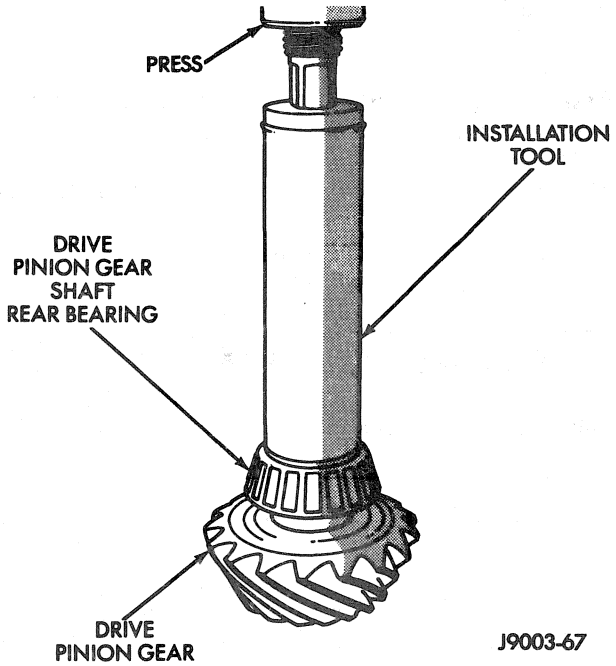


Fig. 43 Shaft Rear Bearing Installation

(9) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 44).

(10) Install pinion gear in housing.

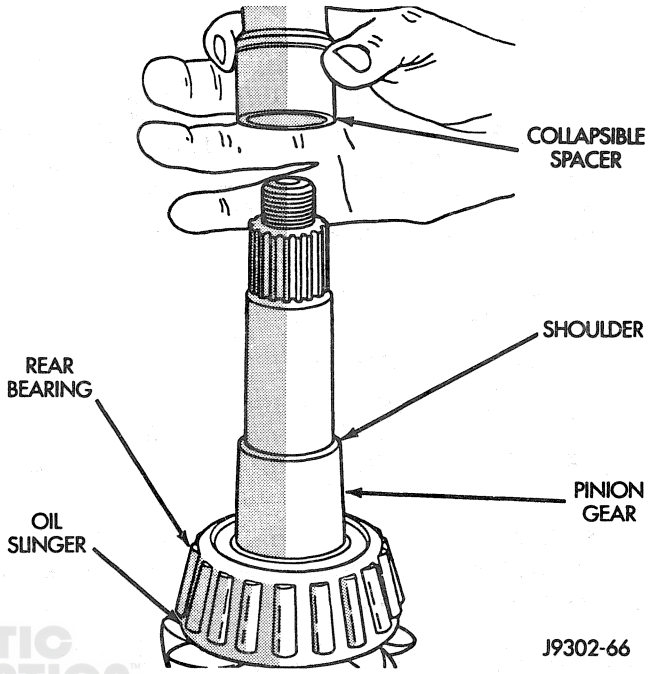


Fig. 44 Collapsible Preload Spacer

(11) Install yoke with Installer Screw 8112, Cup 8109, and holder 6958 (Fig. 45).

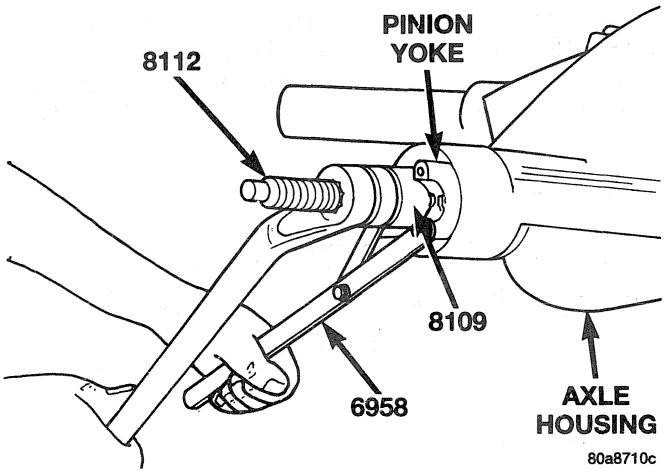


Fig. 45 Pinion Yoke Installation

(12) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

(13) Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

REMOVAL AND INSTALLATION (Continued)

(14) Using yoke holder 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 46).

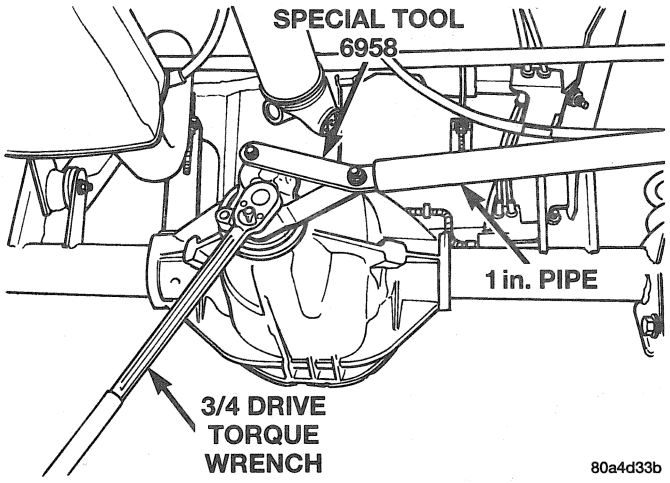


Fig. 46 Tightening Pinion Nut

NOTE: If the spacer requires more than 474 N·m (350 ft. lbs.) torque to crush, the collapsible spacer is defective and must be replaced.

(15) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 47).

(16) Check bearing rotating torque with a (in. lbs.) torque wrench (Fig. 47). The torque necessary to rotate the pinion gear should be:

- Original Bearings — 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

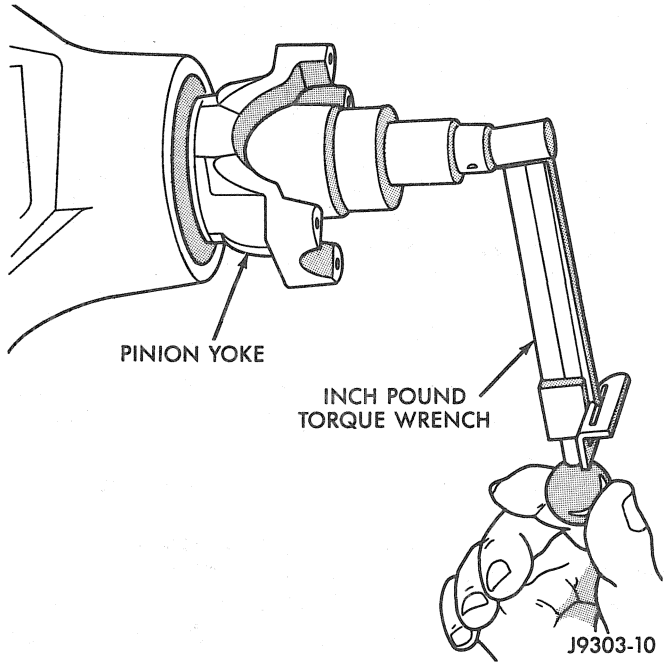


Fig. 47 Check Pinion Gear Rotating Torque

(17) Install differential in housing.

FINAL ASSEMBLY

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 48).

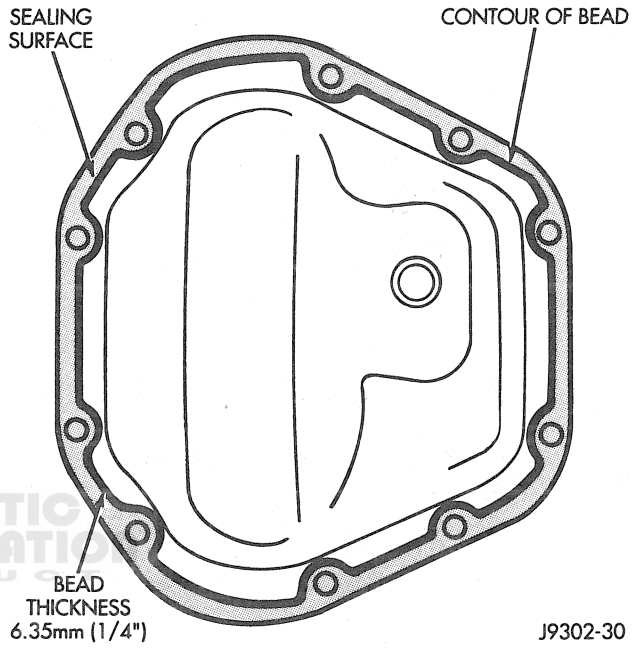


Fig. 48 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant.

(2) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(3) Refill the differential housing with gear lubricant. Refer to the Lubricant Specifications section of this group for the gear lubricant requirements.

(4) Install the fill hole plug.

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove pinion gear mate shaft lock screw (Fig. 49).

(2) Remove pinion gear mate shaft.

(3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 50).

DISASSEMBLY AND ASSEMBLY (Continued)

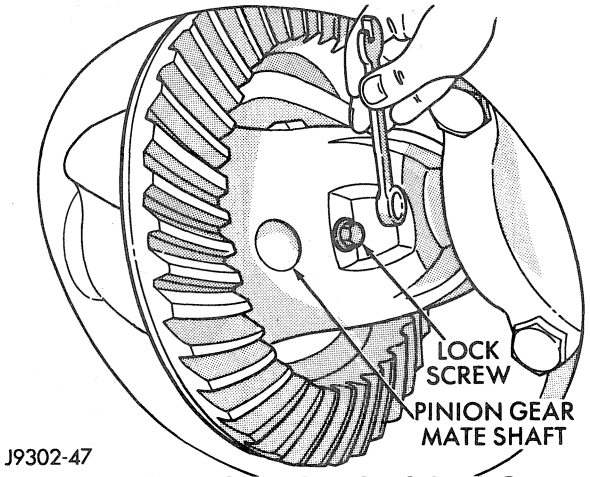


Fig. 49 Pinion Gear Mate Shaft Lock Screw

(4) Remove the differential side gears and thrust washers.

ASSEMBLY

(1) Install the differential side gears and thrust washers.

(2) Install the pinion mate gears and thrust washers.

(3) Install the pinion gear mate shaft.

(4) Align the hole in the pinion gear mate shaft with the hole in the differential case and install the pinion gear mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

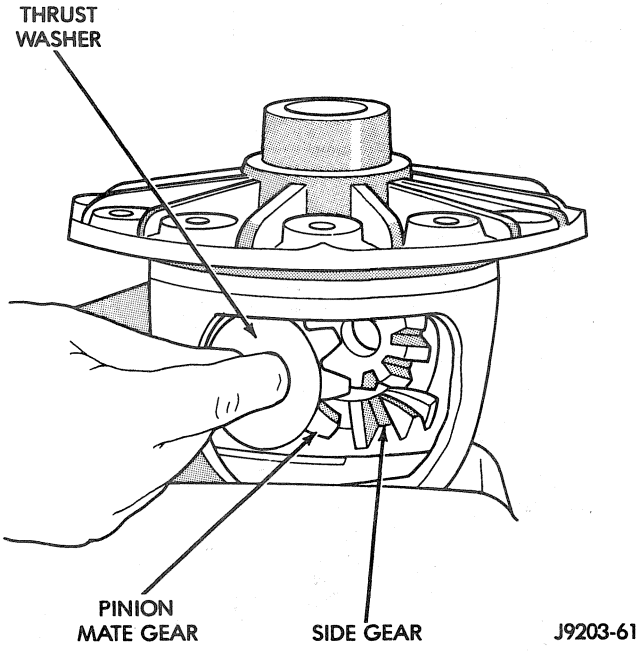


Fig. 50 Pinion Mate Gear Removal

TRAC-LOK DIFFERENTIAL

The Trac–lok differential components are illustrated in (Fig. 51). Refer to this illustration during repair service.

DISASSEMBLY

(1) Clamp Side Gear Holding Tool 6965 in a vise.

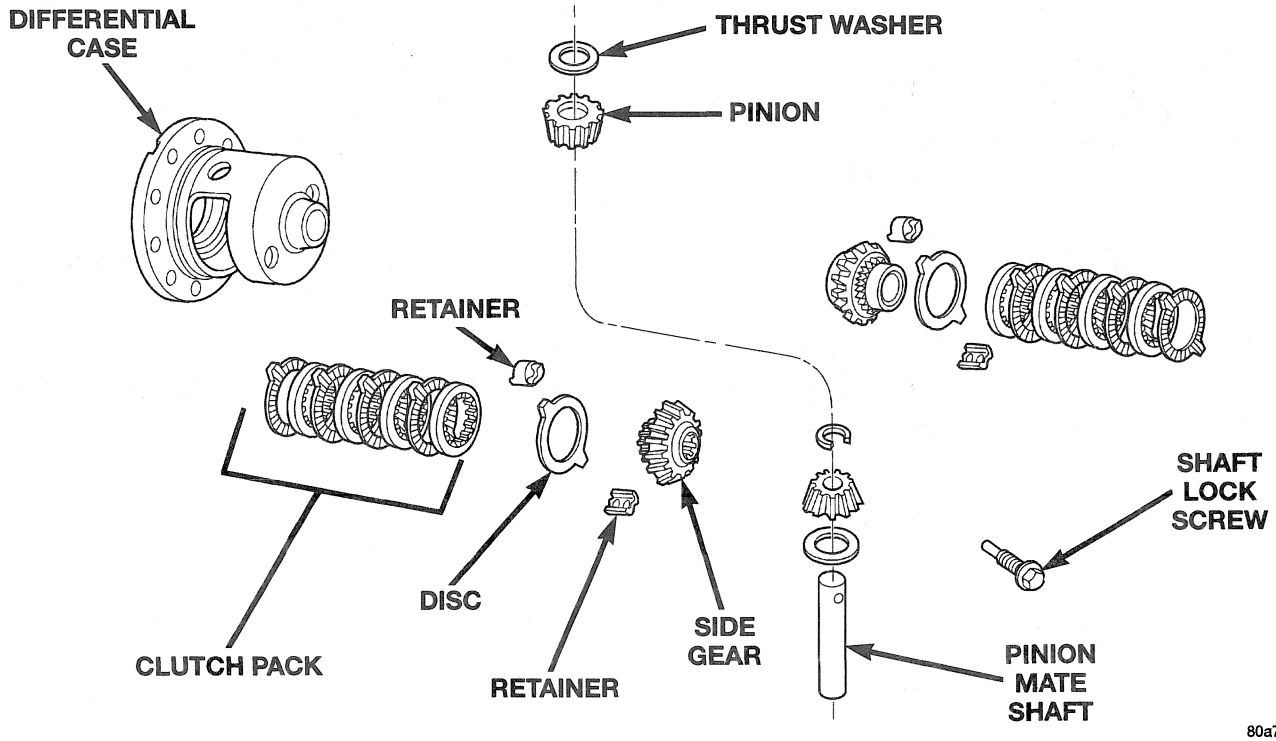


Fig. 51 Trac–lok Differential Components

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Position the differential case on Side Gear Holding Tool 6965 (Fig. 52).

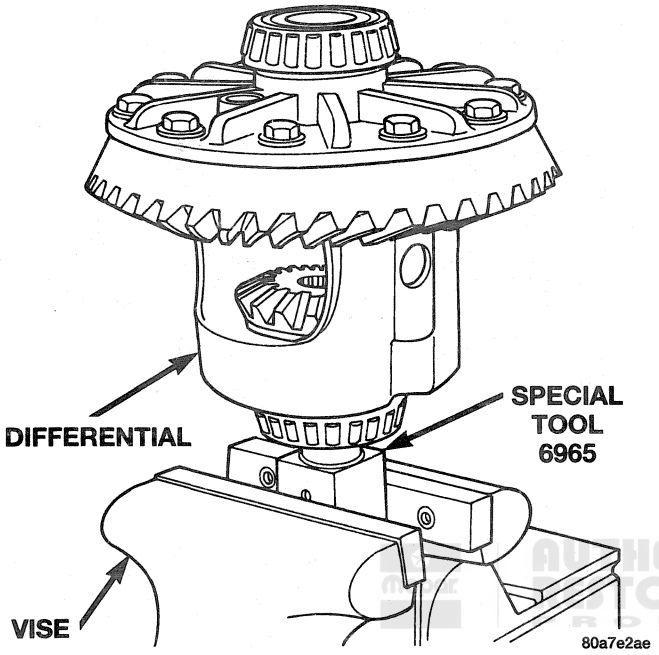


Fig. 52 Differential Case Holding Tool

(3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be replaced. The Trac-lok differential can be serviced with the ring gear installed.

(4) Remove the pinion gear mate shaft lock screw (Fig. 53).

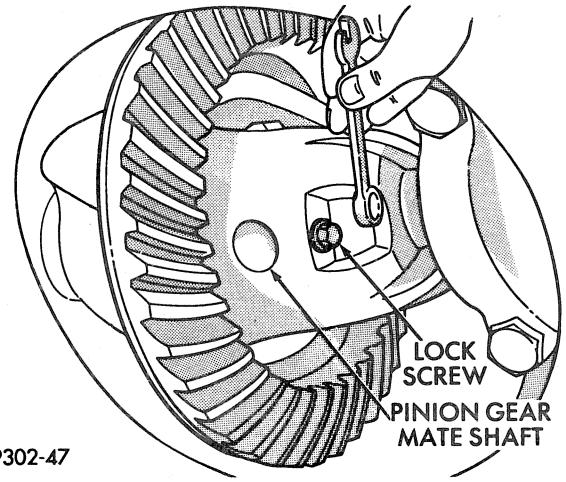


Fig. 53 Mate Shaft Lock Screw

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 54).

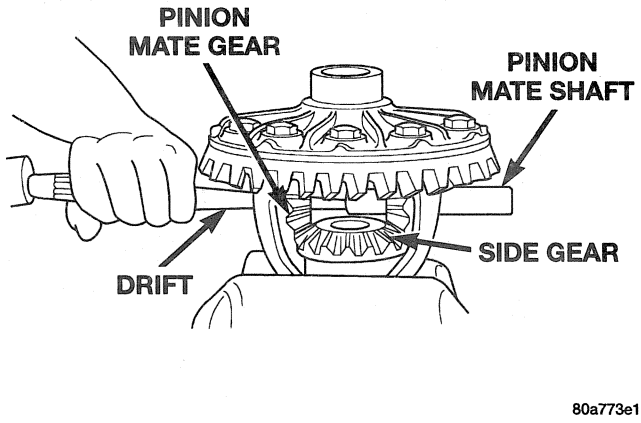


Fig. 54 Mate Shaft Removal

(6) Install and lubricate Step Plate C-6960-3 (Fig. 55).

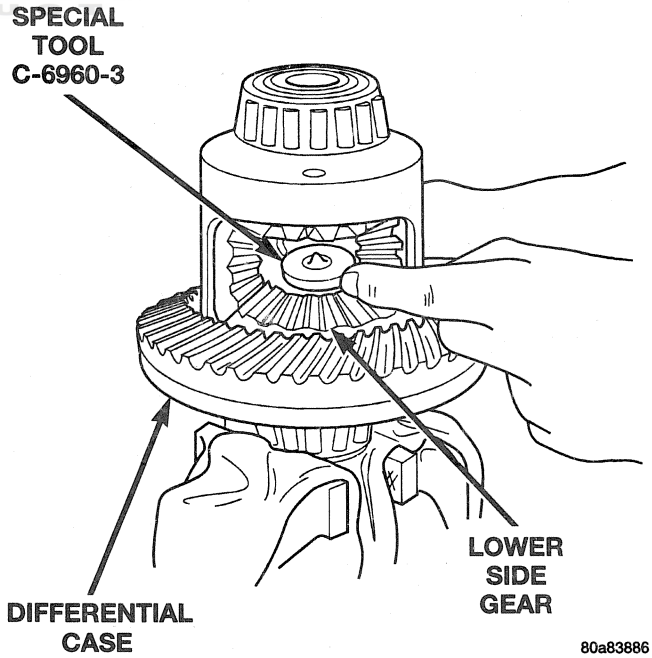


Fig. 55 Step Plate Tool Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Assemble Threaded Adapter C-6960-1 into top side gear. Thread Forcing Screw C-6960-4 into adapter until it becomes centered in adapter plate.

(8) Position a small screw driver in slot of Threaded Adapter C-6960-1 (Fig. 56) to prevent adapter from turning.

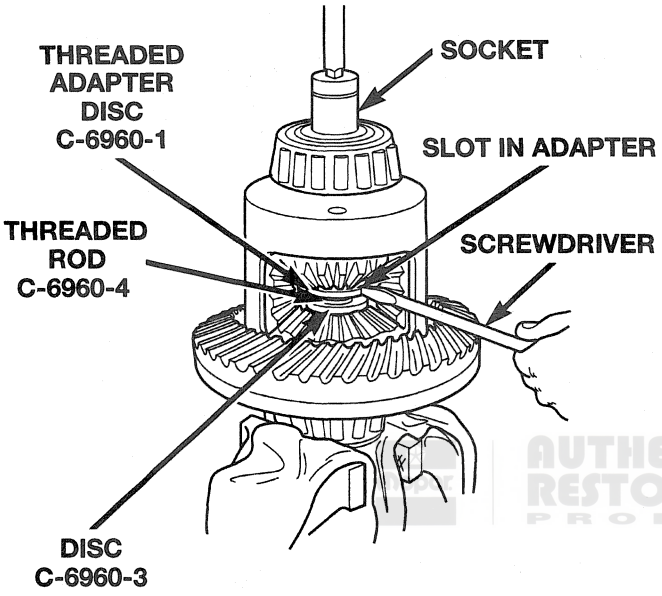


Fig. 56 Threaded Adapter Installation

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 57).

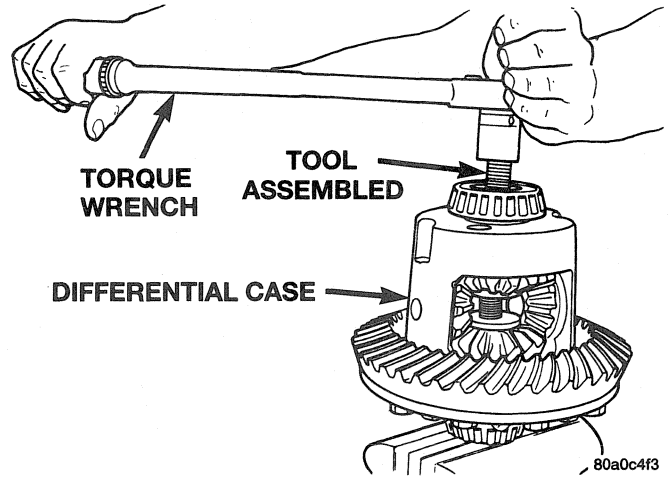


Fig. 57 Tighten Belleville Spring Compressor Tool

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 58).

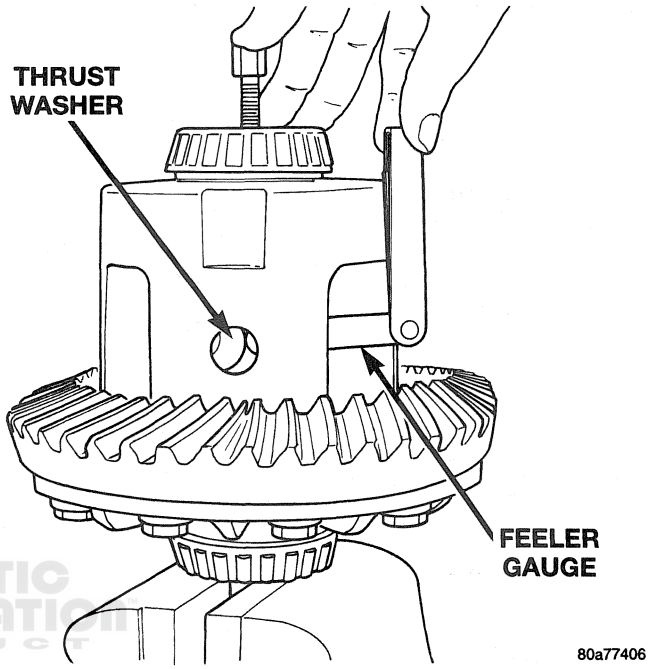


Fig. 58 Remove Pinion Gear Thrust Washer

(11) Insert Turning Bar C-6960-2 in case (Fig. 59).

(12) Loosen the Forcing Screw C-6960-4 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar C-6960-2.

(13) Rotate differential case until the pinion gears can be removed.

(14) Remove pinion gears from differential case.

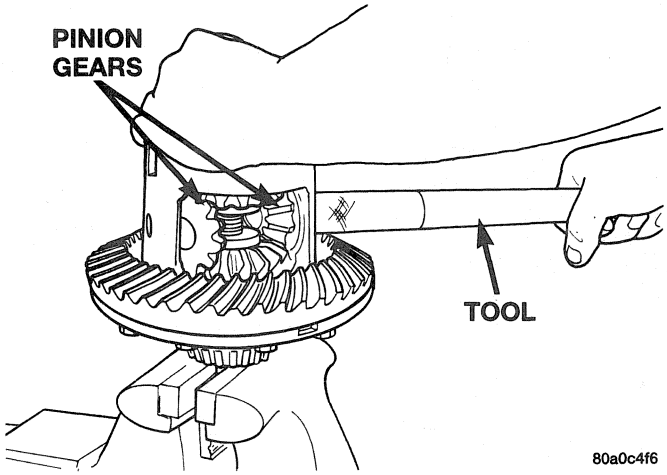


Fig. 59 Pinion Gear Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Remove Forcing Screw C-6960-4, Step Plate C-6960-3, and Threaded Adapter C-6960-1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 60).

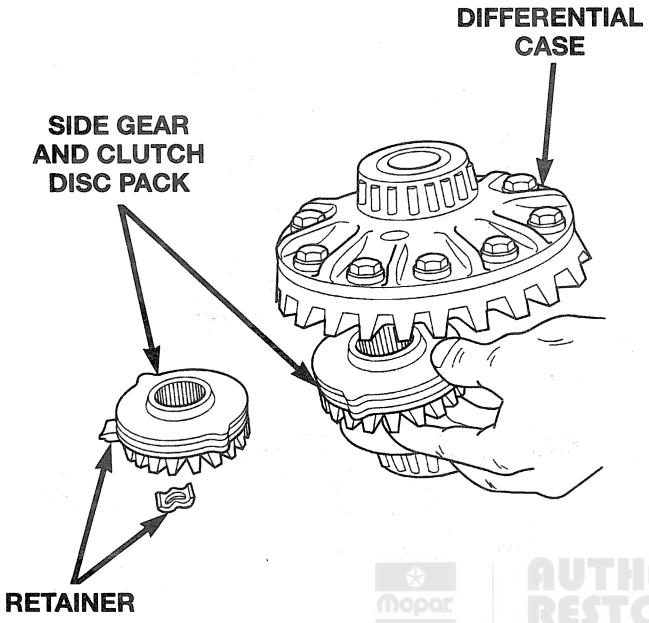


Fig. 60 Side Gear & Clutch Disc Removal

(17) Remove differential case from Side Gear Holding Tool 6965. Remove side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

NOTE: The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both packs must be replaced.

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 61).

(2) Position assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 62). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 6965.

(5) Install lubricated Step Plate C-6960-3 in lower side gear (Fig. 63).

(6) Install the upper side gear and clutch disc pack (Fig. 63).

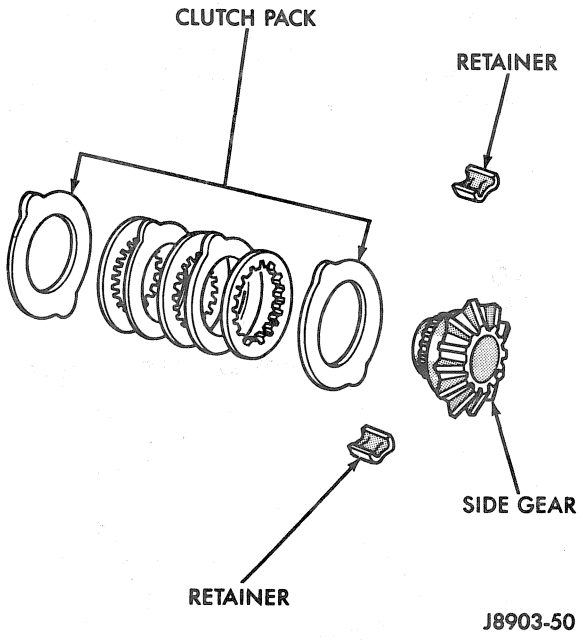


Fig. 61 Clutch Disc Pack

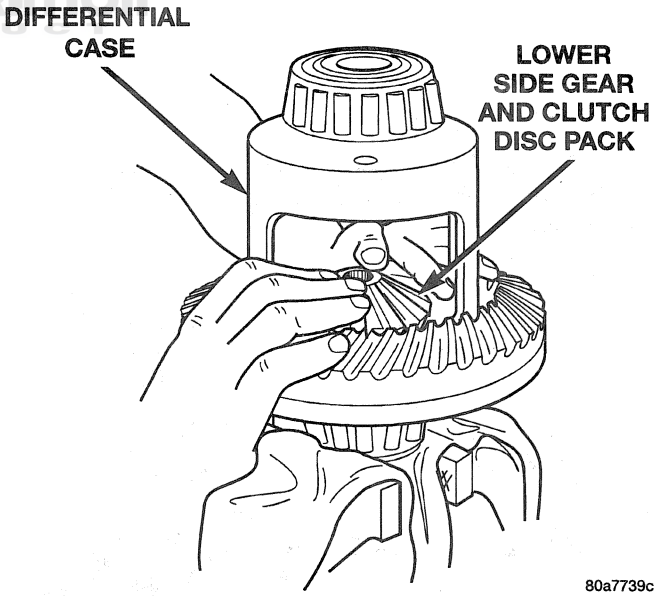


Fig. 62 Clutch Discs & Lower Side Gear Installation

(7) Hold assembly in position. Insert Threaded Adapter C-6960-1 into top side gear.

(8) Insert Forcing Screw C-6960-4.

(9) Tighten forcing screw tool to slightly compress clutch discs.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

(11) Rotate case with Turning Bar C-6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly

DISASSEMBLY AND ASSEMBLY (Continued)

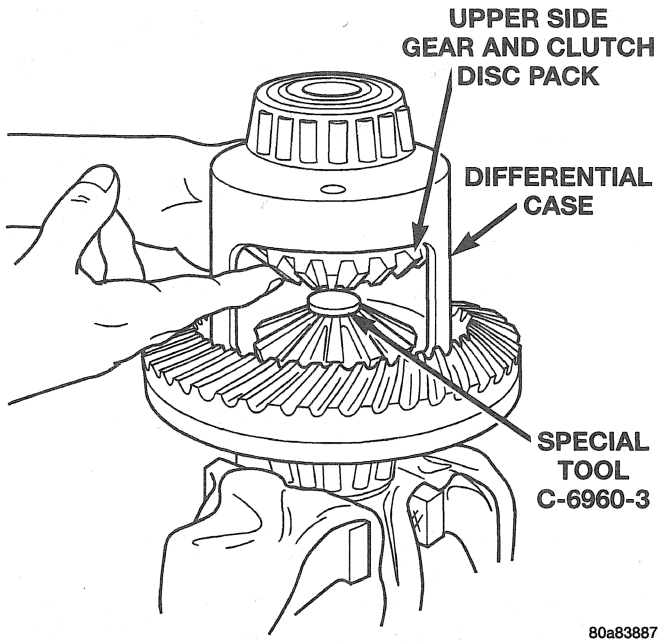


Fig. 63 Upper Side Gear & Clutch Disc Pack Installation

tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove Forcing Screw C-6960-4, Step Plate C-6960-3, and Threaded Adapter C-6960-1.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install the pinion mate shaft lock screw finger tight to hold shaft during differential installation.

If replacement gears and thrust washers were installed, it is not necessary to measure the gear backlash. Correct fit is due to close machining tolerances during manufacture.

(17) Lubricate all differential components with hypoid gear lubricant.

CLEANING AND INSPECTION

AXLE COMPONENTS

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing. Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims, if necessary.

TRAC-LOK

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

ADJUSTMENTS

PINION GEAR DEPTH

GENERAL INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 64). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 96.850 mm (3.813 in.). The standard depth provides the best teeth contact pattern. Refer to

ADJUSTMENTS (Continued)

Backlash and Contact Pattern Analysis Paragraph in this section for additional information.

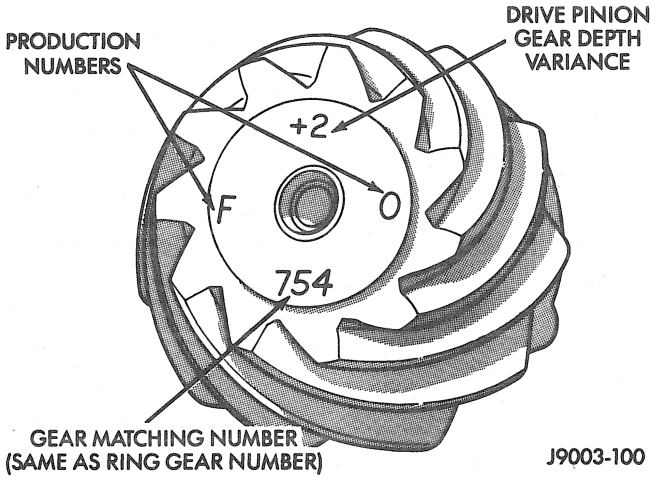


Fig. 64 Pinion Gear ID Numbers

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the inner pinion bearing cone (Fig. 65).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance charts.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

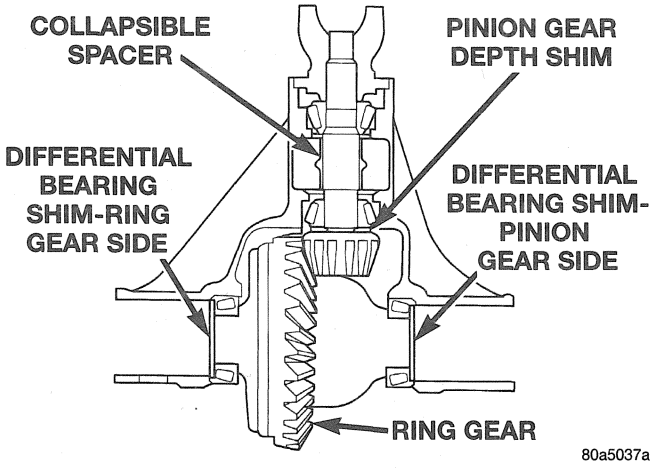


Fig. 65 Shim Locations

Note the etched number on the face of the drive pinion gear (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shim(s). If the number is positive, subtract that value from the thickness of the depth shim(s). If the number is 0 no change is necessary. Refer to the Pinion Gear Depth Variance Chart.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set, Pinion Block 6735,

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

J8902-46

ADJUSTMENTS (Continued)

Arbor Discs 6732, and Dial Indicator C-3339 (Fig. 66).

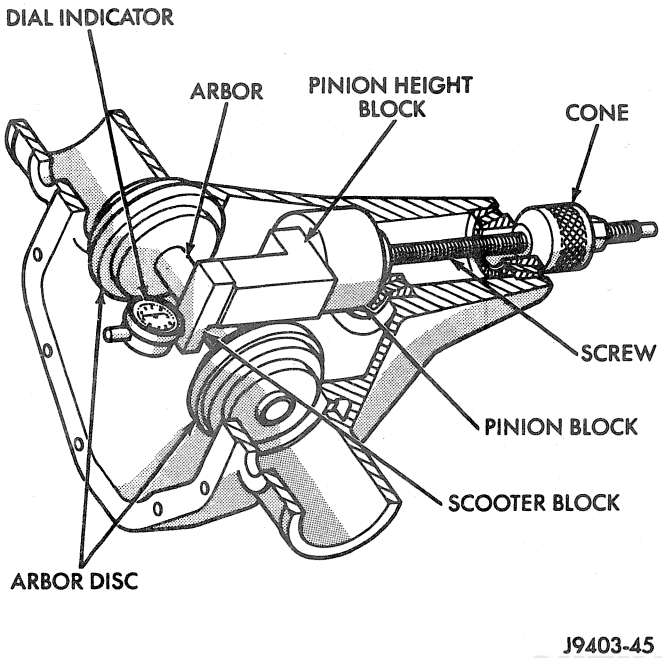


Fig. 66 Pinion Gear Depth Gauge Tools—Typical

(1) Assemble Pinion Height Block 6739, Pinion Block 6735, and rear pinion bearing onto Screw 6741 (Fig. 66).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 67).

(3) Install front pinion bearing and Cone 6740 hand tight (Fig. 66).

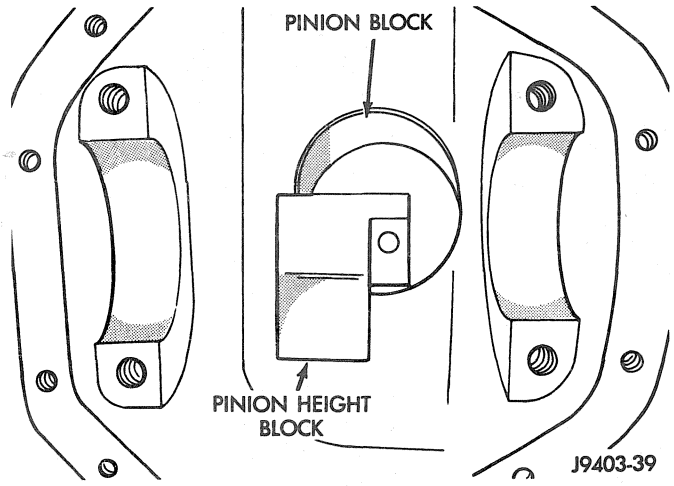


Fig. 67 Pinion Height Block—Typical

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 68). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications in this section.

NOTE: Arbor Discs 6732 have different step diameters to fit other axle sizes. Pick correct size step for axle being serviced.

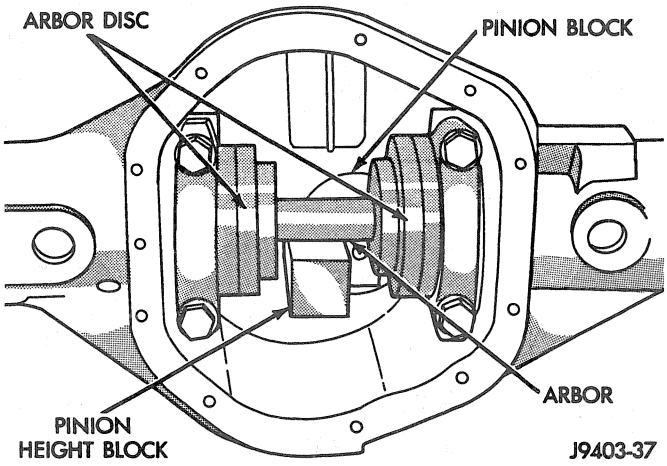


Fig. 68 Gauge Tools In Housing—Typical

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the surface of the pinion height block. Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block. Observe how many revolutions counterclockwise the dial pointer travels (approximately 0.125 in.) to the out-stop of the dial indicator.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 69). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 64) using the opposite sign on the variance number. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

(10) Remove the pinion depth gauge components from the axle housing

ADJUSTMENTS (Continued)

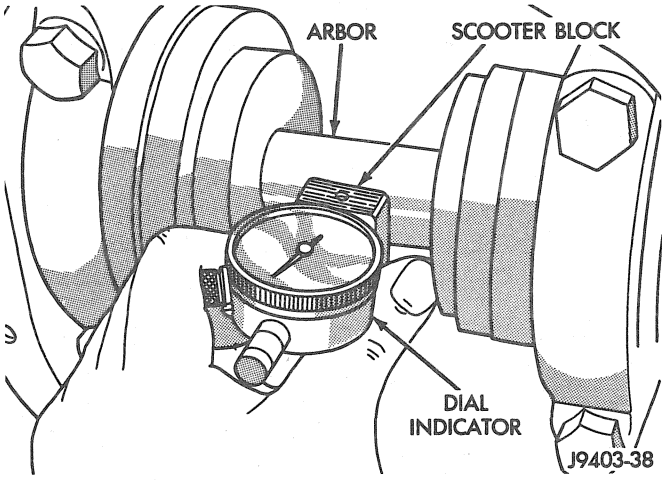


Fig. 69 Pinion Gear Depth Measurement—Typical

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

Differential side bearing preload and gear backlash is achieved by selective shims inserted between the bearing cup and the axle housing. The proper shim thickness can be determined using slip-fit dummy bearings D-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion gear for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion gear is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading, starting point shim thickness, and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 70).

SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

(1) Remove side bearings from differential case.
(2) Install ring gear, if necessary, on differential case and tighten bolts to specification.
(3) Install dummy side bearings D-348 on differential case.
(4) Install differential case in axle housing.

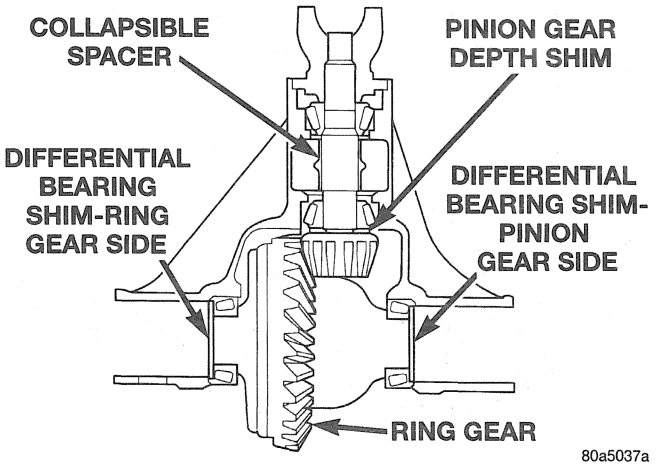


Fig. 70 Axle Adjustment Shim Locations

(5) Insert Dummy Shims 8107 (0.118 in. (3.0 mm)) starting point shims between the dummy bearing and the axle housing (Fig. 71).

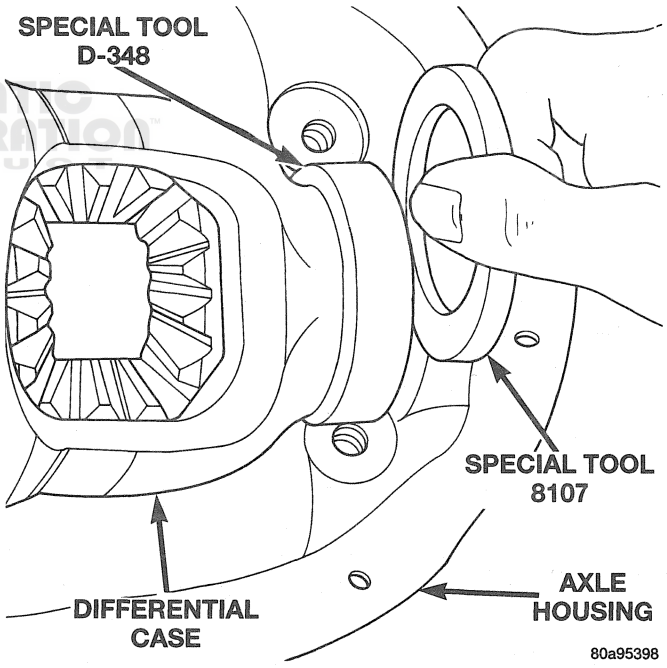


Fig. 71 Insert Starting Point Shims

(6) Install the marked bearing caps in their correct positions. Install and tighten the bolts.
(7) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 72).
(8) Attach dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface on a ring gear bolt head (Fig. 72).
(9) Push firmly and hold differential case to pinion gear side of axle housing.
(10) Zero dial indicator face to pointer.
(11) Push firmly and hold differential case to ring gear side of the axle housing.

ADJUSTMENTS (Continued)

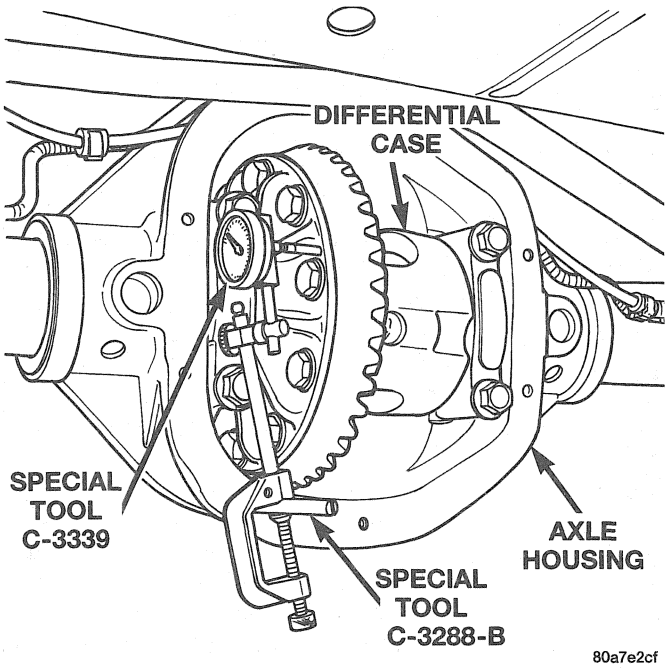


Fig. 72 Differential Side play Measurement

(12) Record dial indicator reading.

(13) Add the dial indicator reading to the starting point shim thickness to determine total shim thickness to achieve zero differential end play.

(14) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.

(15) Rotate dial indicator out of the way on guide stud.

(16) Remove differential case, dummy bearings, and starting point shims from axle housing.

(17) Install pinion gear in axle housing. Install the yoke and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings in axle housing (without shims) and tighten retaining cap bolts.

(19) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 72).

(20) Push and hold differential case toward pinion gear.

(21) Zero dial indicator face to pointer.

(22) Push and hold differential case to ring gear side of the axle housing.

(23) Record dial indicator reading.

(24) Subtract 0.002 in. (0.05 mm) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness of shim required to achieve proper backlash.

(25) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(26) Rotate dial indicator out of the way on guide stud.

(27) Remove differential case and dummy bearings from axle housing.

(28) Install new side bearing cones and cups on differential case.

(29) Install spreader W-129-B, utilizing some components of Adapter Set 6987, on axle housing and spread axle opening enough to receive differential case.

(30) Place side bearing shims in axle housing against axle tubes.

(31) Install differential case in axle housing.

(32) Rotate the differential case several times to seat the side bearings.

(33) Position the indicator plunger against a ring gear tooth (Fig. 73).

(34) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(35) Zero dial indicator face to pointer.

(36) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the differential housing to the other (Fig. 74).

(37) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at several locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform the Gear Contact Pattern Analysis procedure.

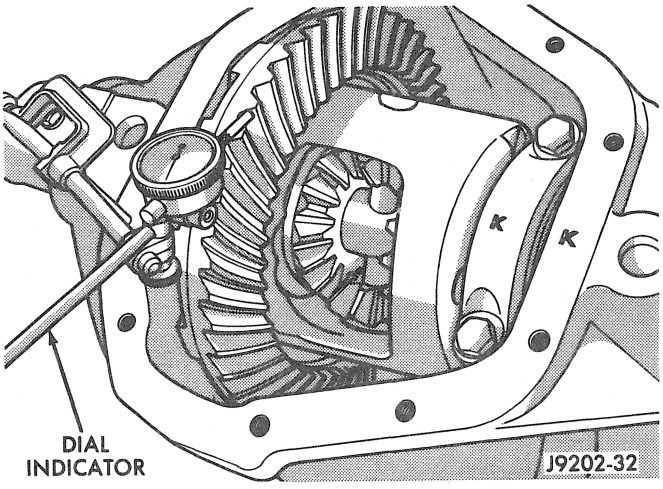


Fig. 73 Ring Gear Backlash Measurement

ADJUSTMENTS (Continued)

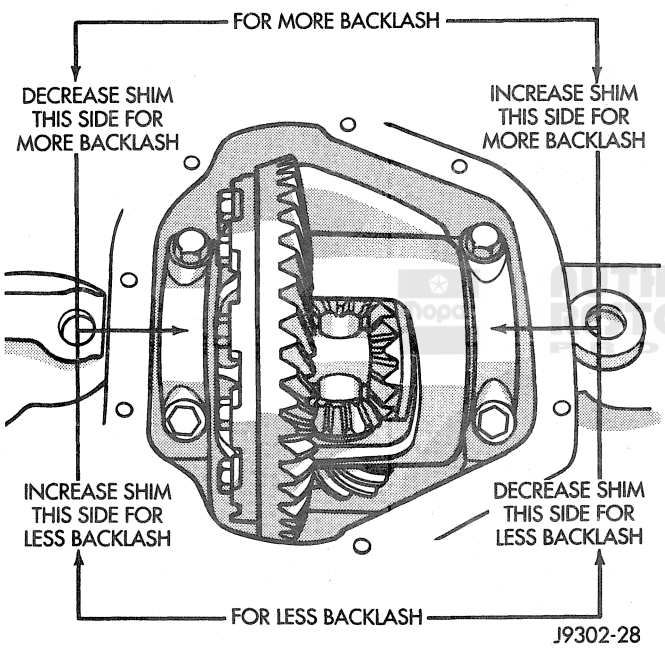


Fig. 74 Backlash Shim Adjustment

GEAR CONTACT PATTERN ANALYSIS

The ring and pinion gear teeth contact patterns will show if the pinion gear depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

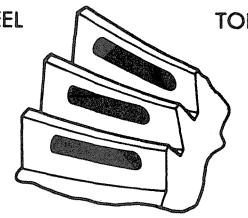
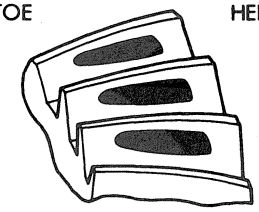
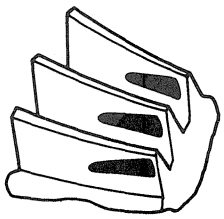
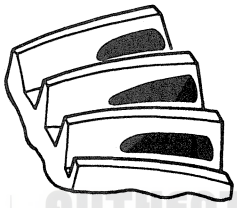
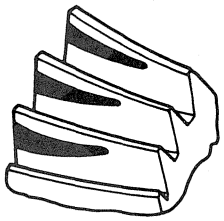
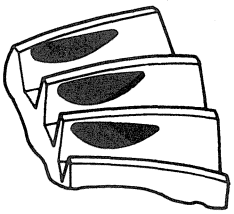
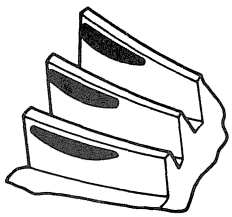
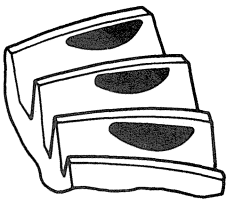
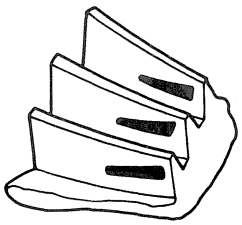
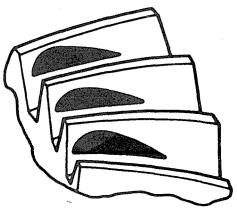
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion gear. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion gear teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 75) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 75 Gear Tooth Contact Patterns

SPECIFICATIONS

DANA 35 AXLE

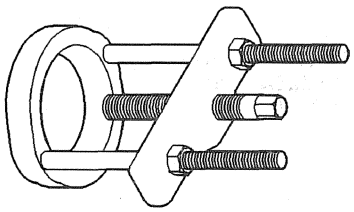
DESCRIPTION	SPECIFICATION
Axle Type	Semi–Floating Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lubricant Trailer Tow	Synthetic 75W–140
Lube Capacity	1.66 L (3.50 pts.)
Axle Ratios	3.07, 3.55, 3.73, 4.11
Differential Bearing Preload	0.1 mm (0.004 in.)
Differential Side Gear Clearance	0–0.15 mm (0–0.006 in.)
Ring Gear Diameter	19.2 cm (7.562 in.)
Ring Gear Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.08 mm (3.625 in.)
Pinion Bearing Preload-Original Bearings	1–2 N·m (10–20 in. lbs.)
Pinion Bearing Preload-New Bearings	1.5–4 N·m (15–35 in. lbs.)

DANA 35 AXLE

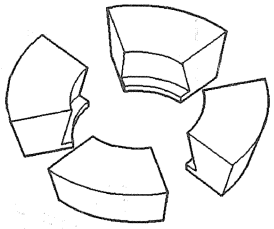
DESCRIPTION	TORQUE
Bolt, Diff. Cover	41 N·m (30 ft. lbs.)
Bolot, Bearing Cap	77 N·m (57 ft. lbs.)
Nut, Pinion	271–474 N·m (200–350 ft. lbs.)
Screw, Pinion Mate Shaft Lock	16.25 N·m (12 ft. lbs.)
Bolt, Ring Gear	95–122 N·m (70–90 ft. lbs.)
Bolt, RWAL/ABS Sensor	8 N·m (70 in. lbs.)

SPECIAL TOOLS

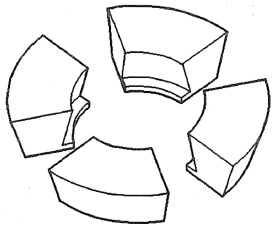
DANA 35 AXLE



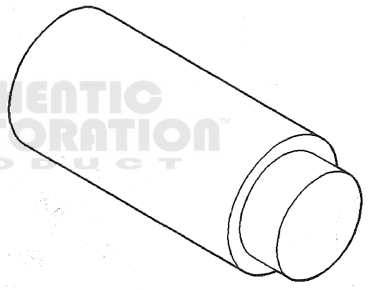
Puller—C-293-PA



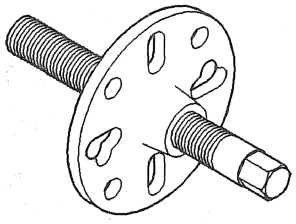
Adapter—C-293-39



Adapter—C-293-40



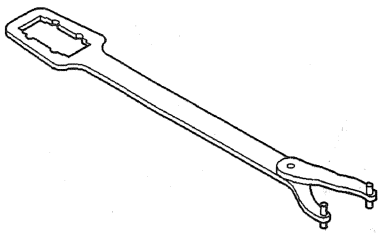
Plug—SP-3289



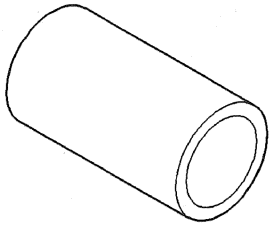
Puller—C-452

AUTHENTIC RESTORATION PRODUCT

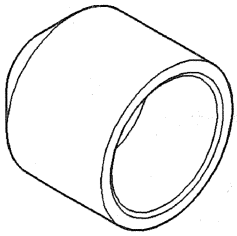
SPECIAL TOOLS (Continued)



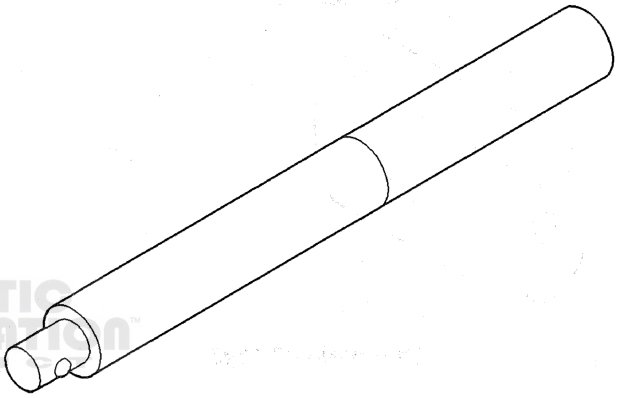
Wrench—C-3281



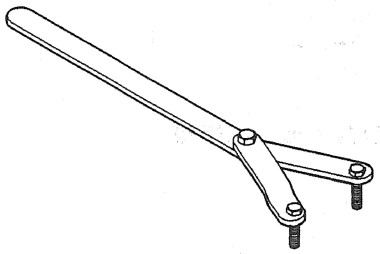
Cup—8109



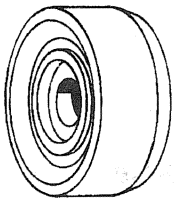
Installer—C-3972-A



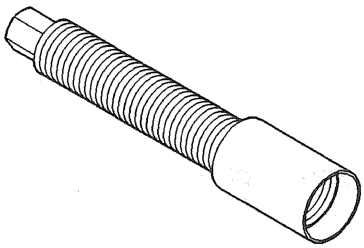
Handle—C-4171



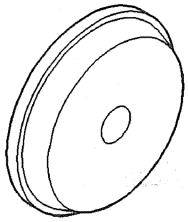
Spanner—6958



Driver—C-3716-A

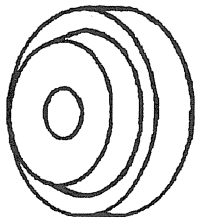


Installer Screw—8112

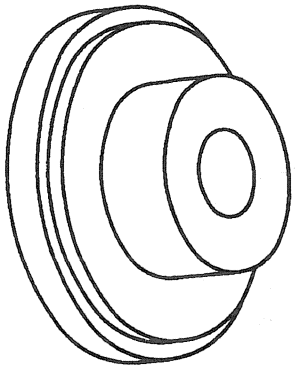


Installer—D-130

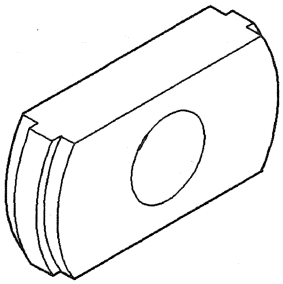
SPECIAL TOOLS (Continued)



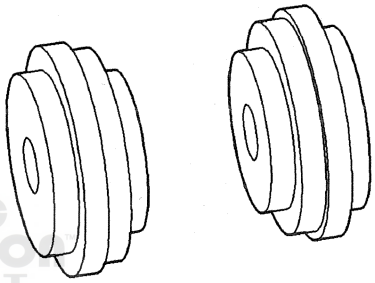
Installer—D-146



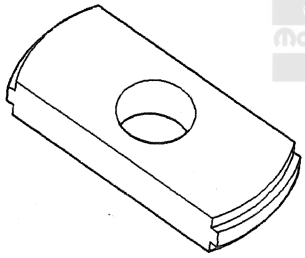
Installer—6437



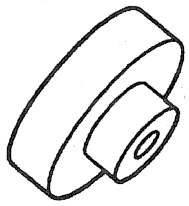
Remover—C-4345



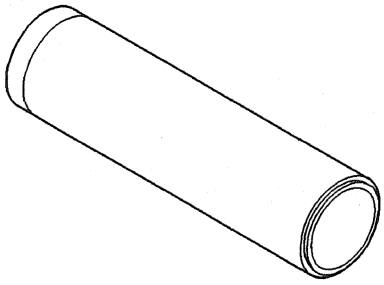
Disc, Axle Arbor—6732



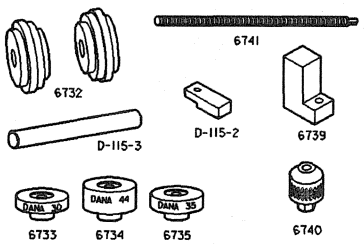
Remover—D-149



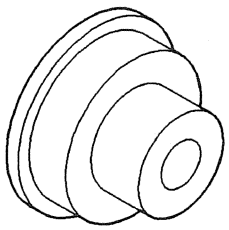
Gauge Block—6735



Installer—W-262

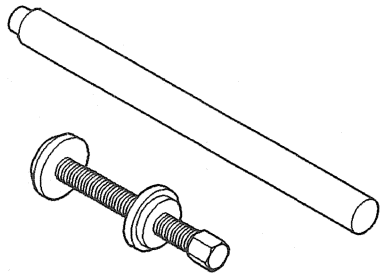


Tool Set, Pinion Depth—6774

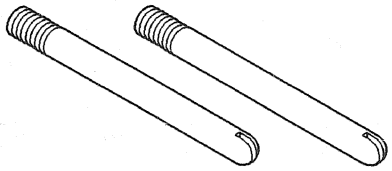


Installer—6436

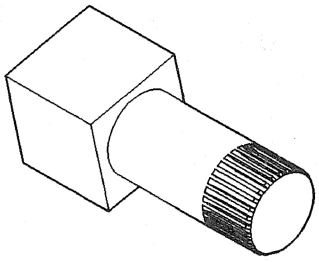
SPECIAL TOOLS (Continued)



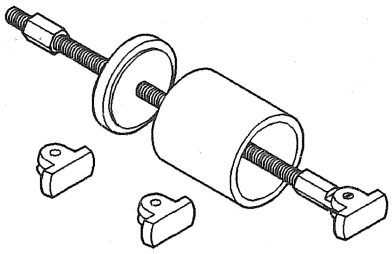
Trac-lok Tool Set—6960



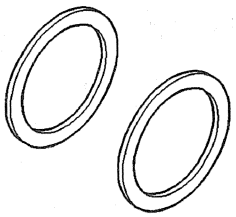
Guide Pin—C-3288-B



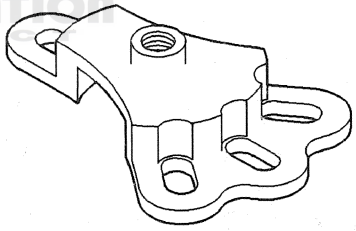
Holder—6965



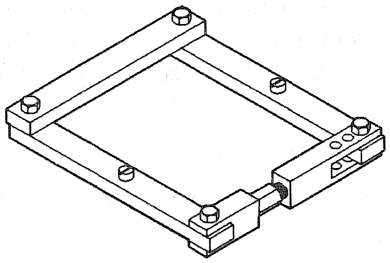
Bearing Remover Tool Set—6310



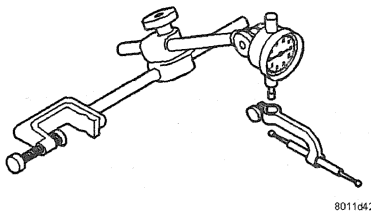
Starting Point Shim—8107



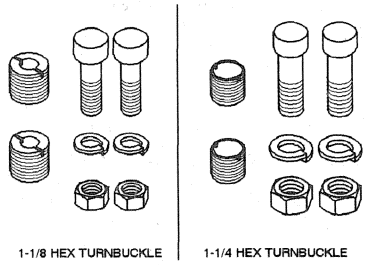
Hub Puller—6790



Spreader—W-129-B



Dial Indicator—C-3339



Adapter Kit—6987

8 1/4 REAR AXLE

INDEX

page

GENERAL INFORMATION
8 1/4 AXLES 68
AXLE IDENTIFICATION 68
LUBRICANT SPECIFICATIONS 68
DESCRIPTION AND OPERATION
STANDARD DIFFERENTIAL 69
TRAC-LOK OPERATION 70
DIAGNOSIS AND TESTING
BEARING NOISE 71
DRIVELINE SNAP 71
GEAR NOISE 71
GENERAL INFORMATION 70
LOW SPEED KNOCK 71
TRAC–LOK DIFFERENTIAL NOISE 71
TRAC–LOK TEST 74
VIBRATION 71
SERVICE PROCEDURES
LUBRICANT CHANGE 74
REMOVAL AND INSTALLATION
AXLE SEAL AND BEARING 76
AXLE SHAFT 75
DIFFERENTIAL SIDE BEARINGS 79

page

DIFFERENTIAL 78
PINION GEAR 80
PINION SEAL 76
REAR AXLE 74
RING GEAR 80
DISASSEMBLY AND ASSEMBLY
STANDARD DIFFERENTIAL 83
TRAC-LOK DIFFERENTIAL 84
CLEANING AND INSPECTION
8 1/4 AXLES 88
TRAC-LOK 88
ADJUSTMENTS
8 1/4 AXLE PINION GEAR DEPTH 89
DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH 91
GEAR CONTACT PATTERN ANALYSIS 92
SIDE GEAR CLEARANCE 94
SPECIFICATIONS
8 1/4 INCH AXLE 94
8 1/4 INCH AXLE 94
SPECIAL TOOLS
8 1/4 AXLES 95

GENERAL INFORMATION

8 1/4 AXLES

The 8 1/4 inch axle housings consist of a cast iron center section with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing (Fig. 1).

The axles have a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi-floating axle shafts, meaning vehicle loads are supported by the axle shaft and bearings. The axle shafts are retained by C-clips in the differential side gears.

The removable, stamped steel cover provides a means for inspection and service without removing the complete axle from the vehicle.

The 8 1/4 axle have the assembly part number and gear ratio listed on tag. The tag is attached to the differential housing by a cover bolt.

The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the outside of the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

Axles equipped with a Trac-Lok™ differential are optional. A Trac-Lok differential has a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.

AXLE IDENTIFICATION

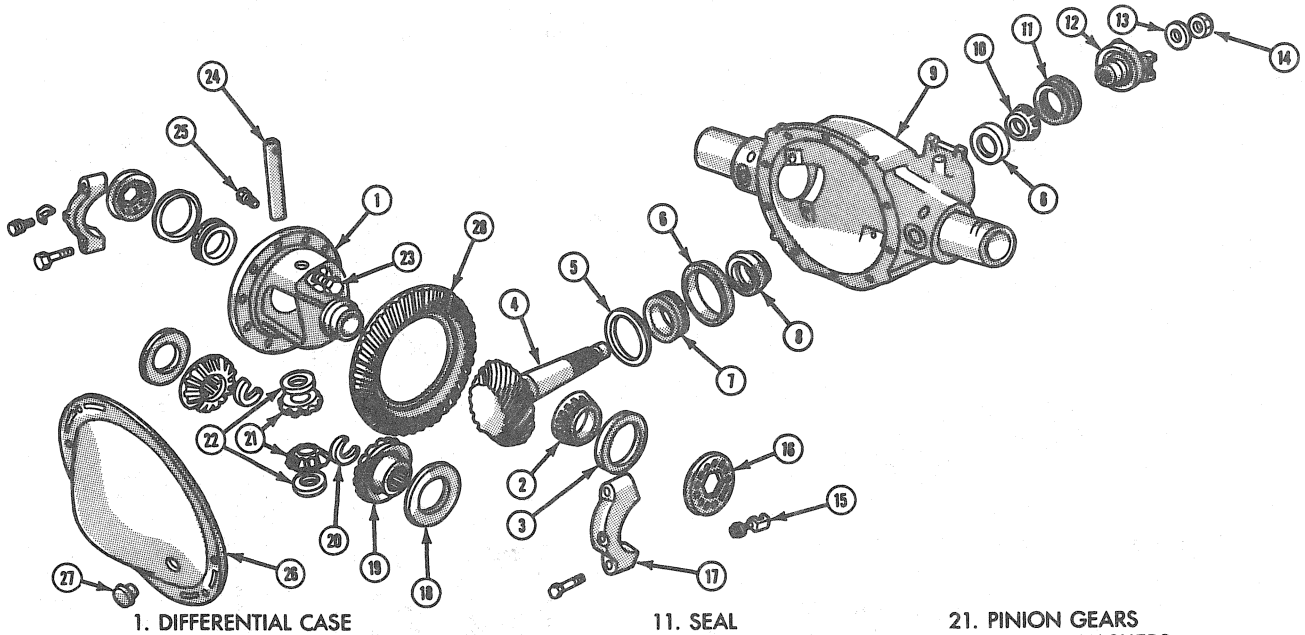
The axle differential cover can be used for identification of the axle (Fig. 2). A tag is also attached to the cover.

LUBRICANT SPECIFICATIONS

Multi-purpose, hypoid gear lubricant should be used for rear axles with a standard differential. The lubricant should have a MIL-L-2105C and API GL 5 quality specifications.

Trac-Lok differentials require the addition of 5 oz. of friction modifier to the axle lubricant after service. The 8 1/4 axle lubricant capacity is 2.27 L (4.8 pts.) total, including the friction modifier, if necessary.

NOTE: If the rear axle is submerged in water, the lubricant must be replaced immediately. Avoid the possibility of premature axle failure resulting from water contamination of the lubricant.



1. DIFFERENTIAL CASE
2. DIFFERENTIAL BEARING
3. BEARING CUP
4. PINION GEAR SHAFT
5. PINION GEAR DEPTH SHIMS
6. BEARING CUP
7. PINION GEAR SHAFT REAR BEARING
8. BEARING PRELOAD COLLAPSIBLE SPACER
9. DIFFERENTIAL HOUSING
10. PINION GEAR SHAFT FRONT BEARING
11. SEAL
12. YOKE
13. WASHER
14. NUT
15. LOCK
16. ADJUSTER
17. BEARING CAP
18. THRUST WASHER
19. SIDE GEAR
20. C-LOCK
21. PINION GEARS
22. THRUST WASHERS
23. SHAFT LOCK BOLT
24. MATE SHAFT
25. RING GEAR BOLT
26. COVER
27. PLUG
28. RING GEAR

J9203-14

Fig. 1 8 1/4 Axle

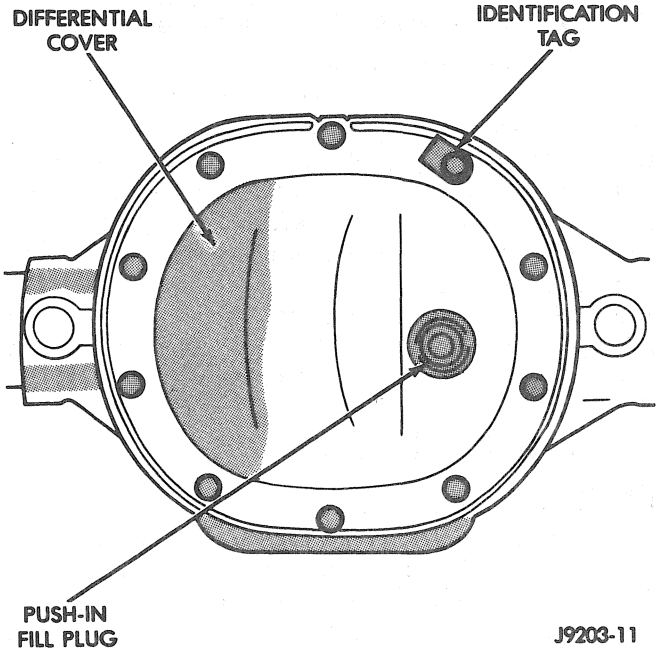


Fig. 2 Differential Cover 8 1/4 Inch Axle

DESCRIPTION AND OPERATION

STANDARD DIFFERENTIAL

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a

DESCRIPTION AND OPERATION (Continued)

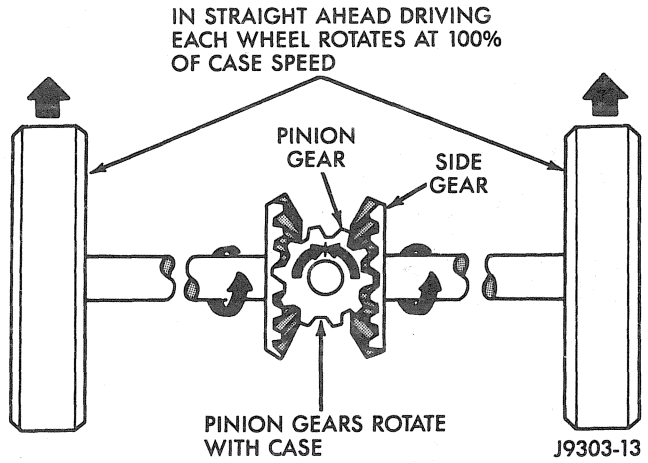


Fig. 3 Differential Operation—Straight Ahead Driving

turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 4). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

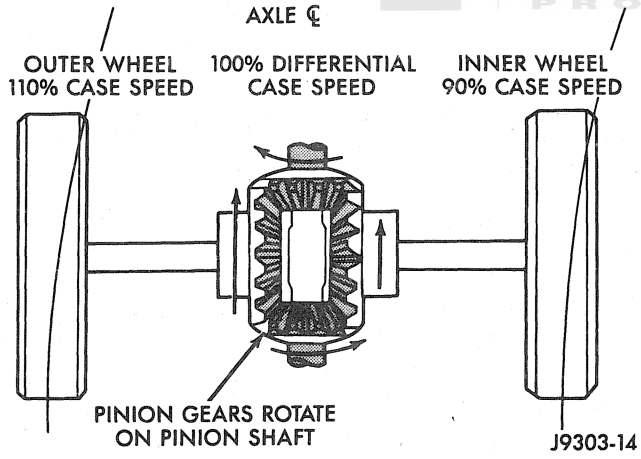


Fig. 4 Differential Operation—On Turns

TRAC-LOK OPERATION

In a conventional differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

In the Trac-lok differential, part of the ring gear torque is transmitted through clutch packs which contain multiple discs. The clutches will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material that is smooth in appearance.

In operation, the Trac-lok clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 5).

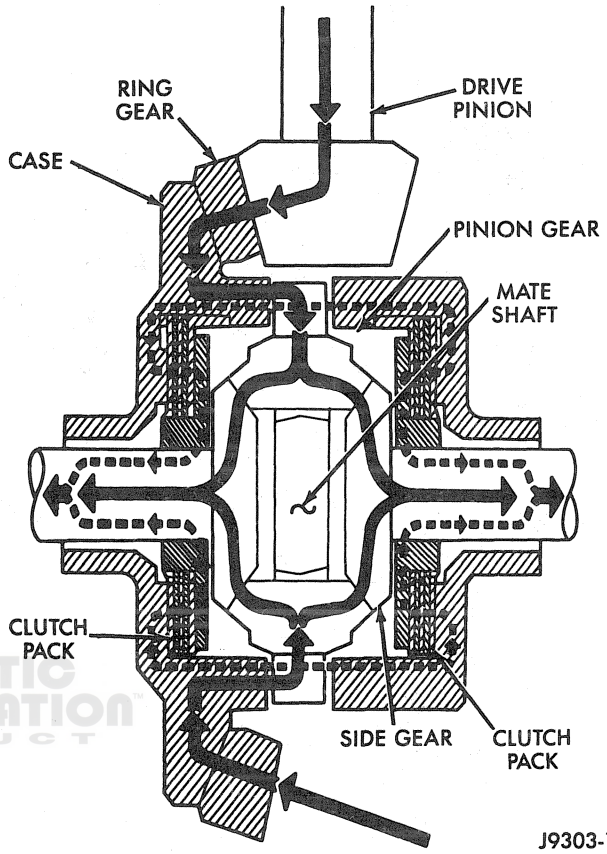


Fig. 5 Trac-lok Limited Slip Differential Operation

The Trac-lok design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. Trac-lok differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.

DIAGNOSIS AND TESTING (Continued)

- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak–noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise during straight–ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion gear bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion gear bearings have a constant–pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U–joint or by worn side–gear thrust washers. A worn pinion gear shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out–of–balance wheels.
- Loose wheel lug nuts.
- Worn U–joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front–end components or engine/transmission mounts. These components can contribute to what appears to be a rear–end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed
- Loose engine/transmission/transfer case mounts
- Worn U–joints
- Loose spring mounts
- Loose pinion gear nut and yoke
- Excessive ring gear backlash
- Excessive side gear/case clearance

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

TRAC–LOK DIFFERENTIAL NOISE

The most common problem is a chatter noise when turning corners. Before removing a Trac-lok unit for repair, drain, flush and refill the axle with the specified lubricant. Refer to Lubricant change in this Group.

A container of Mopar® Trac-lok Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces.	1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed.	2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts	1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

Mopar AUTHENTIC RESTORATION PARTS

DIAGNOSIS AND TESTING (Continued)

TRAC–LOK TEST

WARNING: WHEN SERVICING VEHICLES WITH A TRAC–LOK DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A TRAC–LOK AXLE CAN EXERT ENOUGH FORCE IF ONE WHEEL IS IN CONTACT WITH A SURFACE TO CAUSE THE VEHICLE TO MOVE.

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 6).

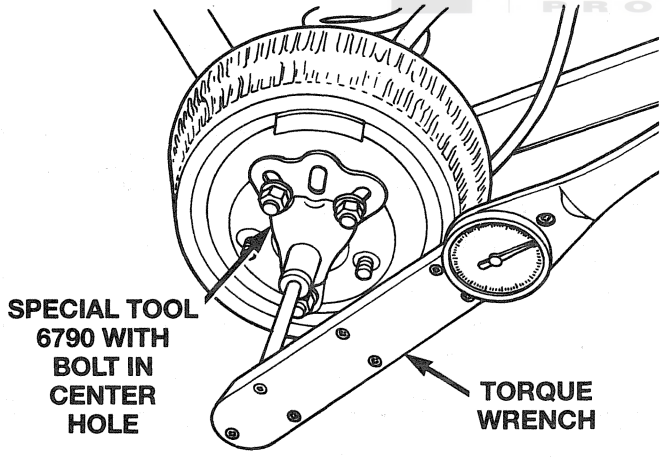


Fig. 6 Trac-lok Test —Typical

(6) If rotating torque is less than 22 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

SERVICE PROCEDURES

LUBRICANT CHANGE

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

(5) Remove the original sealant from the housing and cover surfaces.

(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 7).

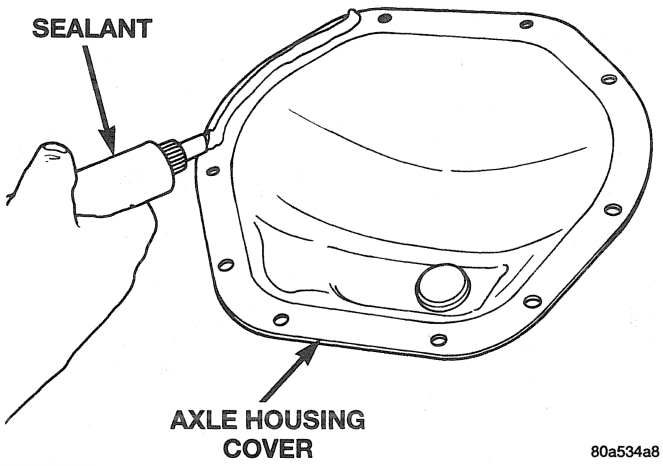


Fig. 7 Apply Sealant

Install the housing cover within 5 minutes after applying the sealant.

(7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

(8) For Trac–lok differentials, a quantity of Mopar® Trac–lok lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

(9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(10) Install the fill hole plug and lower the vehicle.

(11) Trac–lok differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

(1) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Secure brake drums to the axle shaft.
(6) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.
(7) Disconnect the parking brake cables and cable brackets.
(8) Disconnect the vent hose from the axle shaft tube.
(9) Mark the propeller shaft and yoke for installation alignment reference.
(10) Remove propeller shaft.
(11) Disconnect shock absorbers from axle.
(12) Remove the stabilizer links.
(13) Remove the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
(14) Separate the axle from the vehicle.

INSTALLATION

(1) Raise the axle with lifting device and align to the leaf spring centering bolts.
(2) Install the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
(3) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.) torque.
(4) Install the stabilizer links. Tighten sway bar links to 74 N·m (55 ft. lbs.).
(5) Connect the parking brake cables and cable brackets.
(6) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.
(7) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.
(8) Install axle vent hose.
(9) Align propeller shaft and pinion yoke reference marks. Install universal joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.
(10) Install the wheels and tires.
(11) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.
(12) Remove lifting device from axle and lower the vehicle.

AXLE SHAFT

REMOVAL

(1) Raise and support vehicle. Ensure that the transmission is in neutral.
(2) Remove wheel and tire assembly.
(3) Remove brake drum. Refer to Group 5, Brakes, for proper procedure.
(4) Clean all foreign material from housing cover area.
(5) Loosen housing cover bolts. Drain lubricant from the housing and axle shaft tubes. Remove housing cover.
(6) Rotate differential case so that pinion mate gear shaft lock screw is accessible. Remove lock screw and pinion mate gear shaft from differential case (Fig. 8).

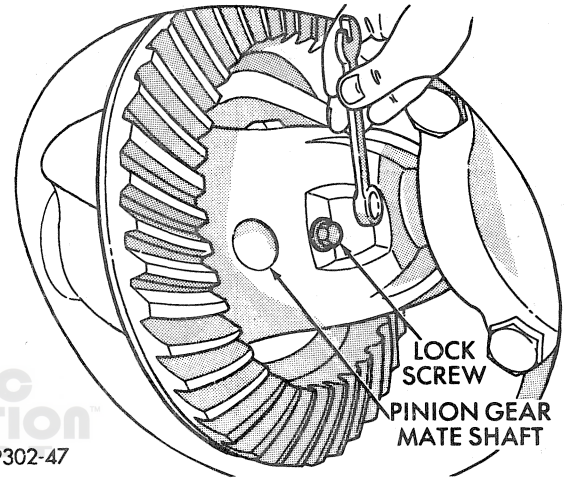


Fig. 8 Mate Shaft Lock Screw

(7) Push axle shaft inward and remove axle shaft C–clip lock from the axle shaft (Fig. 9).

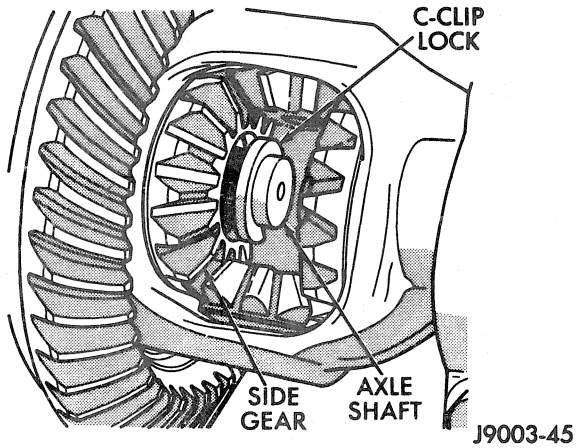


Fig. 9 Axle Shaft C–Clip Lock

(8) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube.
(9) Inspect axle shaft seal for leakage or damage.
(10) Inspect roller bearing contact surface on axle shaft for signs of brinelling, galling and pitting. If any of these conditions exist, the axle shaft and/or bearing and seal must be replaced.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing, and engage it into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip.

(2) Insert C–clip lock in end of axle shaft. Push axle shaft outward to seat C–clip lock in side gear.
(3) Insert pinion mate shaft into differential case and through thrust washers and pinion gears.
(4) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 11 N·m (8 ft. lbs.) torque.
(5) Install cover and add fluid. Refer to Lubricant Change procedure in this section for procedure and lubricant requirements.
(6) Install brake drum. Refer to Group 5, Brakes, for proper procedures.
(7) Install wheel and tire.
(8) Lower vehicle.

AXLE SEAL AND BEARING

REMOVAL

(1) Remove axle shaft.
(2) Remove axle shaft seal from the end of the axle tube with a small pry bar (Fig. 10).

NOTE: The seal and bearing can be removed at the same time with the bearing removal tool.

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool Set 6310, using Adapter Foot 6310-9 (Fig. 11).

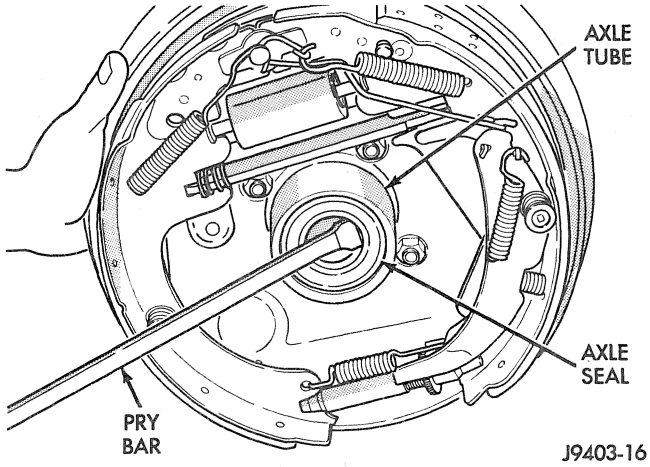


Fig. 10 Axle Seal Removal

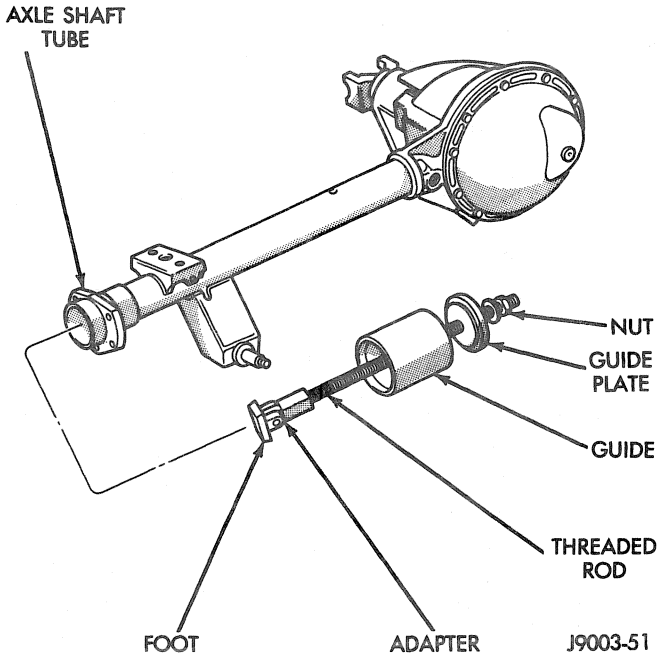


Fig. 11 Axle Shaft Bearing Removal Tool

INSTALLATION

NOTE: Do not install the original axle shaft seal. Always install a new seal.

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.
(2) Install the axle shaft bearing with Installer C-4198 and Handle C-4171 (Fig. 12). Ensure that the bearing part number is against the installer. Verify that the bearing in installed straight and the tool fully contacts the axle tube when seating the bearing.
(3) Install a new axle seal with Installer C-4076-B and Handle C-4735-1. When the tool contacts the axle tube, the seal is installed to the correct depth.
(4) Coat the lip of the seal with axle lubricant for protection prior to installing the axle shaft.
(5) Install the axle shaft.

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.
(2) Scribe a mark on the universal joint, pinion yoke, and pinion shaft for reference.
(3) Disconnect the propeller shaft from the pinion yoke. Secure the propeller shaft in an upright position to prevent damage to the rear universal joint.
(4) Remove the wheel and tire assemblies.
(5) Remove the brake drums to prevent any drag. The drag may cause a false bearing preload torque measurement.
(6) Rotate the pinion yoke three or four times.

REMOVAL AND INSTALLATION (Continued)

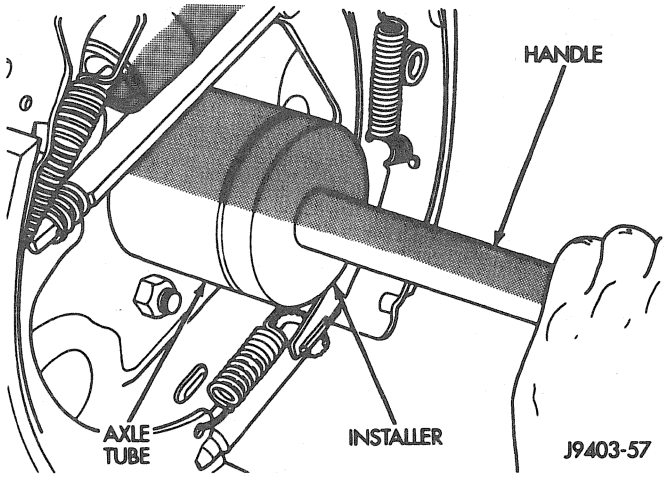


Fig. 12 Axle Shaft Seal and Bearing Installation

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Hold the yoke with Wrench 6719. Remove the pinion shaft nut and washer.

(9) Remove the yoke with Remover C-452 (Fig. 13).

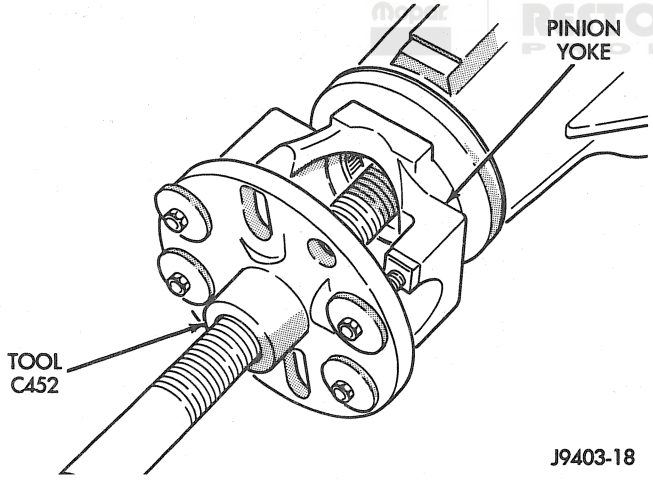


Fig. 13 Yoke Removal

(10) Remove the pinion shaft seal with suitable pry tool or slide-hammer mounted screw.

INSTALLATION

(1) Clean the seal contact surface in the housing bore.

(2) Examine the splines on the pinion shaft for burrs or wear. Remove any burrs and clean the shaft.

(3) Inspect pinion yoke for cracks, worn splines and worn seal contact surface. Replace yoke if necessary.

NOTE: The outer perimeter of the seal is pre-coated with a special sealant. An additional application of sealant is not required.

(4) Apply a light coating of gear lubricant on the lip of pinion seal.

(5) Install the new pinion shaft seal with Installer C-4076-B and Handle C-4735-1 (Fig. 14).

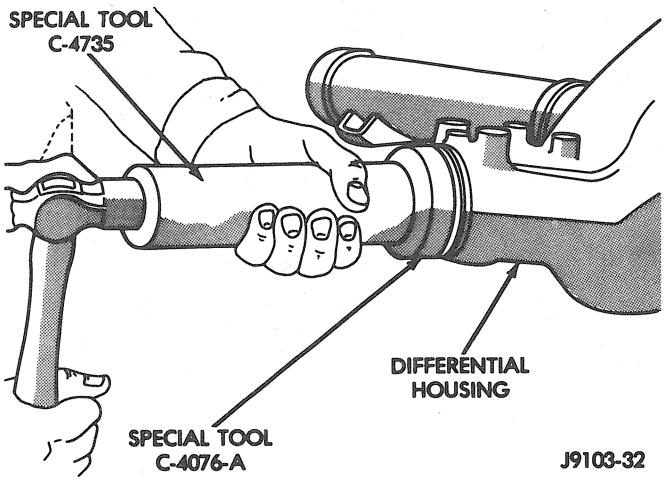


Fig. 14 8 1/4 Axle Pinion Seal Installation

NOTE: The seal is correctly installed when the seal flange contacts the face of the differential housing flange.

(6) Position the pinion yoke on the end of the shaft with the reference marks aligned.

(7) Seat yoke on pinion shaft with Installer C-3718 and Wrench 6719.

(8) Remove the tools and install the pinion yoke washer. The convex side of the washer must face outward.

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to collapsible spacer or bearings may result.

(9) Hold pinion yoke with Yoke Holder 6719 and tighten shaft nut to 285 N·m (210 ft. lbs.) (Fig. 15). Rotate pinion shaft several revolutions to ensure the bearing rollers are seated.

(10) Rotate the pinion shaft using an (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 16).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(11) If the rotating torque is low, use Yoke Holder 6719 to hold the pinion yoke (Fig. 15) and tighten the

REMOVAL AND INSTALLATION (Continued)

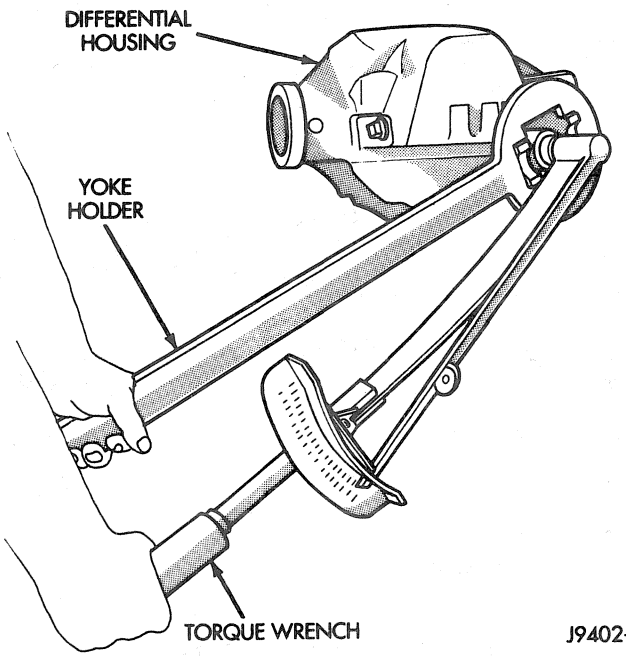


Fig. 15 Tightening Pinion Shaft Nut

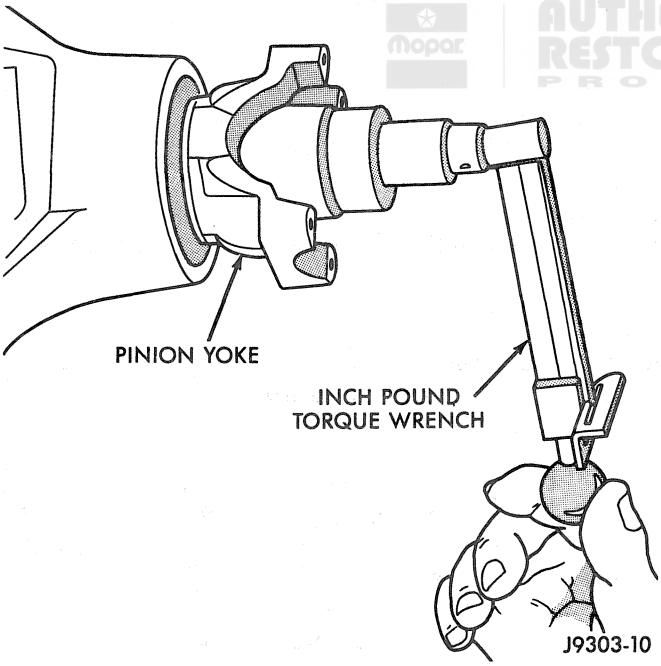


Fig. 16 Check Pinion Rotation Torque

pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

NOTE: The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, this indicates a binding condition.

(12) The seal replacement is unacceptable if the final pinion nut torque is less than 285 N·m (210 ft. lbs.).

(13) Install the propeller shaft with the installation reference marks aligned.

(14) Tighten the universal joint yoke clamp screws to 19 N·m (14 ft. lbs.).

(15) Install the brake drums.

(16) Install wheel and tire assemblies and lower the vehicle.

(17) Check the differential housing lubricant level.

DIFFERENTIAL

REMOVAL

(1) Remove the axle shafts.

NOTE: Side play resulting from bearing races being loose on case hubs requires replacement of the differential case.

(2) Mark the differential housing and the differential bearing caps for installation reference (Fig. 17).

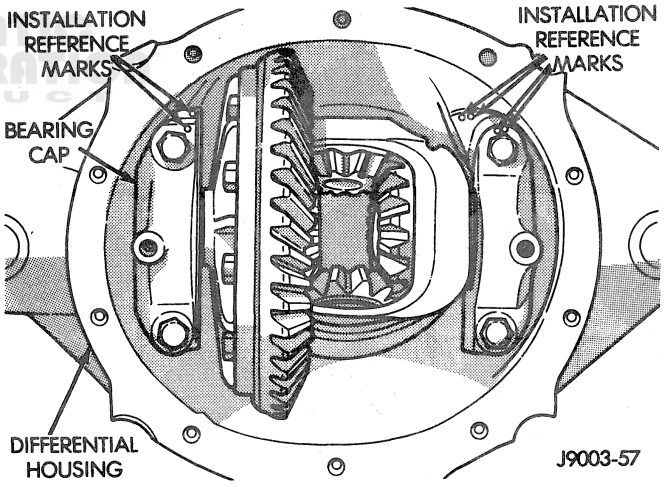


Fig. 17 Mark For Installation Reference

(3) Remove bearing threaded adjuster lock from each bearing cap. Loosen the bolts, but do not remove the bearing caps.

(4) Loosen the threaded adjusters with Wrench C-4164 (Fig. 18).

(5) Hold the differential case while removing bearing caps and adjusters.

(6) Remove the differential case.

NOTE: Each differential bearing cup and threaded adjuster must be kept with their respective bearing.

INSTALLATION

(1) Apply a coating of hypoid gear lubricant to the differential bearings, bearing cups, and threaded adjusters. A dab of grease can be used to keep the

REMOVAL AND INSTALLATION (Continued)

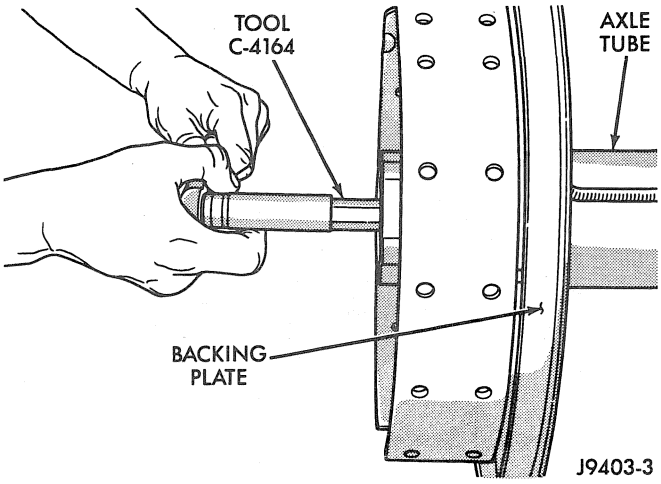


Fig. 18 Threaded Adjuster Tool

adjusters in position. Carefully position the assembled differential case in the housing.

(2) Observe the reference marks and install the differential bearing caps at their original locations (Fig. 19).

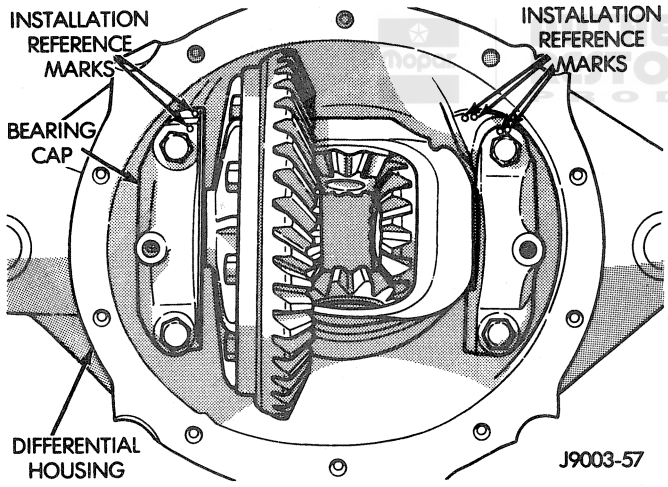


Fig. 19 Bearing Caps & Bolts

(3) Install bearing cap bolts and tighten the upper bolts to 14 N·m (10 ft. lbs.). Tighten the lower bolts finger-tight until the bolt head is seated.

(4) Perform the differential bearing preload and adjustment procedure.

(5) Install axle shafts and differential housing cover.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA and Adapters C-293-48 and Plug SP-3289 (Fig. 20).

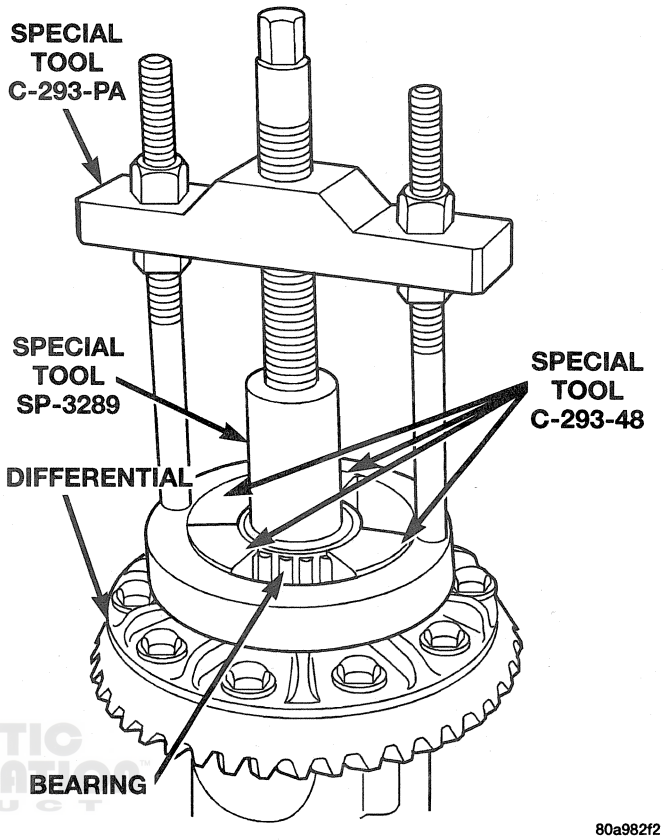


Fig. 20 Differential Bearing Removal

INSTALLATION

(1) Install differential side bearings. Use Installer C-4340 with handle C-4171 (Fig. 21).

(2) Install differential case in axle housing.

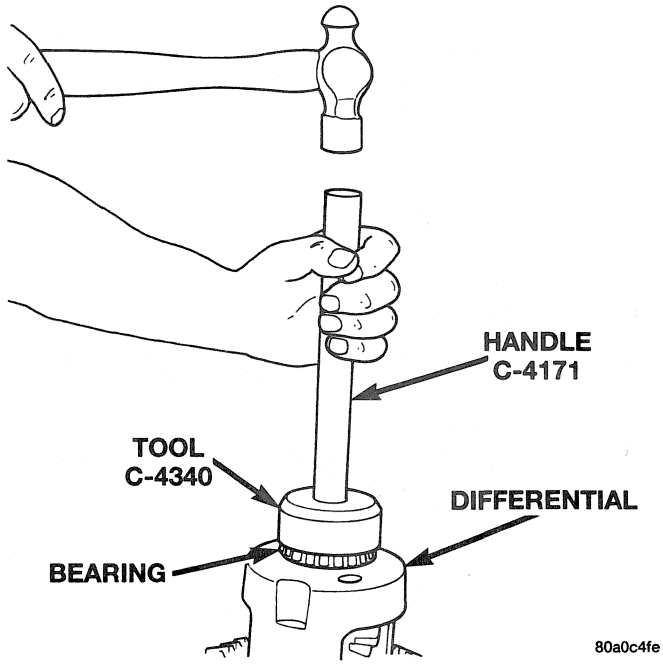


Fig. 21 Install Differential Side Bearings

REMOVAL AND INSTALLATION (Continued)

RING GEAR

The ring and pinion gears are serviced in a matched set. Do not replace the ring gear without replacing the pinion gear.

REMOVAL

(1) Remove differential from axle housing.
(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 22).
(3) Remove bolts holding ring gear to differential case.
(4) Using a soft hammer, drive ring gear from differential case (Fig. 22).

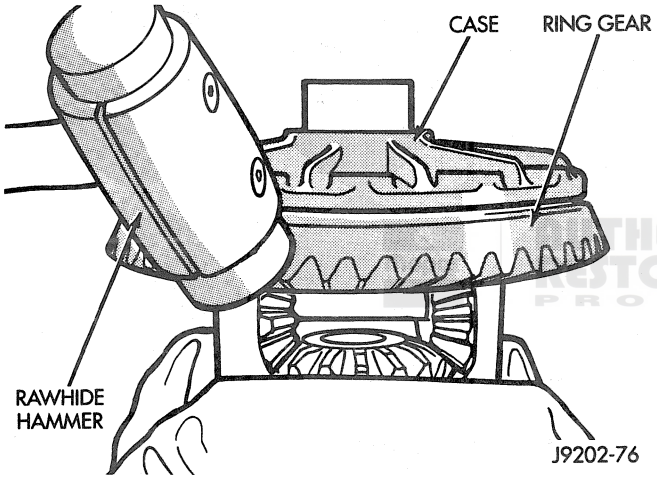


Fig. 22 Ring Gear Removal

INSTALLATION

CAUTION: Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

(1) Invert the differential case.
(2) Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
(3) Invert the differential case in the vise.
(4) Install new ring gear bolts and alternately tighten to 102 N·m (75 ft. lbs.) torque (Fig. 23).
(5) Install differential in axle housing and verify gear mesh and contact pattern.

PINION GEAR

The ring and pinion gears are serviced in a matched set. Do not replace the pinion gear without replacing the ring gear.

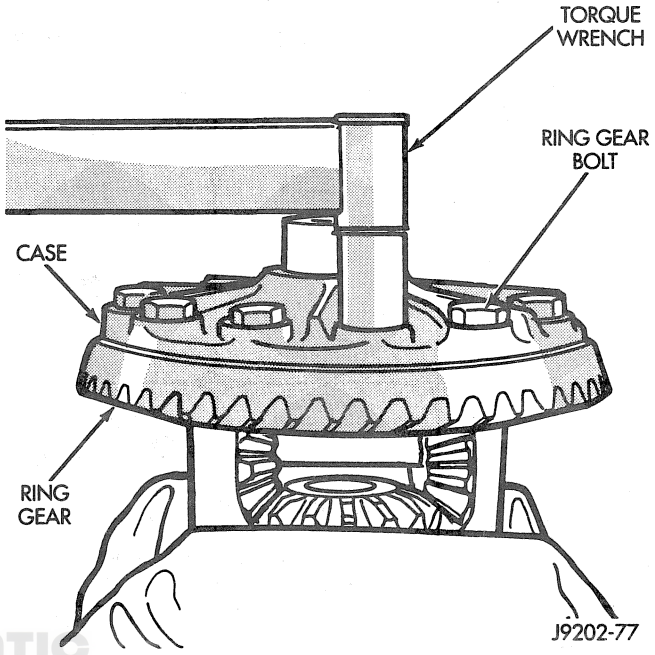


Fig. 23 Ring Gear Bolt Installation

REMOVAL

(1) Remove differential from the axle housing.
(2) Mark pinion yoke and propeller shaft for installation alignment.
(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.
(4) Using Yoke Holder 6719 to hold yoke and remove the pinion yoke nut and washer.
(5) Using Remover C–452, remove the pinion yoke from pinion shaft (Fig. 24).

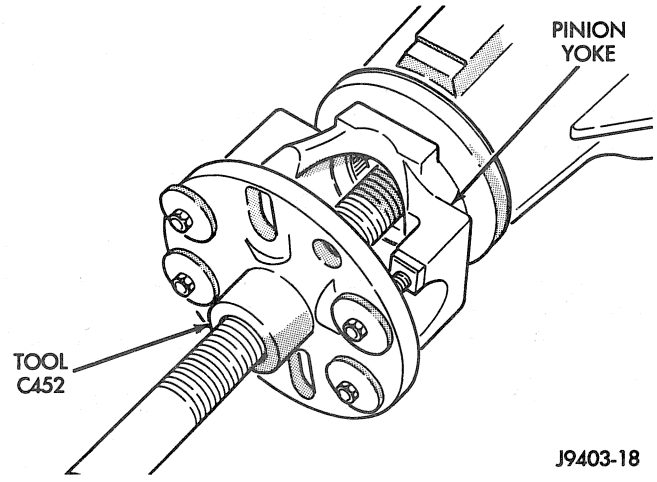


Fig. 24 Pinion Yoke Removal

REMOVAL AND INSTALLATION (Continued)

(6) Partially install pinion nut onto pinion to protect the threads.

(7) Remove the pinion gear from housing (Fig. 25). Catch the pinion with your hand to prevent it from falling and being damaged.

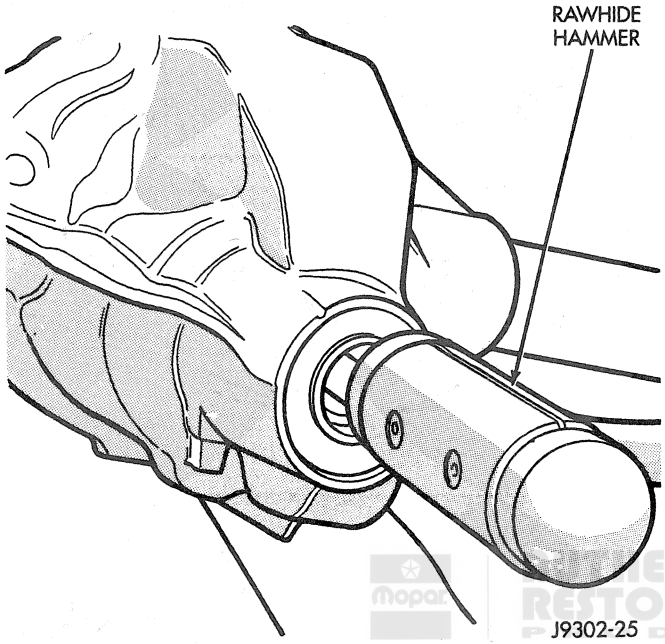


Fig. 25 Remove Pinion Gear

(8) Remove the pinion shaft seal with suitable pry tool or slide-hammer mounted screw.

(9) Remove oil slinger, if equipped, and front pinion bearing.

(10) Remove the front pinion bearing cup with Remover C-4345 and Handle C–4171 (Fig. 26).

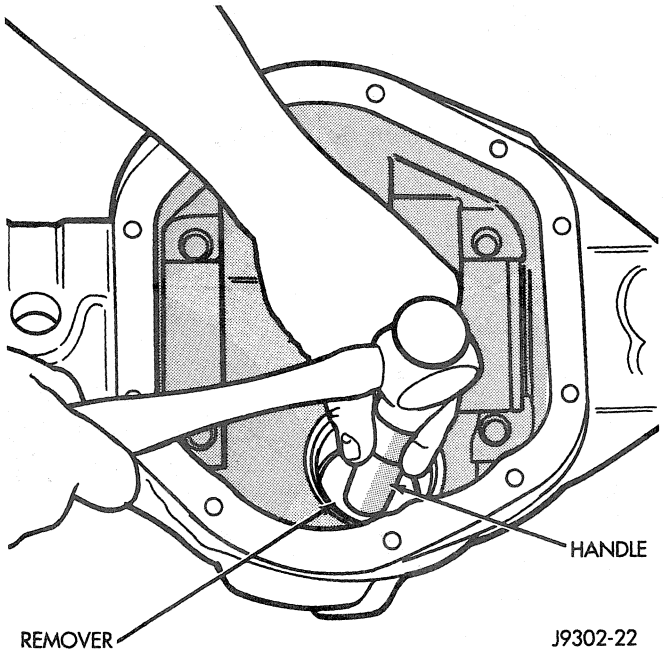


Fig. 26 Front Bearing Cup Removal

(11) Remove the rear bearing cup from housing (Fig. 27). Use Remover C-4307 and Handle C–4171.

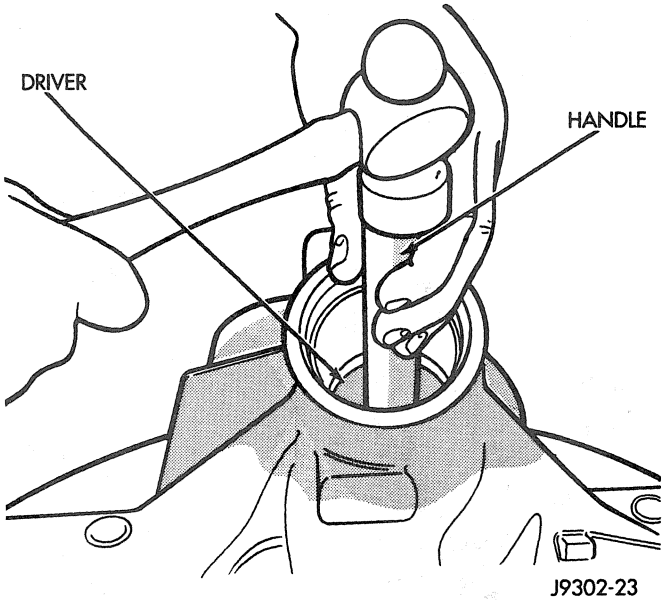


Fig. 27 Rear Bearing Cup Removal

(12) Remove the collapsible preload spacer (Fig. 28).

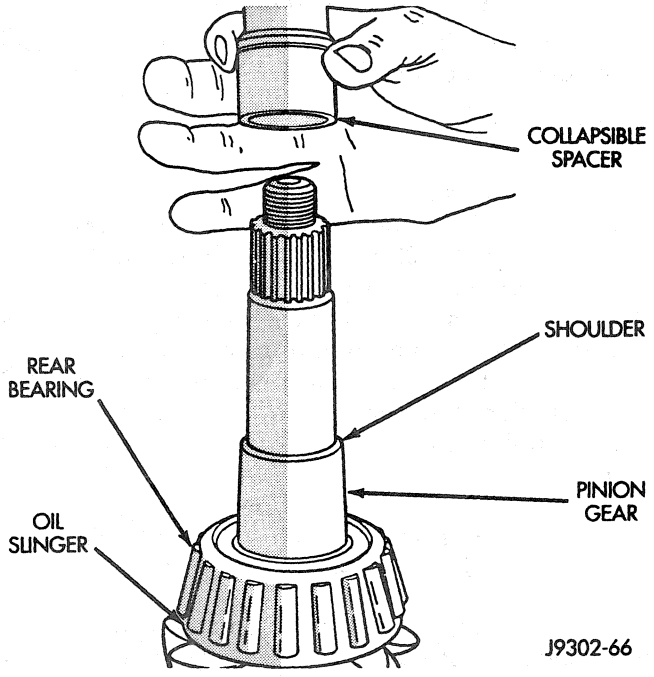


Fig. 28 Collapsible Spacer

REMOVAL AND INSTALLATION (Continued)

(13) Remove the rear bearing from the pinion (Fig. 29) with Puller/Press C-293-PA and Adapters C-293-47.

Place 4 adapter blocks so they do not damage the bearing cage.

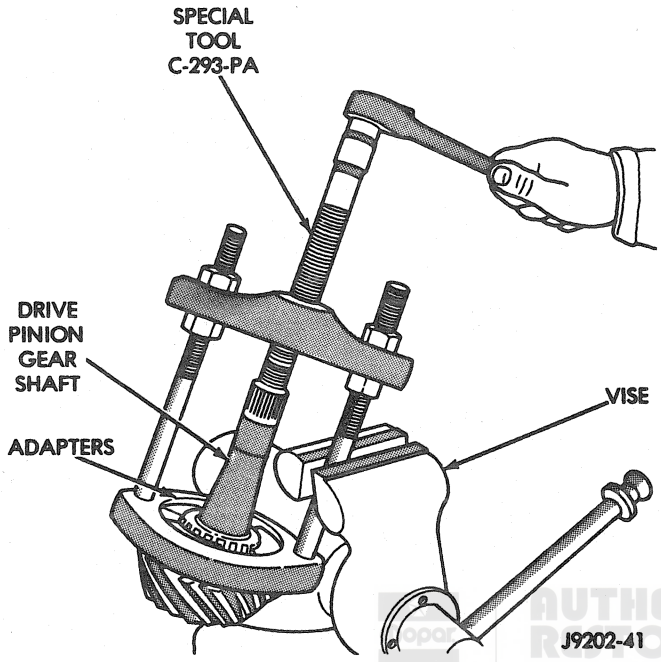


Fig. 29 Rear Bearing Removal

(14) Remove the depth shims from the pinion gear shaft. Record the thickness of the depth shims.

INSTALLATION

(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(2) Install the pinion rear bearing cup (Fig. 30) with Installer C-4308 and Driver Handle C–4171.

(3) Ensure cup is correctly seated.

(4) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(5) Install the pinion front bearing cup (Fig. 31) with Installer D–130 and Handle C–4171.

(6) Install pinion front bearing, and oil slinger, if equipped.

(7) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-4076–B and Handle C-4735-1 (Fig. 32).

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and pinion gear to achieve proper ring and pinion gear mesh. If the factory installed ring and pinion gears are reused, the pinion depth shim should not require replacement. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

(8) Place the proper thickness depth shim on the pinion gear.

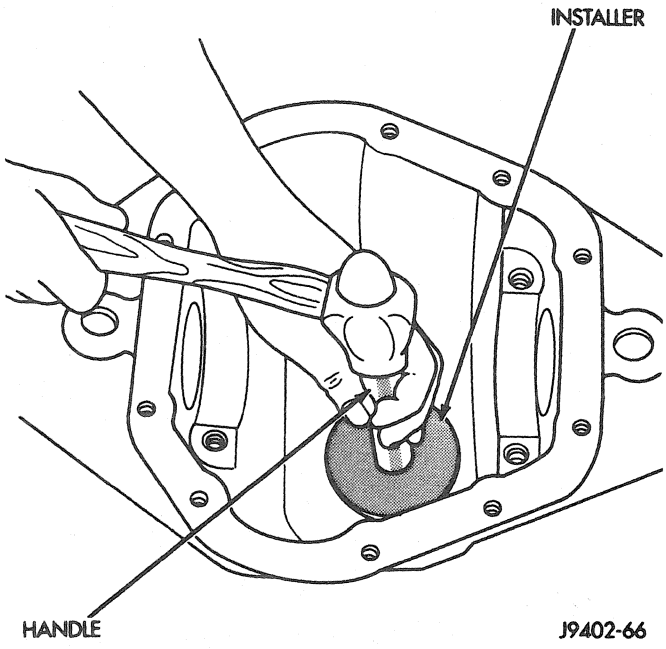


Fig. 30 Pinion Rear Bearing Cup Installation

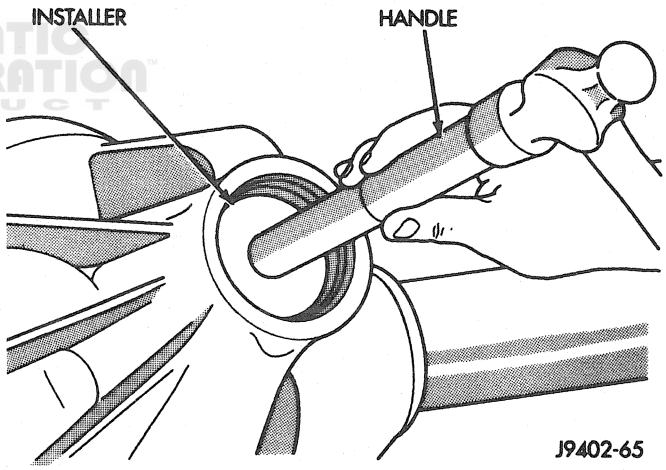


Fig. 31 Pinion Front Bearing Cup Installation

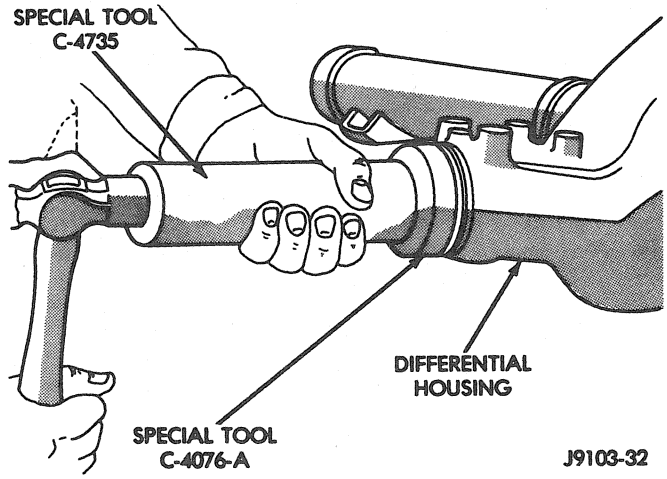


Fig. 32 Pinion Seal Installation

REMOVAL AND INSTALLATION (Continued)

(9) Install the rear bearing and slinger, if equipped, on the pinion gear (Fig. 33) with Installer 6448.

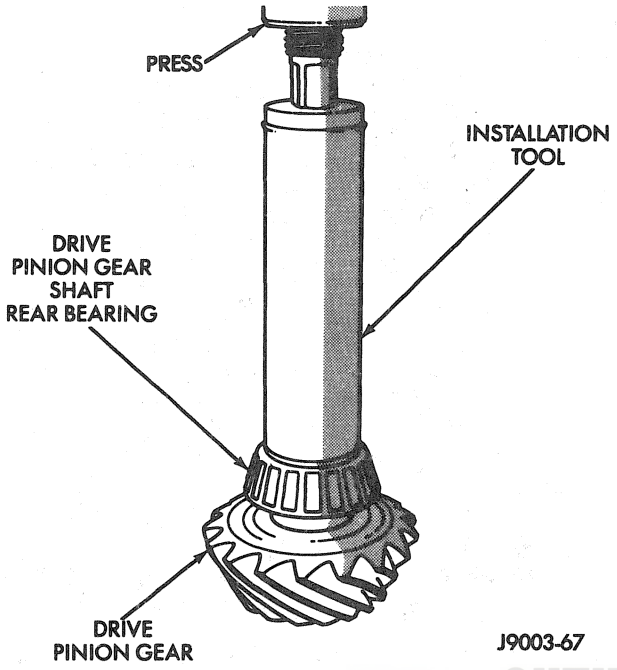


Fig. 33 Shaft Rear Bearing Installation

(10) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 34).

(11) Install pinion gear in housing.

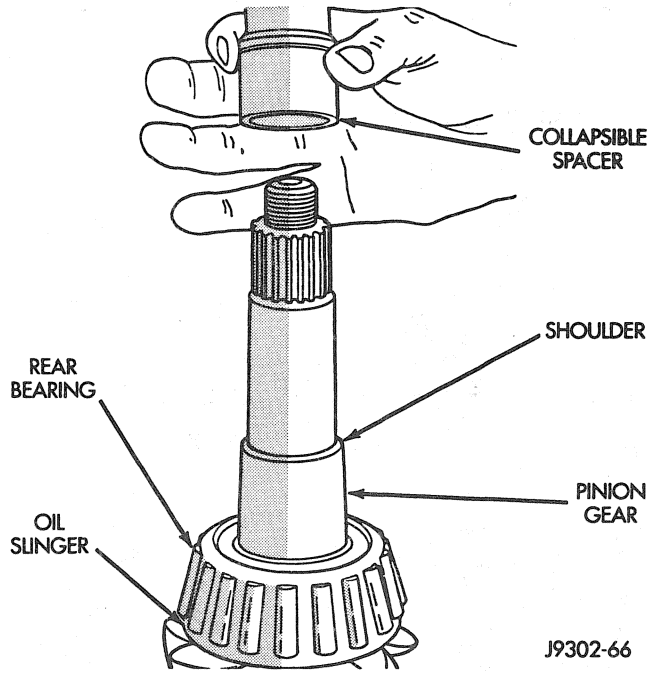


Fig. 34 Collapsible Preload Spacer

(12) Install yoke with Installer C-3718 and Yoke Holder 6719.

(13) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play. It will not be possible at this point to achieve zero bearing end-play if a new collapsible spacer was installed.

(14) Tighten the nut to 285 N·m (210 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(15) Using Yoke Holder 6719, crush collapsible spacer until bearing end play is taken up.

(16) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 35).

(17) Check bearing rotating torque with an inch pound torque wrench (Fig. 35). The torque necessary to rotate the pinion gear should be:

- Original Bearings — 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

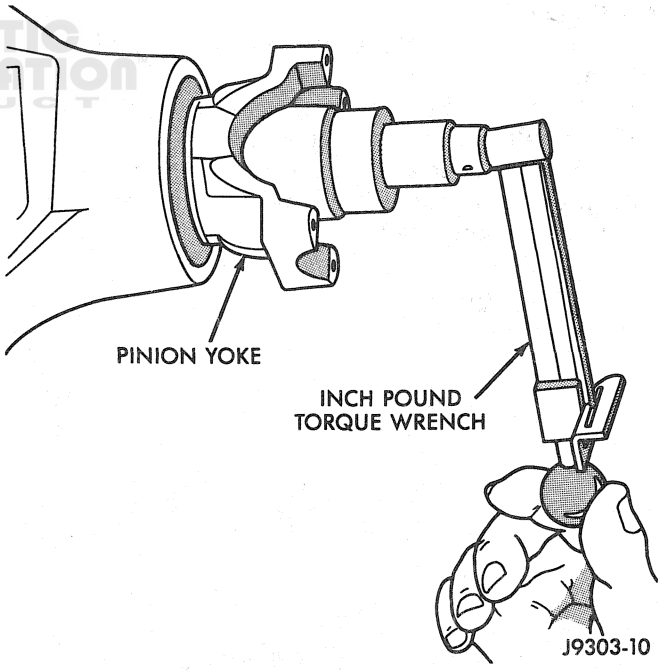


Fig. 35 Check Pinion Gear Rotating Torque

(18) Install propeller shaft.

(19) Install differential in housing.

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove pinion gear mate shaft lock screw (Fig. 36).

DISASSEMBLY AND ASSEMBLY (Continued)

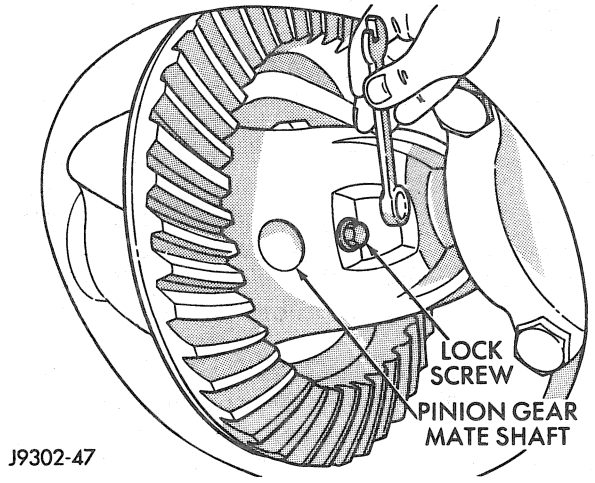


Fig. 36 Pinion Gear Mate Shaft Lock Screw

(2) Remove pinion gear mate shaft.

(3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 37).

(4) Remove the differential side gears and thrust washers.

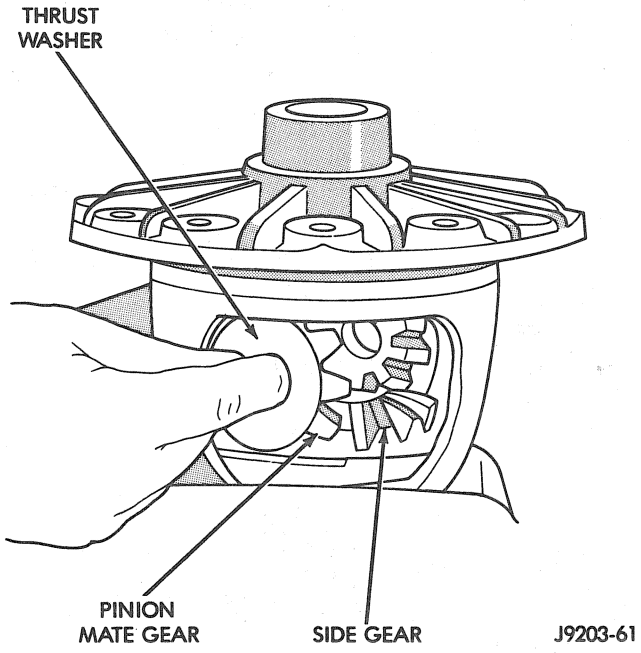


Fig. 37 Pinion Mate Gear Removal

ASSEMBLY

(1) Install the differential side gears and thrust washers.

(2) Install the pinion mate gears and thrust washers.

(3) Install the pinion gear mate shaft.

(4) Align the hole in the pinion gear mate shaft with the hole in the differential case and install the pinion gear mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

TRAC-LOK DIFFERENTIAL

The Trac–lok differential components are illustrated in (Fig. 38). Refer to this illustration during repair service.

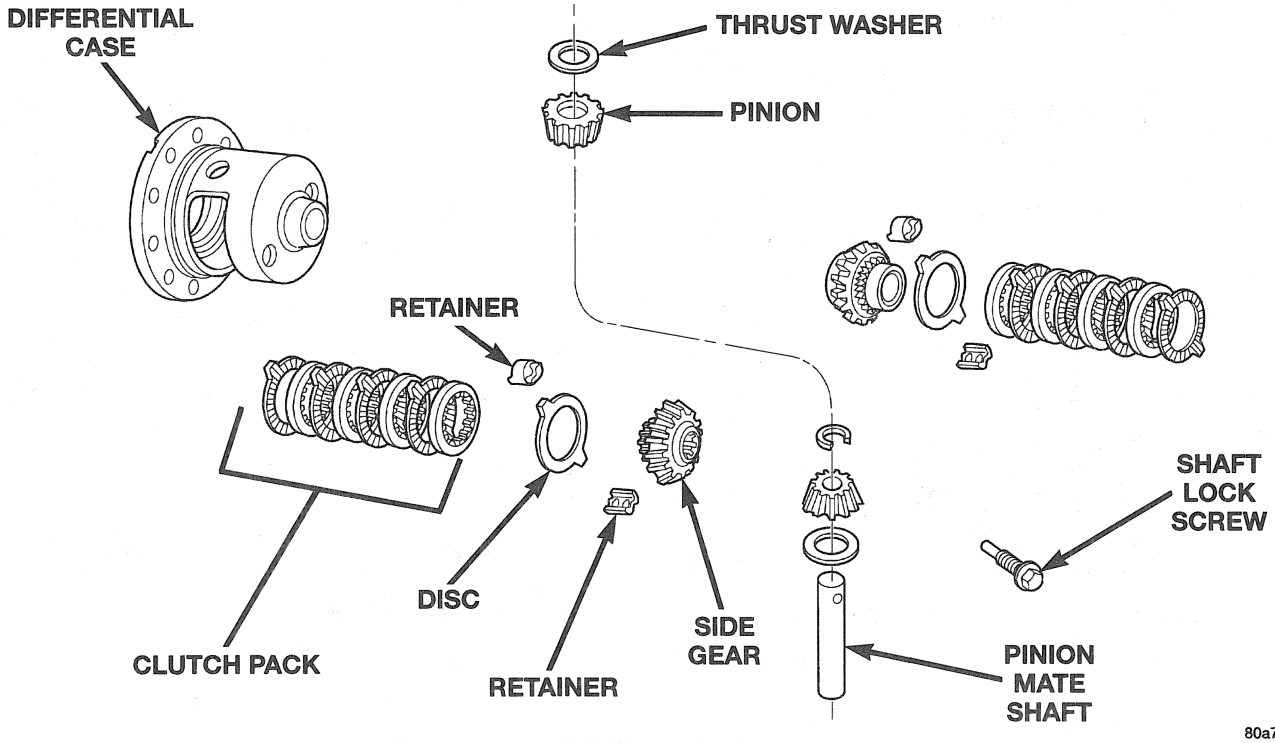


Fig. 38 Trac–lok Differential Components

DISASSEMBLY AND ASSEMBLY (Continued)

DISASSEMBLY

(1) Clamp Side Gear Holding Tool 8138 in a vise.

(2) Position the differential case on Side Gear Holding Tool 8138 (Fig. 39).

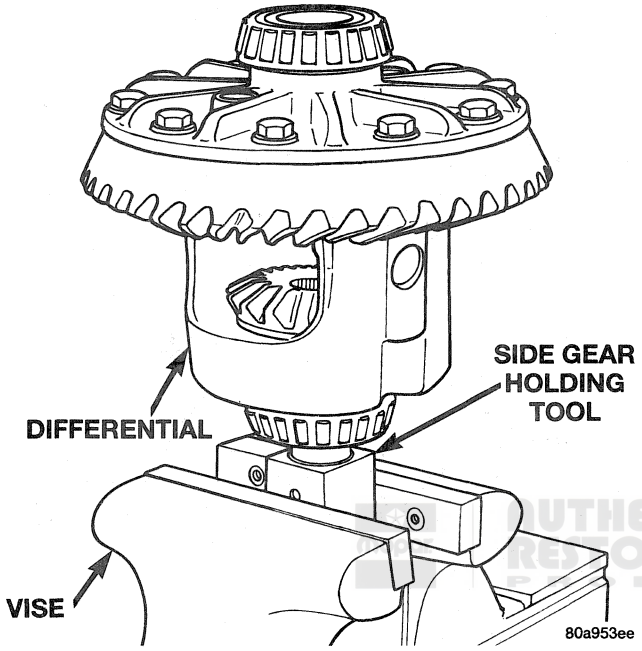


Fig. 39 Differential Case Holding Tool

(3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be replaced. The Trac-lok differential can be serviced with the ring gear installed.

(4) Remove the pinion gear mate shaft lock screw (Fig. 40).

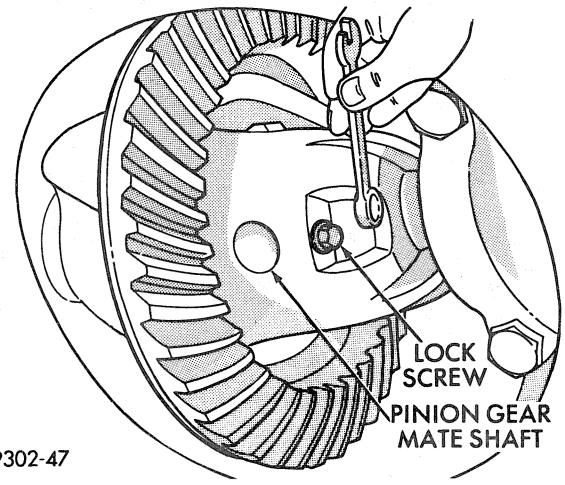


Fig. 40 Mate Shaft Lock Screw

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 41).

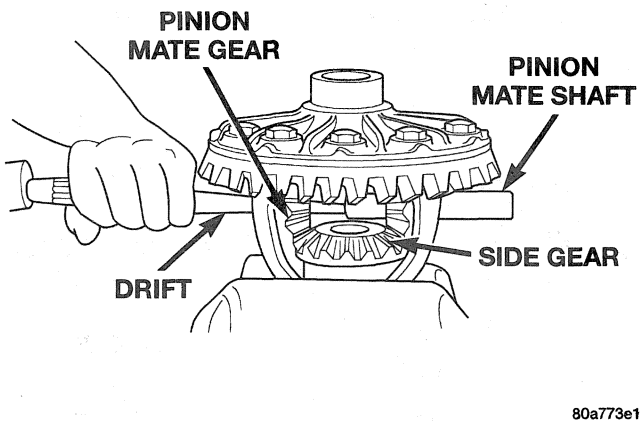


Fig. 41 Mate Shaft Removal

(6) Install and lubricate Step Plate 8140–2 (Fig. 42).

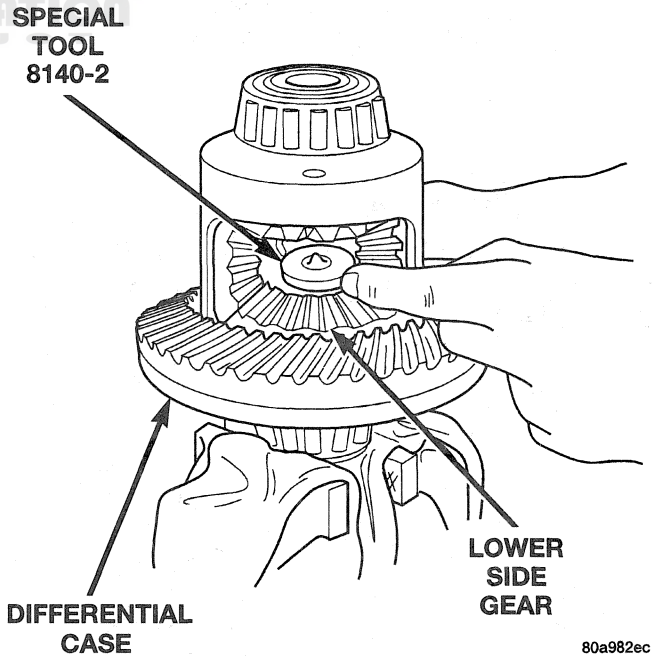


Fig. 42 Step Plate Tool Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Assemble Threaded Adapter 8140-1 into top side gear. Thread Forcing Screw 6960-4 into adapter until it becomes centered in adapter plate.

(8) Position a small screw driver in slot of Threaded Adapter 8140-1 (Fig. 43) to prevent adapter from turning.

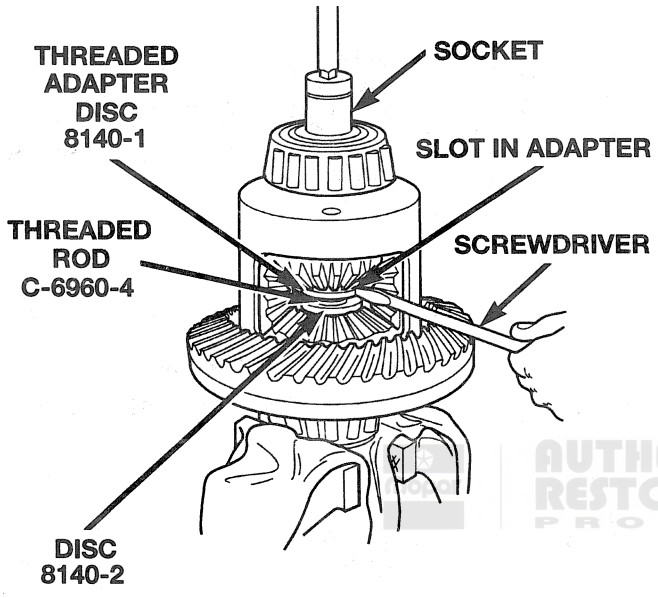


Fig. 43 Threaded Adapter Installation

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 44).

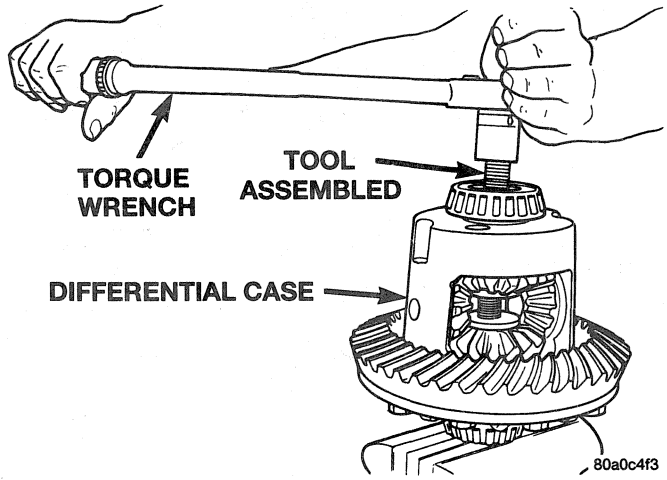


Fig. 44 Tighten Belleville Spring Compressor Tool

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 45).

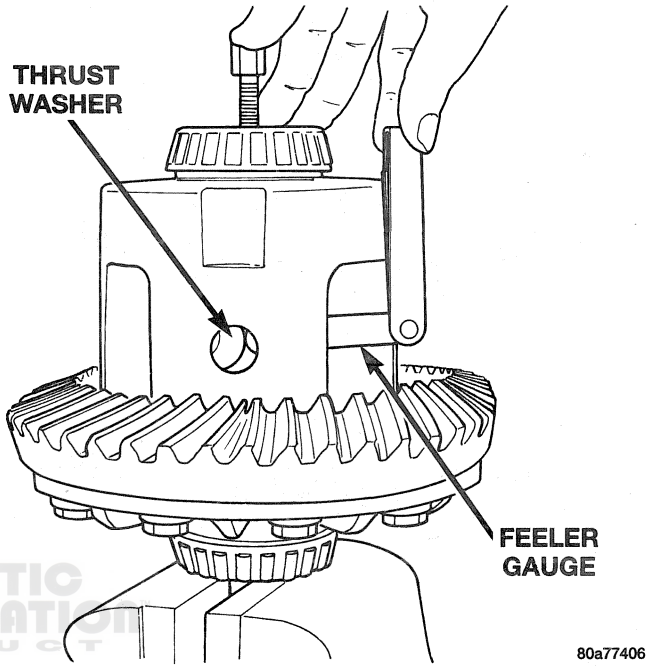


Fig. 45 Remove Pinion Gear Thrust Washer

(11) Insert Turning Bar 6960-2 in case (Fig. 46).

(12) Loosen the Forcing Screw 6960-4 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar 6960-2.

(13) Rotate differential case until the pinion gears can be removed.

(14) Remove pinion gears from differential case.

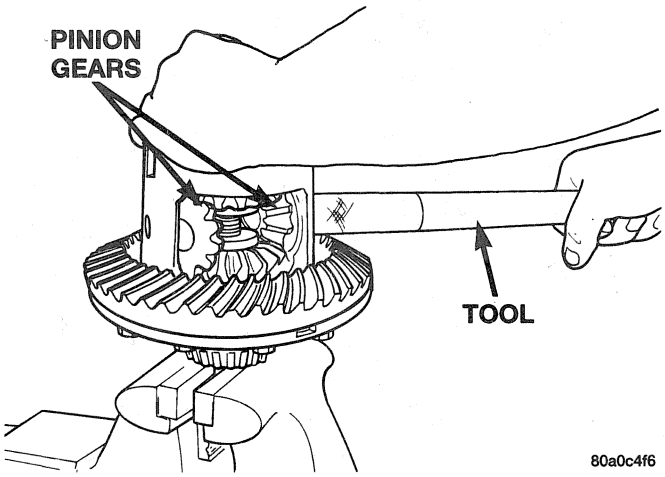


Fig. 46 Pinion Gear Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Remove Forcing Screw 6960-4, Step Plate 8140–2, and Threaded Adapter 8140–1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 47).

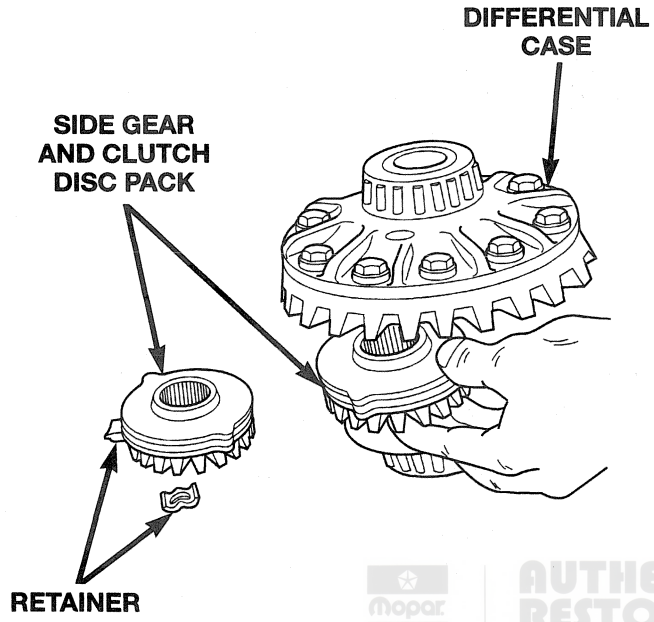


Fig. 47 Side Gear & Clutch Disc Removal

(17) Remove differential case from Side Gear Holding Tool 8138. Remove side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

NOTE: The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both packs must be replaced.

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 48).

(2) Position assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 49). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 8138.

(5) Install lubricated Step Plate 8140–2 in lower side gear (Fig. 50).

(6) Install the upper side gear and clutch disc pack (Fig. 50).

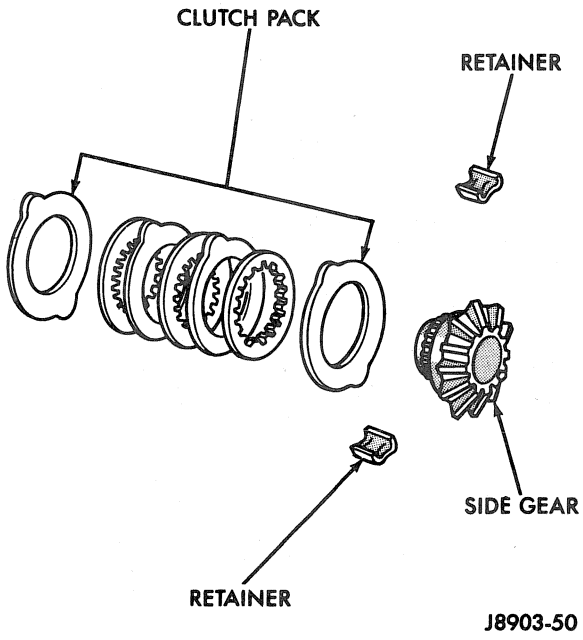


Fig. 48 Clutch Disc Pack

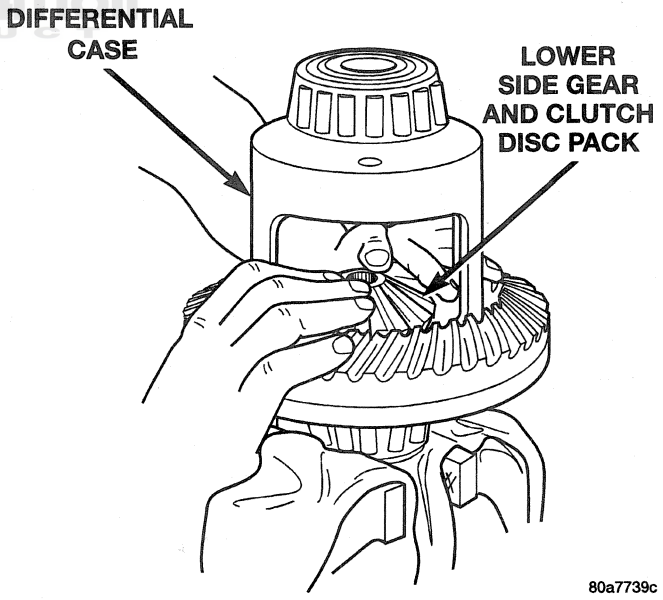


Fig. 49 Clutch Discs & Lower Side Gear Installation

(7) Hold assembly in position. Insert Threaded Adapter 8140-1 into top side gear.

(8) Insert Forcing Screw 6960-4.

(9) Tighten forcing screw tool to slightly compress clutch discs.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft holes are aligned.

(11) Rotate case with Turning Bar 6960-2 until the pinion mate shaft holes in pinion gears align with

DISASSEMBLY AND ASSEMBLY (Continued)

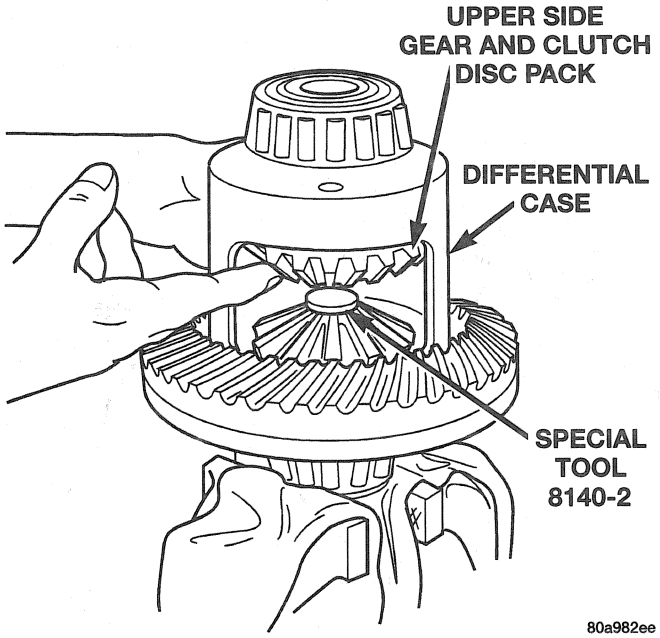


Fig. 50 Upper Side Gear & Clutch Disc Pack Installation

holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove Forcing Screw 6960-4, Step Plate 8140–2, and Threaded Adapter 8140-1.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install the pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

CLEANING AND INSPECTION

8 1/4 AXLES

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing.

Inspect for:

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Pinion depth shims for damage and distortion. Install new shims if necessary.
- The differential case. Replace the case if cracked or damaged.
- The axle shaft C-clip locks for cracks and excessive wear. Replace them if necessary.
- Each threaded adjuster to determine if it rotates freely. If an adjuster binds, repair the damaged threads or replace the adjuster.

Polish each axle shaft sealing surface with No. 600 crocus cloth. This can remove slight surface damage. Do not reduce the diameter of the axle shaft seal contact surface. When polishing, the crocus cloth should be moved around the circumference of the shaft (not in-line with the shaft).

TRAC-LOK

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

ADJUSTMENTS

8 1/4 AXLE PINION GEAR DEPTH

GENERAL INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are marked on the face of each gear (Fig. 51). A plus (+) number, minus (–) number or zero (0) is marked on the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion marked with a (0). The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern Analysis Paragraph in this section for additional information.

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the rear pinion bearing cone (Fig. 52).

If a new gear set is being installed, note the depth variance marked on both the original and replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance charts.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

Note the marked number on the face of the drive pinion gear (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shim(s). If the number is positive, subtract that value from the thickness of the depth shim(s). If the number is 0 no change is necessary. Refer to the Pinion Gear Depth Variance Chart.

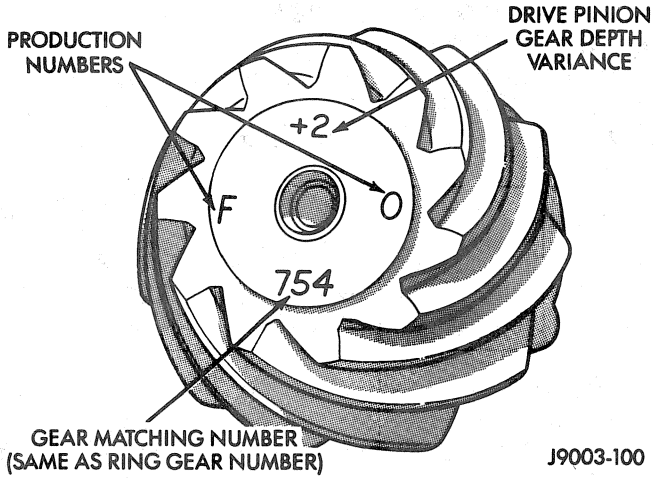


Fig. 51 Pinion Gear ID Numbers

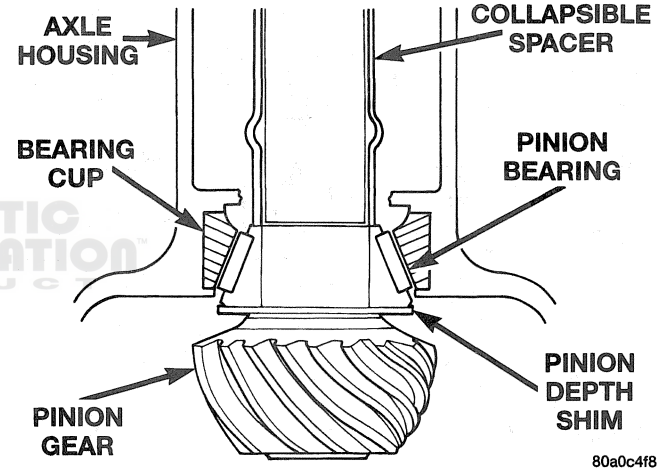


Fig. 52 Shim Locations

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	–4	–3	–2	–1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001	–0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001	–0.002	–0.003
0	+0.004	+0.003	+0.002	+0.001	0	–0.001	–0.002	–0.003	–0.004
–1	+0.003	+0.002	+0.001	0	–0.001	–0.002	–0.003	–0.004	–0.005
–2	+0.002	+0.001	0	–0.001	–0.002	–0.003	–0.004	–0.005	–0.006
–3	+0.001	0	–0.001	–0.002	–0.003	–0.004	–0.005	–0.006	–0.007
–4	0	–0.001	–0.002	–0.003	–0.004	–0.005	–0.006	–0.007	–0.008

J8902-46

ADJUSTMENTS (Continued)

PINION DEPTH MEASUREMENT AND ADJUSTMENT

(1) Install front pinion bearing cup. Use Installer D-130 and Handle C-4171.
(2) Install rear pinion bearing cup. Use Installer C-4308 and Handle C-4171.
(3) Use Pinion Gear Adjustment Gauge Set C-3715-B (Fig. 53).
(4) Position Spacer SP-6030 over Shaft SP-5385.
(5) Position pinion rear bearing on shaft.
(6) Position tools (with bearing) in the housing.
(7) Install Sleeve SP-5382.
(8) Install pinion front bearing.
(9) Install Spacer SP-6022.
(10) Install Sleeve SP-3194-B, Washer SP-534, and Nut SP-3193.

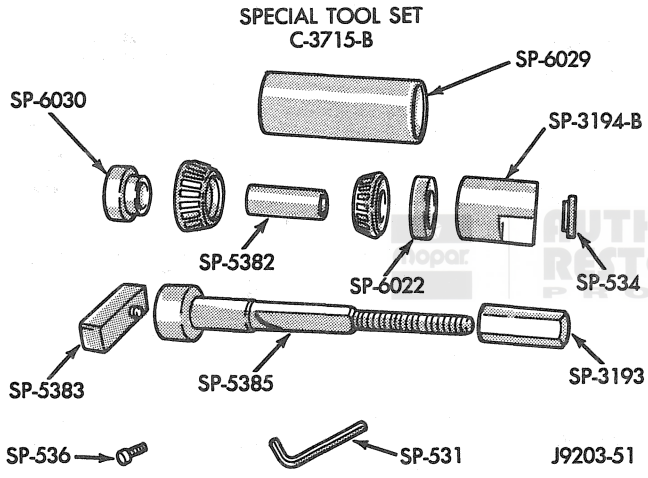


Fig. 53 8 1/4 Axle Pinion Adjustment Tools

(11) Tighten the nut to seat the pinion bearings in the housing. Allow the sleeve to turn several times during tightening to prevent brinelling bearing cups or bearings.
(12) Loosen the compression nut tool.
(13) Lubricate the pinion gear front and rear bearings with gear lubricant.
(14) Re-tighten the compression nut tool to 1-3 N·m (15-25 in. lbs.) torque.
(15) Rotate the pinion gear several complete revolutions to align the bearing rollers.
(16) Install Gauge Block (Fig. 54).
(17) Install Gauge Block SP-5383 at the end of SP-5385.
(18) Install Cap Screw SP-536 and tighten with Wrench SP-531.
(19) Position Crossbore Arbor SP-6029 in the differential housing (Fig. 55).
(20) Center the arbor tool.
(21) Position the bearing caps on the arbor tool.
(22) Install the attaching bolts.
(23) Tighten the cap bolts to 14 N·m (10 ft. lbs.).

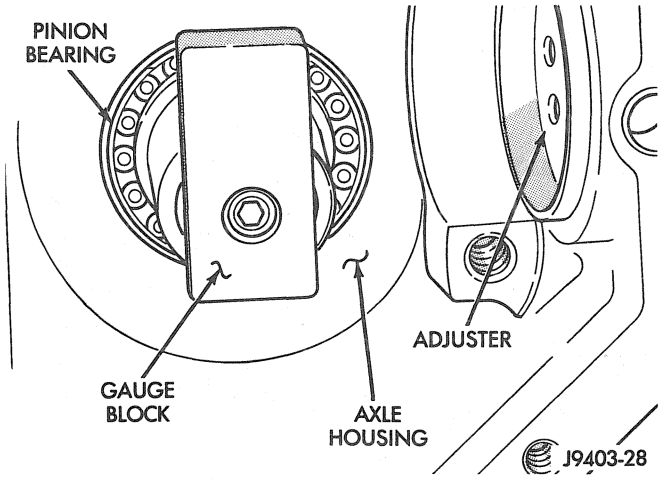


Fig. 54 Gauge Block

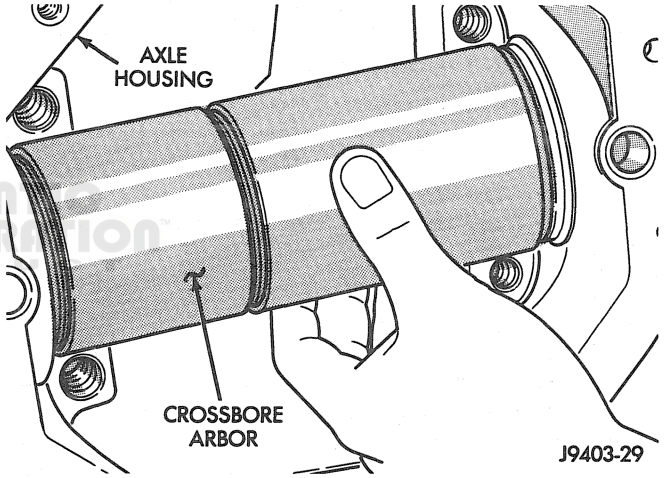


Fig. 55 Crossbore Arbor

(24) Trial fit depth shim(s) between the crossbore arbor and gauge block (Fig. 56). **The depth shim(s) fit must be snug but not tight (drag friction of a feeler gauge blade).**

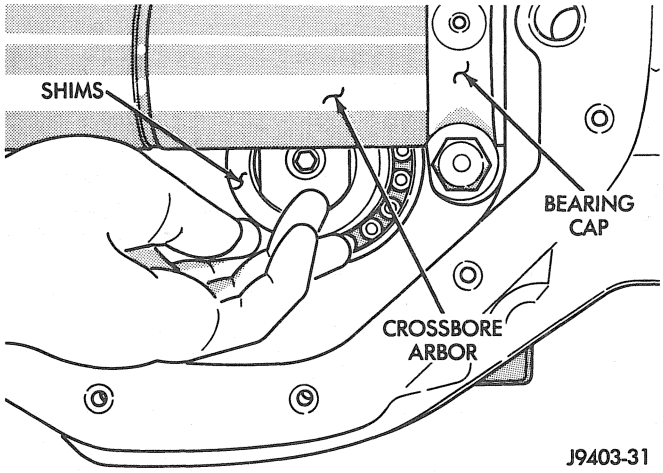


Fig. 56 Depth Shim(s) Selection

ADJUSTMENTS (Continued)

(25) Select a shim equal to the shim selected above plus the drive pinion gear depth variance number marked on the face of the pinion gear (Fig. 51) using the opposite sign on the variance number. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

NOTE: Depth shims are available in 0.001-inch increments from 0.020 inch to 0.038 inch.

(26) Remove the tools from the differential housing.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

The following must be considered when adjusting bearing preload and gear backlash:

- The maximum ring gear backlash variation is 0.003 inch (0.076 mm).
- Mark the gears so the same teeth are meshed during all backlash measurements.
- Maintain the torque while adjusting the bearing preload and ring gear backlash.
- Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free-play and ring gear noise.
- Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free-play and ring gear noise.

NOTE: The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. To ensure accurate bearing cup responses to the adjustments:

- **Maintain the gear teeth engaged (meshed) as marked.**
- **The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.**
- **Do this five to ten times each time the threaded adjusters are adjusted.**

(1) Use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated (Fig. 57). Allow some ring gear backlash (approximately 0.01 inch/0.25 mm) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 58). Measure the backlash at 4 positions (90 degrees apart) around the ring gear. Locate and mark the area of minimum backlash.

(3) Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.

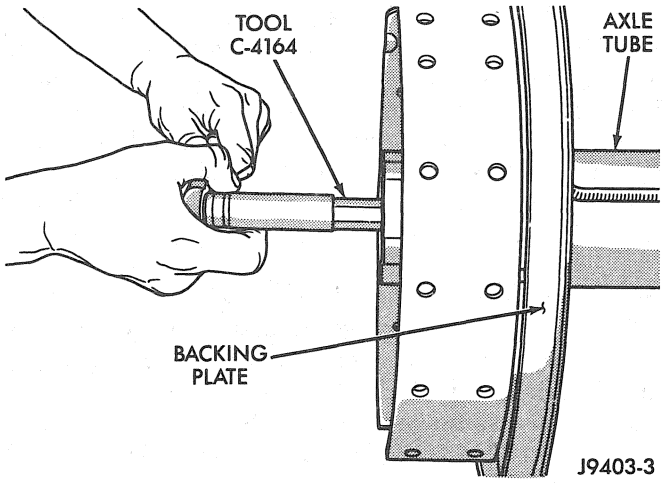


Fig. 57 Threaded Adjuster Tool

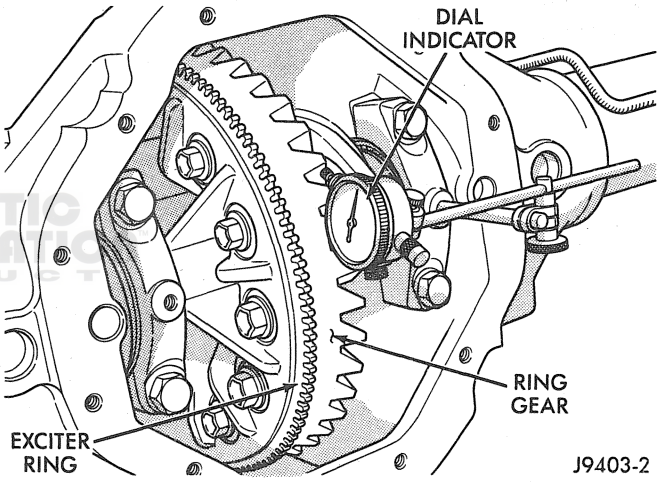


Fig. 58 Ring Gear Backlash Measurement

(4) Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.003 to 0.004 inch (0.076 to 0.102 mm) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.

(5) Tighten the differential bearing cap bolts 95 N·m (70 ft. lbs.).

(6) Tighten the right-side threaded adjuster to 102 N·m (75 ft. lbs.). Seat the bearing cups with the procedure described above. Continue to tighten the right-side adjuster and seat bearing cups until the torque remains constant at 102 N·m (75 ft. lbs.)

(7) Measure the ring gear backlash. The range of backlash is 0.006 to 0.008 inch (0.15 to 0.203 mm).

(8) Continue increasing the torque at the right-side threaded adjuster until the specified backlash is obtained.

NOTE: The left-side threaded adjuster torque should have approximately 102 N·m (75 ft. lbs.). If the torque is considerably less, the complete adjustment procedure must be repeated.

ADJUSTMENTS (Continued)

(9) Tighten the left-side threaded adjuster until 102 N·m (75 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.

(10) Install the threaded adjuster locks and tighten the lock screws to 10 N·m (90 in. lbs.).

After the proper backlash is achieved, perform the Gear Contact Analysis procedure.

GEAR CONTACT PATTERN ANALYSIS

The ring and pinion gear teeth contact patterns will show if the pinion gear depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

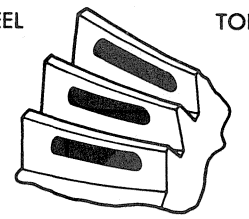
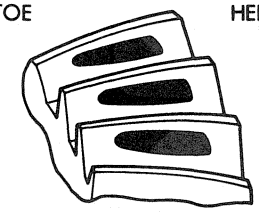
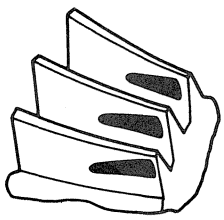
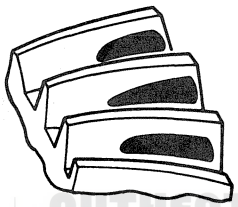
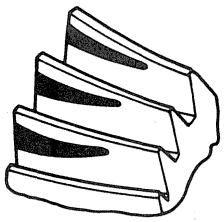
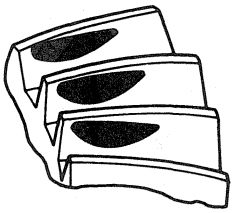
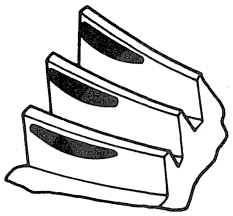
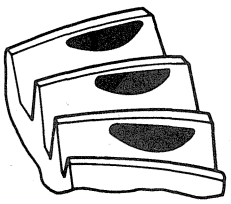
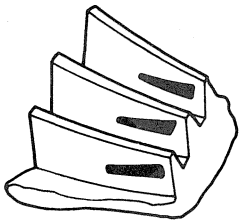
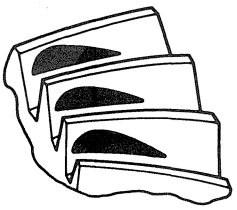
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion gear. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion gear teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 59) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 59 Gear Tooth Contact Patterns

ADJUSTMENTS (Continued)

SIDE GEAR CLEARANCE

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

(1) Install the axle shafts and C-clip locks and pinion mate shaft.

(2) Measure each side gear clearance. Insert a matched pair of feeler gauge blades between the gear and differential housing on opposite sides of the hub (Fig. 60).

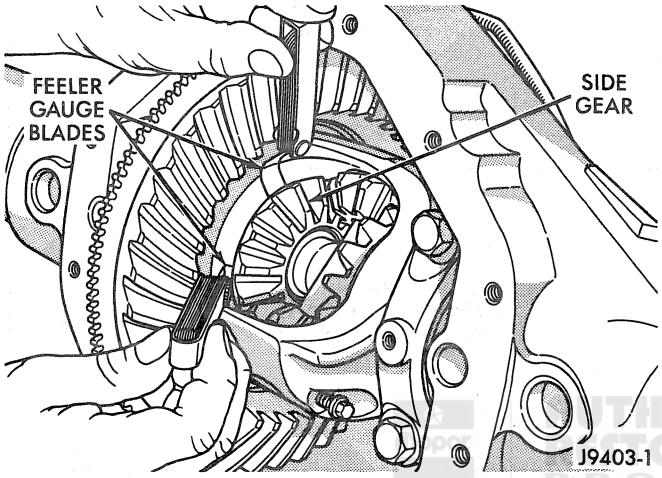


Fig. 60 Side Gear Clearance Measurement

(3) If side gear clearances is no more than 0.005 inch. Determine if the shaft is contacting the pinion gear mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of the axle shaft is not contacting the pinion gear mate shaft, the side gear clearance is acceptable.

(4) If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer (Fig. 61).

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
	0.040
REPLACEMENT WASHER THICKNESS	− 0.037
NEW SIDE GEAR CLEARANCE	0.003

J9203-31

Fig. 61 Side Gear Calculations

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-clip lock is preventing the side gear from sliding on the axle shaft.

(5) If there is no side gear clearance, remove the C-clip lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re-install the thrust washer. Assemble the differential case without the C-clip lock installed and re-measure the side gear clearance.

(6) Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C-clip lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.

(7) If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.

(8) If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

SPECIFICATIONS

8 1/4 INCH AXLE

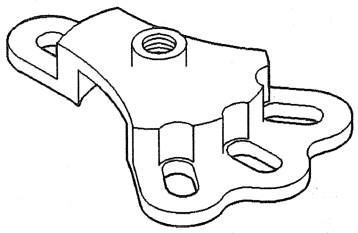
Axle Type	Semi-floating, hypoid
Lubricant	SAE 80W-90
Lube Capacity	2.27 L (4.8 pts.)
Trac-Lok Additive	148 ml (5 oz.)
Axle Ratio	3.21, 3.55, 3.90
Differential	
Case Clearance	0.12 mm (0.005 in.)
Case Flange Runout	0.076 mm (0.003 in.)
Ring Gear	
Diameter	20.95 cm (8.25 in.)
Backlash	0.12-0.20 mm (0.005-0.008 in.)
Runout	0.127 mm (0.005 in.)
Pinion Bearing	
Preload	1-2 N·m (10-20 in.lbs.)

8 1/4 INCH AXLE

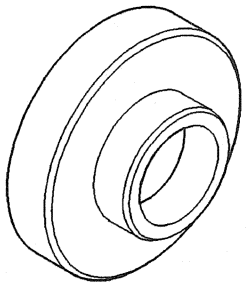
DESCRIPTION	TORQUE
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	136 N·m (100 ft. lbs.)
Pinion Nut–Minimum	285 N·m (210 ft. lbs.)
Ring Gear Bolt	95 N·m (70 ft. lbs.)
Backing Plate Bolt	64 N·m (48 ft. lbs.)
RWAL/ABS Sensor Bolt	24 N·m (18. ft. lbs.)

SPECIAL TOOLS

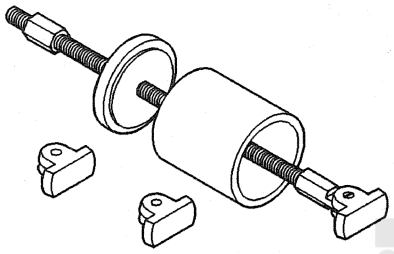
8 1/4 AXLES



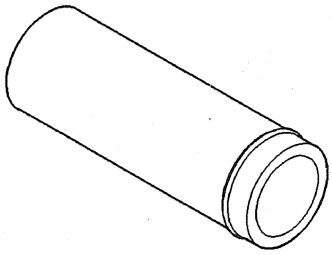
Puller, Hub—6790



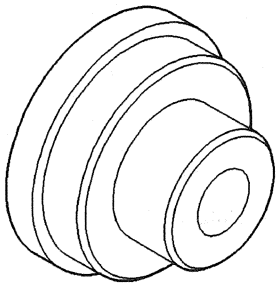
Installer—C-4076-B



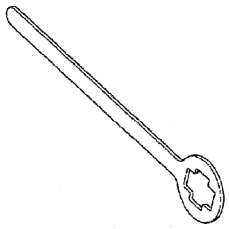
Remover, Bearing—6310



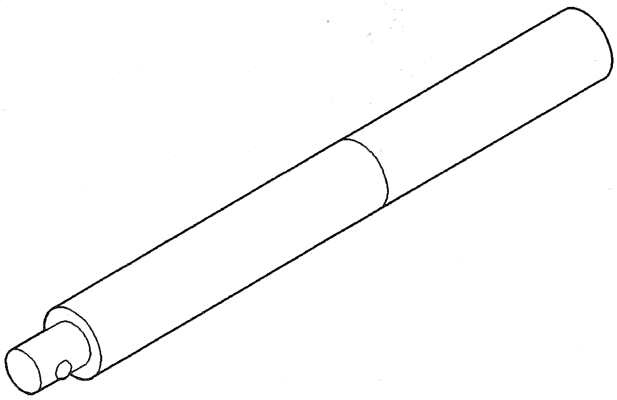
Handle—C-4735-1



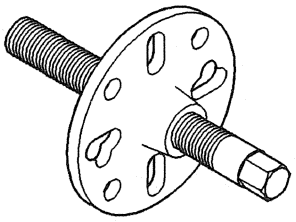
Installer—C-4198



Holder—6719

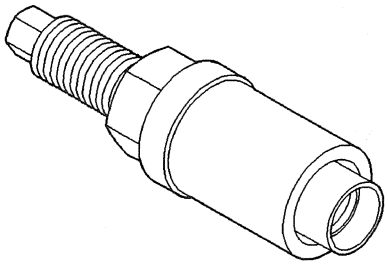


Handle—C-4171

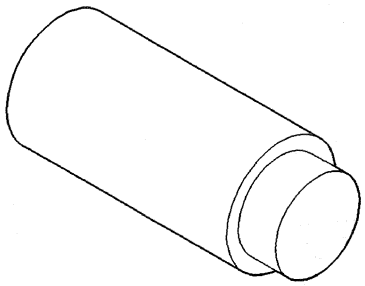


Puller—C-452

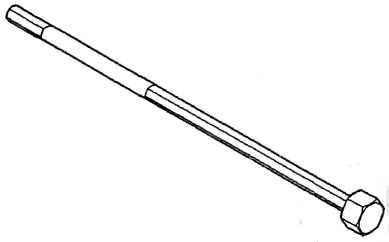
SPECIAL TOOLS (Continued)



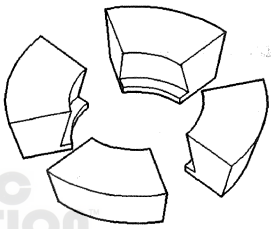
Installer—C-3718



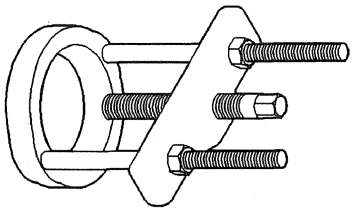
Plug—SP-3289



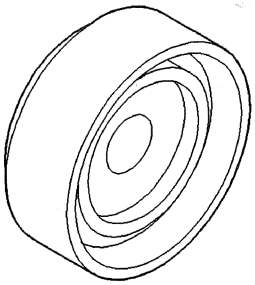
Adjustment Rod—C-4164



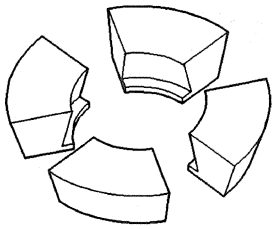
Adapters—C-293-47



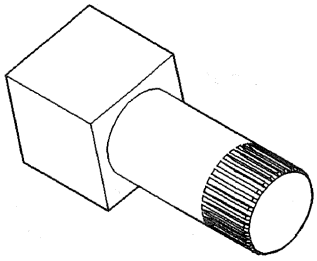
Puller/Press—C-293–PA



Installer—C-4340



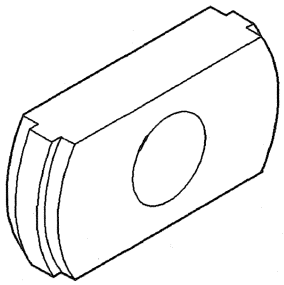
Adapters—C-293-48



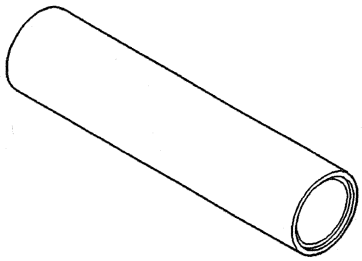
Holder—8138

Mopar AUTHENTIC RESTORATION PRODUCT

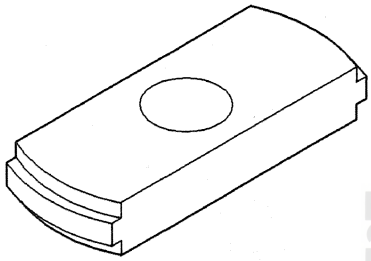
SPECIAL TOOLS (Continued)



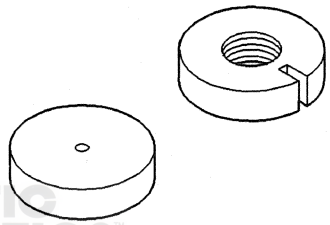
Installer—C-4345



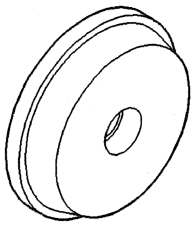
Installer—6448



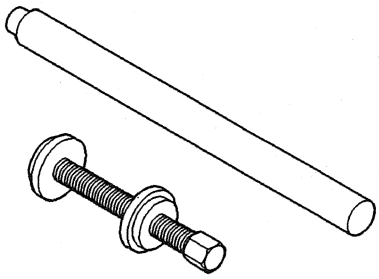
Remover—C-4307



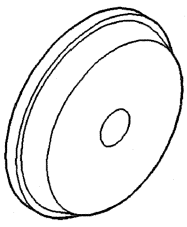
Trac-lok Tools—8140



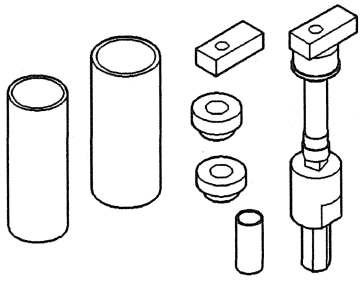
Installer—C-4308



Trac-lok Tools—6960



Installer—D-130



Gauge Set—C-3715-B

Mopar AUTHENTIC RESTORATION PRODUCT

WIRING DIAGRAMS

CONTENTS

page

8W-01 GENERAL INFOMATION 8W-01-1
8W-80 CONNECTOR PIN—OUTS 8W-80-1

Mopar AUTHENTIC RESTORATION PRODUCT

8W-01 GENERAL INFORMATION

GENERAL INFORMATION

INTRODUCTION

This section of the wiring diagrams covers only the changes between the early and late built XJ vehicles. For information not contained in this supplement refer to the 1996 Jeep Cherokee service manual.

mopar AUTHENTIC RESTORATION PRODUCT

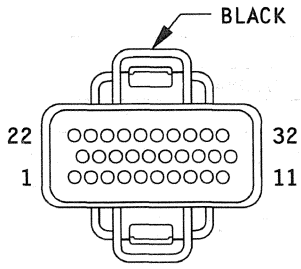
8W-80 CONNECTOR PIN-OUTS

Mopar | AUTHENTIC RESTORATION PRODUCT

CONNECTOR PIN-OUT INDEX

Connector	Page	Connector	Page
C100	8W-80-3	C121	8W-80-6
C117	8W-80-4	C122	8W-80-6
C118	8W-80-4	C129	8W-80-7
C119	8W-80-5	C131	8W-80-7
C120	8W-80-5	C437	8W-80-8

Mopar AUTHENTIC RESTORATION PRODUCT

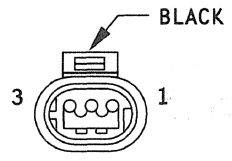


POWERTRAIN
CONTROL MODULE
(CONNECTOR A)

C100

CAV	CIRCUIT	FUNCTION
A1	–	–
A2	A21 14DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
A3	–	–
A4	K4 18BK/LB●	SENSOR GROUND
A4	K167 18BR/YL●●	SENSOR GROUND
A5	–	–
A6	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE*
A7	K19 18GY	IGNITION COILS NO.1 & NO.6 DRIVER
A8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
A9	–	–
A10	K60 18YL/BK	IDLE AIR CONTROL MOTOR NO. 2 DRIVER
A11	K40 18BR/WT	IDLE AIR CONTROL MOTOR NO. 3 DRIVER
A12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SIGNAL**
A13	–	–
A14	–	–
A15	K21 16BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
A16	K2 16TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
A17	K6 20VT/WT●	5 VOLT SUPPLY
A17	K7 18OR●●	5 VOLT SUPPLY
A18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
A19	K39 18GY/RD	IDLE AIR CONTROL MOTOR NO. 1 DRIVER
A20	K59 18VT/BK	IDLE AIR CONTROL MOTOR NO. 4 DRIVER
A21	–	–
A22	A14 14RD	FUSED B(+)
A23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
A24	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL
A25	K141 18TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL
A26	–	–
A27	K1 20DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
A28	–	–
A29	–	–
A30	–	–
A31	Z12 14BK/TN	GROUND
A32	Z12 14BK/TN	GROUND

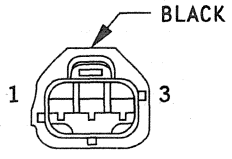
* WITH AUTO TRANS
** WITH 2.5L ENG OR POLICE PACKAGE
● EARLY BUILD
●● LATE BUILD



CRANKSHAFT
POSITION SENSOR
(EARLY BUILD)

C117

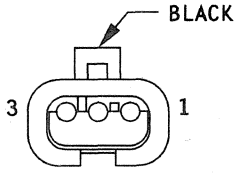
CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K24 18GY/LB	CRANKSHAFT POSITION SENSOR SIGNAL



CRANKSHAFT
POSITION SENSOR
(LATE BUILD)

C117

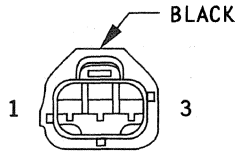
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K167 20BR/YL	SENSOR GROUND
3	K7 20OR	5 VOLT SUPPLY



THROTTLE
POSITION SENSOR
(EARLY BUILD)

C118

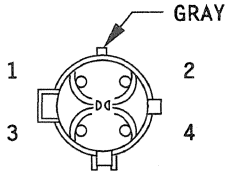
CAV	CIRCUIT	FUNCTION
1	K6 20VT/WT	5 VOLT SUPPLY
2	K22 18OR/DB	THROTTLE POSITION SENSOR
3	K4 18BK/LB	SENSOR GROUND



THROTTLE
POSITION SENSOR
(LATE BUILD)

C118

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
3	K7 20OR	5 VOLT SUPPLY



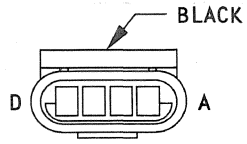
UPSTREAM HEATED OXYGEN SENSOR

C119 (EARLY BUILD)

CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	FUEL PUMP RELAY OUTPUT
2	Z11 18BK/WT*	GROUND
2	Z11 16BK/WT**	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL

C119 (LATE BUILD)

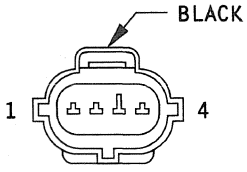
CAV	CIRCUIT	FUNCTION
1	A142 18DG/BK	FUEL PUMP RELAY OUTPUT
2	Z1 18BK	GROUND
3	K167 20BR/YL	SENSOR GROUND
4	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL



IDLE AIR CONTROL MOTOR **(EARLY BUILD)**

C120

CAV	CIRCUIT	FUNCTION
A	K59 18VT/BK	IDLE AIR CONTROL NO.4 DRIVER
B	K40 18BR/WT	IDLE AIR CONTROL NO.3 DRIVER
C	K60 18YL/BK	IDLE AIR CONTROL NO.2 DRIVER
D	K39 18GY/RD	IDLE AIR CONTROL NO.1 DRIVER

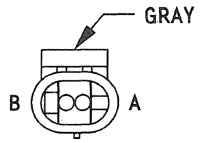


IDLE AIR CONTROL MOTOR **(LATE BUILD)**

C120

CAV	CIRCUIT	FUNCTION
1	K59 18VT/BK	IDLE AIR CONTROL NO.4 DRIVER
2	K40 18BR/WT	IDLE AIR CONTROL NO.3 DRIVER
3	K60 18YL/BK	IDLE AIR CONTROL NO.2 DRIVER
4	K39 18GY/RD	IDLE AIR CONTROL NO.1 DRIVER

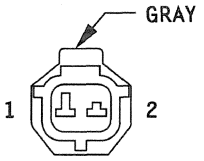
* WITH 2.5L ENG
** WITH 4.0L ENG



INTAKE AIR TEMPERATURE SENSOR **(EARLY BUILD)**

C121

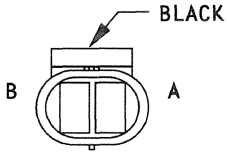
CAV	CIRCUIT	FUNCTION
A	K167 20BR/YL	SENSOR GROUND
B	K21 16BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL



INTAKE AIR TEMPERATURE SENSOR **(LATE BUILD)**

C121

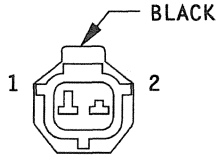
CAV	CIRCUIT	FUNCTION
1	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
2	K167 20BR/YL	SENSOR GROUND



ENGINE COOLANT TEMPERATURE SENSOR **(EARLY BUILD)**

C122

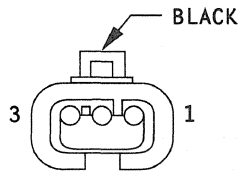
CAV	CIRCUIT	FUNCTION
A	K4 20BR/YL	SENSOR GROUND
B	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE COOLANT TEMPERATURE SENSOR **(LATE BUILD)**

C122

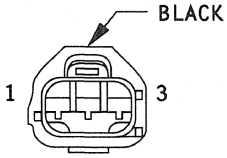
CAV	CIRCUIT	FUNCTION
1	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
2	K167 20BR/YL	SENSOR GROUND



MANIFOLD ABSOLUTE PRESSURE SENSOR (EARLY BUILD)

C129

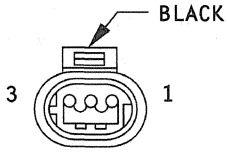
CAV	CIRCUIT	FUNCTION
1	K6 20VT/WT	5 VOLT SUPPLY
2	K1 20DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



MANIFOLD ABSOLUTE PRESSURE SENSOR (LATE BUILD)

C129

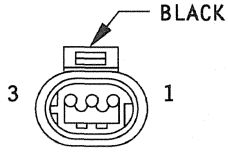
CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	K1 18DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
3	K7 200R	5 VOLT SUPPLY



CAMSHAFT POSITION SENSOR (EARLY BUILD)

C131

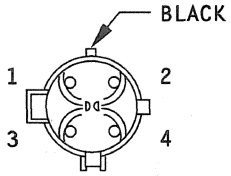
CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL



CAMSHAFT POSITION SENSOR (LATE BUILD)

C131

CAV	CIRCUIT	FUNCTION
1	K7 200R	5 VOLT SUPPLY
2	K167 20BR/YL	SENSOR GROUND
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL



DOWNSTREAM HEATED OXYGEN SENSOR

C437 (EARLY BUILD)

CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	FUEL PUMP RELAY OUTPUT
2	Z11 18BK/WT*	GROUND
2	Z11 16BK/WT**	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL

C437 (LATE BUILD)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/BK	FUEL PUMP RELAY OUTPUT
2	Z1 18BK	GROUND
3	K167 20BR/YL	SENSOR GROUND
4	K141 18TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL

Mopar AUTHENTIC RESTORATION PRODUCT

TRANSMISSION AND TRANSFER CASE

CONTENTS

	page		page
NV231 TRANSFER CASE	1	NV242 TRANSFER CASE	28

NV231 TRANSFER CASE

INDEX

	page		page
GENERAL INFORMATION		**DISASSEMBLY AND ASSEMBLY**	
NV231 TRANSFER CASE	1	NV231 TRANSFER CASE	6
RECOMMENDED LUBRICANT AND FILL LEVEL	2	**CLEANING AND INSPECTION**	
TRANSFER CASE IDENTIFICATION	2	NV231 TRANSFER CASE	22
DIAGNOSIS AND TESTING		**ADJUSTMENTS**	
NV231 DIAGNOSIS	3	SHIFT LINKAGE ADJUSTMENT	25
REMOVAL AND INSTALLATION		**SPECIFICATIONS**	
FRONT OUTPUT SHAFT SEAL	6	TORQUE	25
SHIFT LEVER	4	**SPECIAL TOOLS**	
SPEEDOMETER	4	NV231	26
TRANSFER CASE	4		

GENERAL INFORMATION

NV231 TRANSFER CASE

The NV231 is a part-time transfer case with a low range reduction gear system. The NV231 has three operating ranges plus a Neutral position. A low range system provides a reduction ratio for increased low speed torque capability.

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

Transfer case operating ranges are:

- 2WD (2-wheel drive)
- 4x4 (4-wheel drive)
- 4 Lo (4-wheel drive low range

The 2WD range is for use on any road surface at any time.

The 4x4 and 4 Lo ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is covered by ice and snow.

The low range reduction gear system is operative in 4 Lo range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate.

GENERAL INFORMATION (Continued)

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 1). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

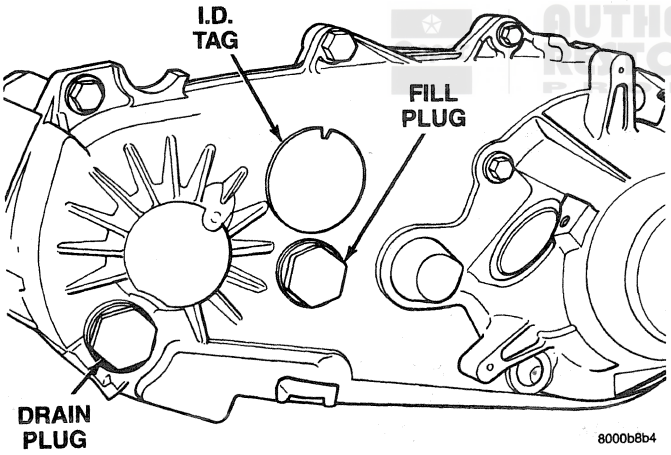


Fig. 1 Fill/Drain Plug And I.D. Tag Locations

RECOMMENDED LUBRICANT AND FILL LEVEL

Recommended lubricant for the NV231 transfer case is Mopar® Dexron II, or ATF Plus. Approximate lubricant fill capacity is 1.2 liters (2.5 pints).

The fill and drain plugs are both in the rear case (Fig. 1). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

DIAGNOSIS AND TESTING

NV231 DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Vehicle speed too great to permit shifting.	(1) Stop vehicle and shift into desired range. Or reduce speed to 3-4 km/h (2-3 mph) before attempting to shift.
	(2) If vehicle was operated for extended period in 4H mode on dry paved surface, driveline torque load may cause difficulty.	(2) Stop vehicle, shift transmission to Neutral, shift transfer case to 2H mode and operate vehicle in 2H on dry paved surfaces.
	(3) Transfer case external shift linkage binding.	(3) Lubricate, repair or replace linkage bushings or tighten loose components as necessary.
	(4) Insufficient or incorrect lubricant.	(4) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid.
	(5) Internal components binding, worn or damaged.	(5) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE MODES	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. Check for leaks and repair if necessary. **Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.**
NOISY IN – OR JUMPS OUT OF – FOUR WHEEL DRIVE LOW RANGE	(1) Transfer case not completely engaged in 4L position.	(1) Stop vehicle, shift transfer case to Neutral, then shift back into 4L position.
	(2) Shift linkage out of adjustment.	(2) Adjust linkage.
	(3) Shift linkage loose or binding.	(3) Tighten, lubricate or repair linkage as necessary.
	(4) Range fork damaged, inserts worn, or fork is binding on shift rail.	(4) Disassemble unit and repair as necessary.
	(5) Low range gear worn or damaged.	(5) Disassemble and repair as necessary.
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clear or replace vent if necessary.
	(3) Output shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.
ABNORMAL TIRE WEAR	(1) Extended operation on dry hard surface (paved) roads in 4H range.	(1) Operate in 2H on hard surface (paved) roads.

J9021-118

REMOVAL AND INSTALLATION

TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.
(2) Raise vehicle.
(3) Drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember, or skid plate.
(7) Disconnect front/rear propeller shafts at transfer case.
(8) Disconnect vehicle speed sensor wires.
(9) Disconnect transfer case linkage rod from range lever.
(10) Disconnect transfer case vent hose (Fig. 2) and indicator switch harness, if necessary.
(11) Support transfer case with transmission jack.
(12) Secure transfer case to jack with chains.
(13) Remove nuts attaching transfer case to transmission.
(14) Pull transfer case and jack rearward to disengage transfer case.
(15) Remove transfer case from under vehicle.

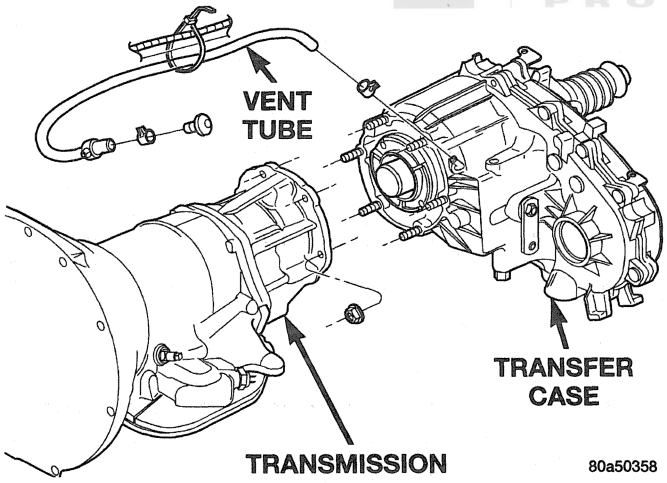


Fig. 2 Transfer Case Mounting

INSTALLATION

(1) Mount transfer case on a transmission jack.
(2) Secure transfer case to jack with chains.
(3) Position transfer case under vehicle.
(4) Align transfer case and transmission shafts and install transfer case on transmission.
(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 2).
(6) Connect vehicle speed sensor wires, and vent hose.
(7) Connect indicator switch harness to transfer case switch, if necessary. Secure wire harness to clips on transfer case.
(8) Align and connect propeller shafts. Tighten shaft attaching bolts to 19 N·m (170 in. lbs.) torque.
(9) Fill transfer case with correct fluid. Refer to Recommended Lubricant And Fill Level section for proper fluid and capacity.
(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
(11) Remove transmission jack and support stand.
(12) Connect shift rod to transfer case range lever.
(13) Adjust transfer case shift linkage.
(14) Lower vehicle and verify transfer case shift operation.

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.
(2) Raise vehicle.
(3) Loosen adjusting trunnion locknut and slide shift rod out of trunnion (Fig. 3). If rod lacks enough travel to come out of trunnion, push trunnion out of torque shaft.
(4) Lower vehicle.
(5) Remove console. Refer to Group 23, Body, for proper procedures.
(6) Remove screws attaching lever assembly to floorpan and remove assembly and shift rod (if left attached).

INSTALLATION

(1) If shift rod was not removed from lever assembly, work rod down through floorpan opening. Then position lever assembly on floorpan and install assembly attaching screws.
(2) Install console. Refer to Group 23, Body, for proper procedures.
(3) Raise vehicle.
(4) Connect trunnion to torque shaft arm. Or, slide shift rod into trunnion on range lever. Be sure shift rod slides freely in trunnion.
(5) Verify that range lever is in 4L position. Then tighten trunnion lock bolt.
(6) Lower vehicle and check transfer case shift operation.

SPEEDOMETER

REMOVAL

(1) Raise vehicle.
(2) Disconnect wires from vehicle speed sensor.
(3) Remove adapter clamp and screw (Fig. 4).
(4) Remove speed sensor and speedometer adapter as an assembly.
(5) Remove speed sensor retaining screw and remove sensor from adapter.
(6) Remove speedometer pinion from adapter. Replace pinion if chipped, cracked, or worn.
(7) Inspect sensor and adapter O-rings (Fig. 4). Remove and discard O-rings if worn or damaged.
(8) Inspect terminal pins in speed sensor. Clean pins with Mopar® electrical spray cleaner if dirty or

REMOVAL AND INSTALLATION (Continued)

TORQUE	
A	3-4 N•m (27-35 in. lbs.)
B	11-14 N•m (97-123 in. lbs.)
C	8-14 N•m (72-120 in. lbs.)

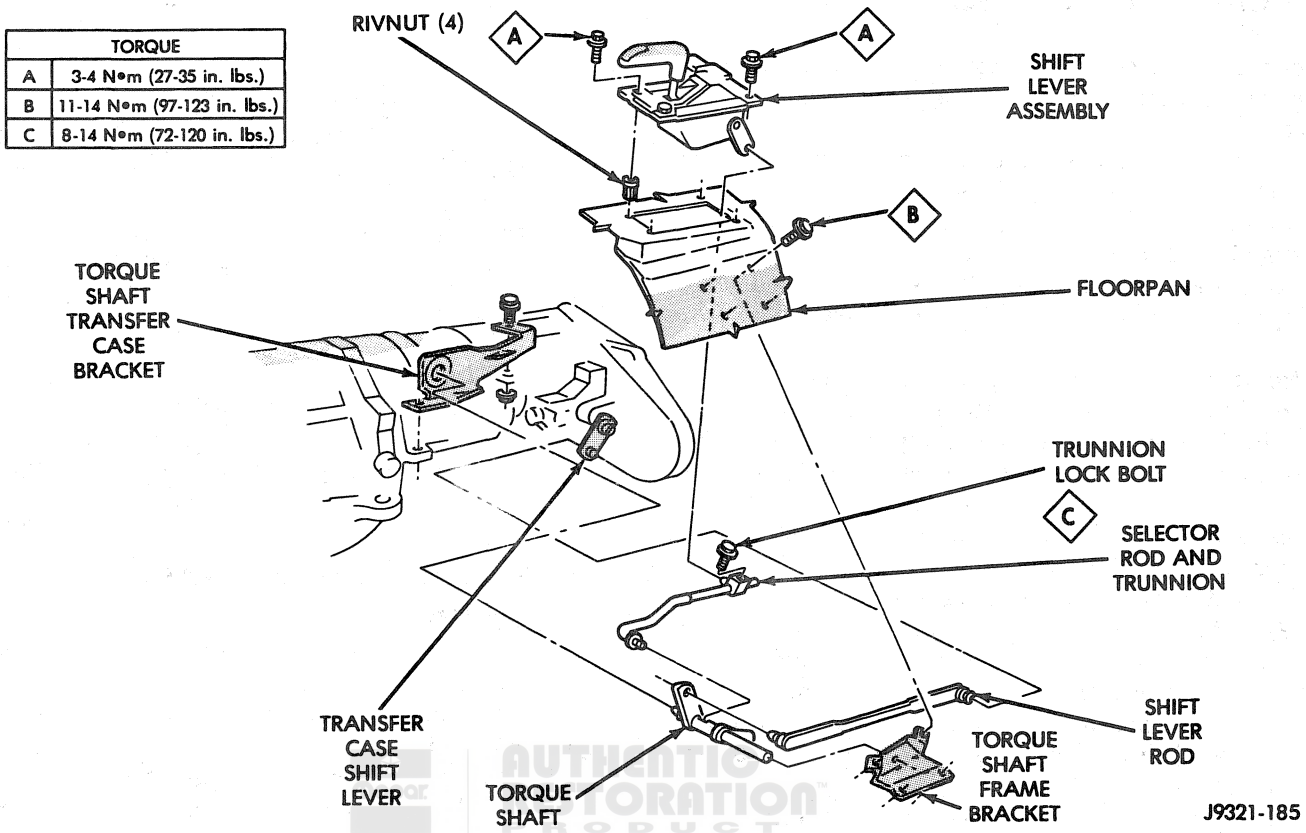


Fig. 3 Shift Linkage

oxidized. Replace sensor if faulty, or if pins are loose, severely corroded, or damaged.

ITEM	TORQUE
A	2-3 N•m (15-27 in. lbs.)
B	10-12 N•m (90-110 in. lbs.)

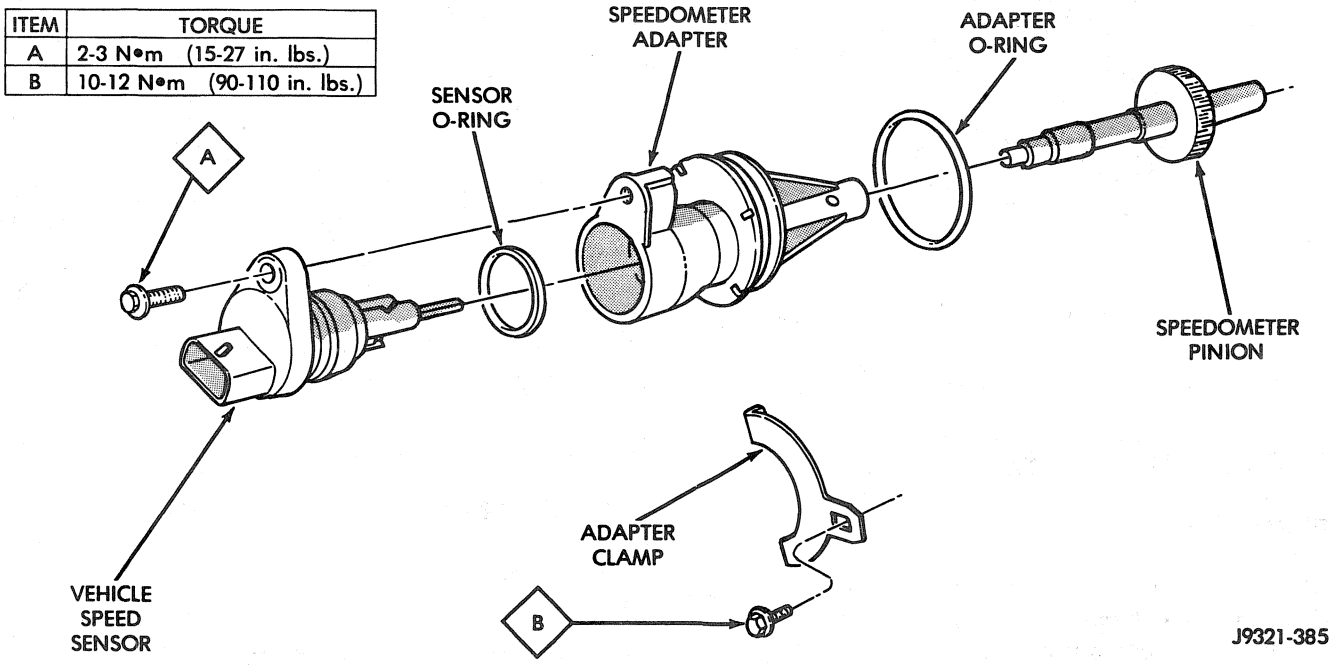


Fig. 4 Speedometer Components

REMOVAL AND INSTALLATION (Continued)

INSTALLATION AND INDEXING

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean for proper adapter alignment and speedometer operation.

(2) Install new O-rings on speed sensor and speedometer adapter (Fig. 4), if necessary.

(3) Lubricate sensor and adapter O-rings with transmission fluid.

(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.

(5) Install speedometer pinion in adapter.

(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

(7) Note index numbers on adapter body (Fig. 5). These numbers will correspond to number of teeth on pinion.

(8) Install speedometer assembly in housing.

(9) Rotate adapter until required range numbers are at 6 o-clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

(12) Lower vehicle and top off transmission fluid level if necessary.

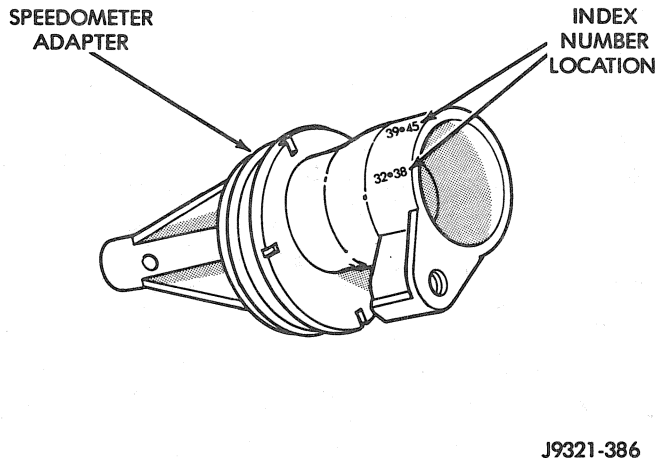


Fig. 5 Location Of Index Numbers On Speedometer Adapter

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

(3) Remove front output shaft yoke.

(4) Remove seal from front case with pry tool (Fig. 6).

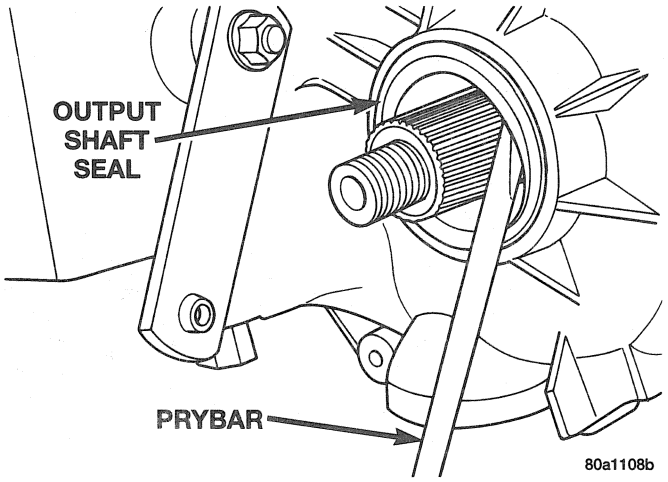


Fig. 6 Remove Front Output Shaft Seal

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 8143 as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 7). Once seal is started, continue tapping seal into bore until installer tool seats against case.

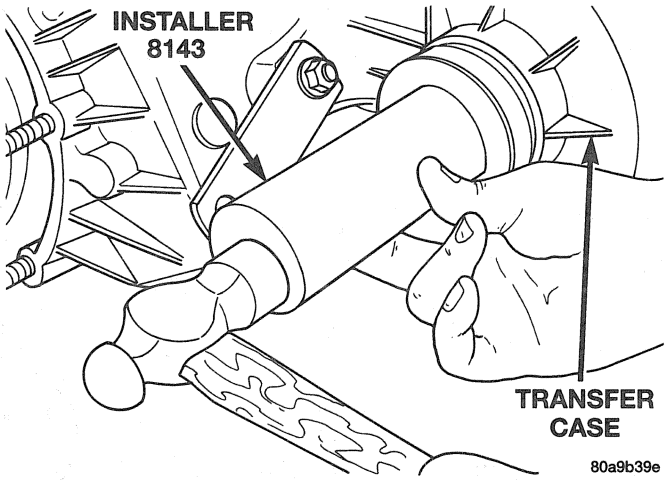


Fig. 7 Front Output Seal Installation

DISASSEMBLY AND ASSEMBLY

NV231 TRANSFER CASE

DISASSEMBLY

Position transfer case on shallow drain pan. Remove drain plug and drain lubricant remaining in case.

REAR RETAINER AND OIL PUMP REMOVAL

(1) Remove the speedometer adapter.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Spread band clamp which holds output shaft boot to slinger with a suitable awl, or equivalent.

(3) Remove output shaft boot from slinger and output shaft.

(4) Using Puller MD-998056-A, remove rear slinger (Fig. 8).

(5) Remove slinger stop spacer and snap-ring from output shaft (Fig. 9).

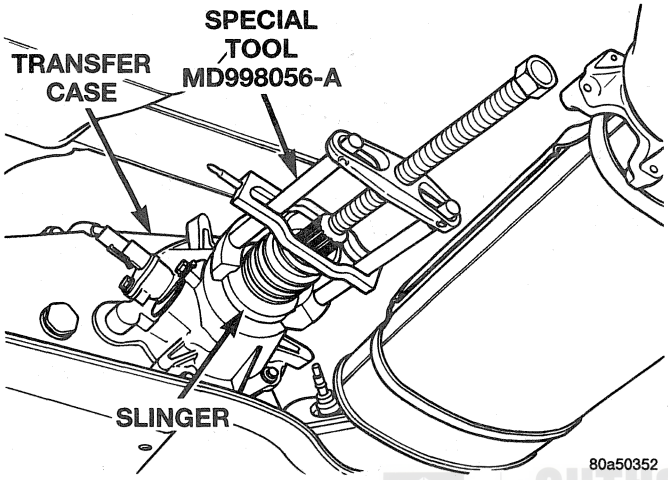


Fig. 8 Rear Slinger Removal

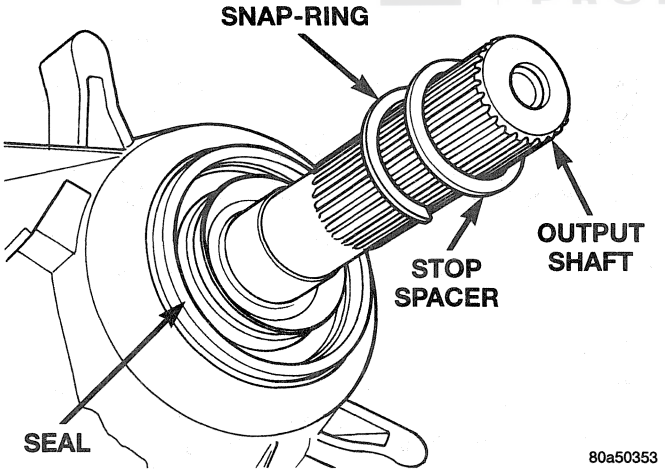


Fig. 9 Slinger Stop Spacer and Snap-ring

(6) Use a suitable pry tool, or a slide hammer mounted screw, to remove the seal from the rear retainer (Fig. 10).

(7) Remove the rear output bearing I.D. retaining ring (Fig. 11).

(8) Remove the bolts holding the rear retainer to the rear case half.

(9) Tap rear retainer with rawhide or rubber mallet to loosen sealer bead.

(10) Remove rear retainer from rear case half (Fig. 12).

(11) Remove snap-ring holding oil pump in position on output shaft.

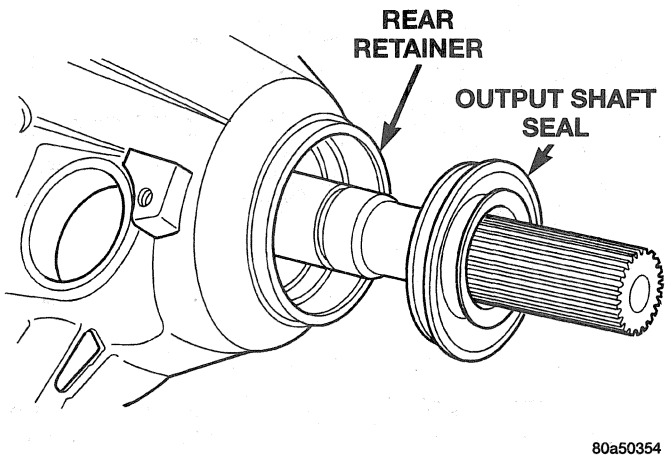


Fig. 10 Rear Retainer Seal

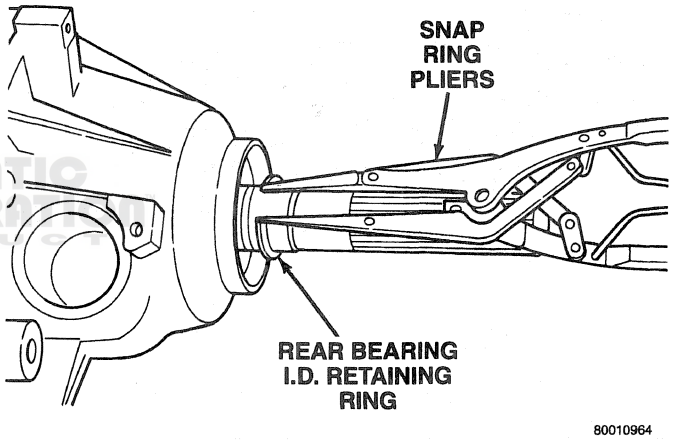


Fig. 11 Output Shaft Rear Bearing Retaining Ring

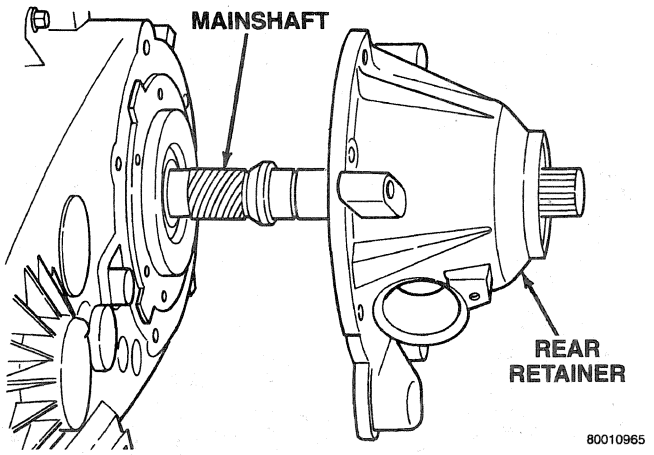


Fig. 12 Rear Retainer Removal

(12) Disengage oil pickup tube from oil pump and remove oil pump assembly. Remove oil pump by tilting the edge of the oil pump from under the edge of the rear case half and sliding the pump (Fig. 13).

DISASSEMBLY AND ASSEMBLY (Continued)

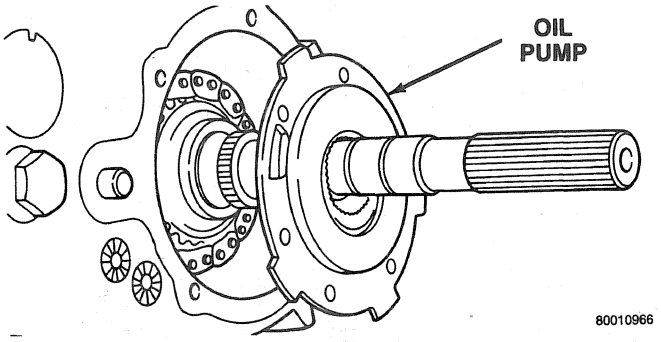


Fig. 13 Oil Pump Removal

(13) Remove pick-up tube o-ring from oil pump (Fig. 14), if necessary. Do not disassemble the oil pump, it is not serviceable.

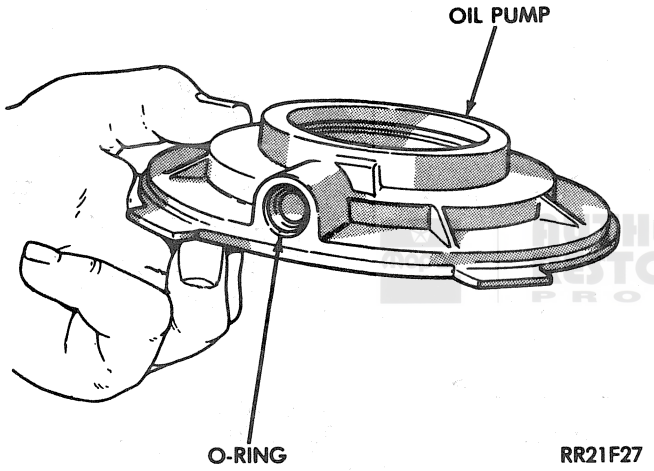


Fig. 14 Pick-up Tube O-ring Location

YOKE AND RANGE LEVER REMOVAL

(1) Remove transfer case indicator switch.
(2) Remove front yoke nut as follows:
(a) Move range lever to 4L position.
(b) Then remove nut with socket and impact wrench (Fig. 15).

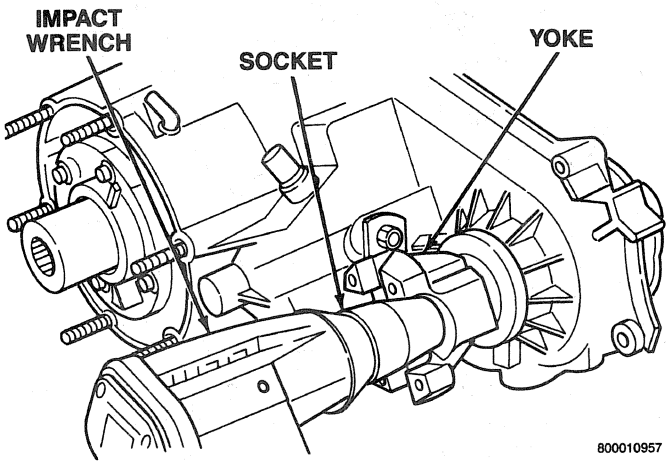


Fig. 15 Yoke Nut Removal

(3) Remove yoke. If yoke is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller (Fig. 16). Be sure puller tool is positioned on yoke and not on slinger as slinger will be damaged.

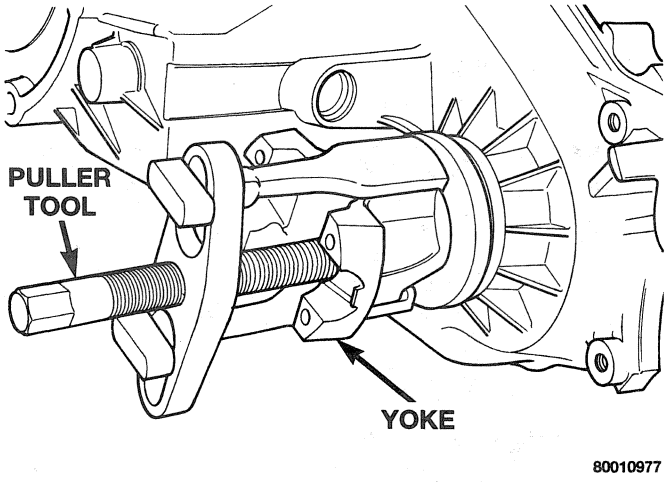


Fig. 16 Yoke Removal

(4) Remove seal washer from front output shaft. Discard washer as it should not be reused.
(5) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft (Fig. 17).

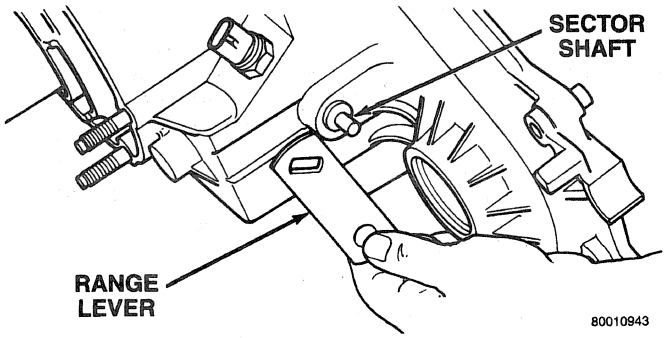


Fig. 17 Range Lever Removal

DISASSEMBLY AND ASSEMBLY (Continued)

FRONT OUTPUT SHAFT AND DRIVE CHAIN REMOVAL

(1) Support transfer case so rear case is facing upward.

(2) Remove bolts holding front case to rear case. The case alignment bolts require flat washers (Fig. 18).

(3) Loosen rear case with flat blade screwdriver to break sealer bead. Insert pry tool blade only into notches provided at each end of case (Fig. 19).

(4) Remove rear case from front case.

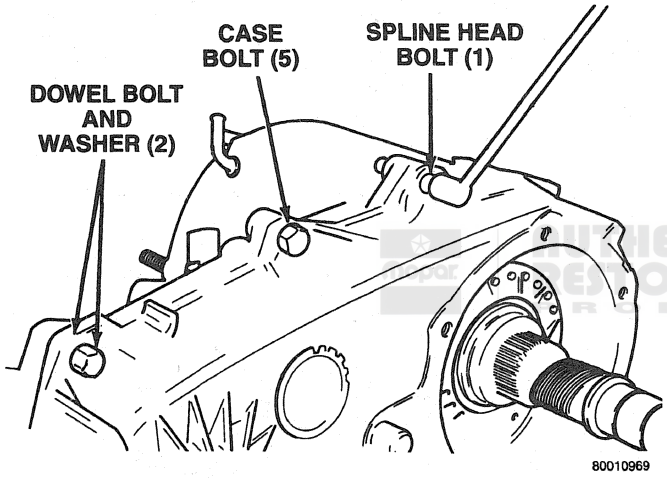


Fig. 18 Rear Case Alignment Bolt Locations

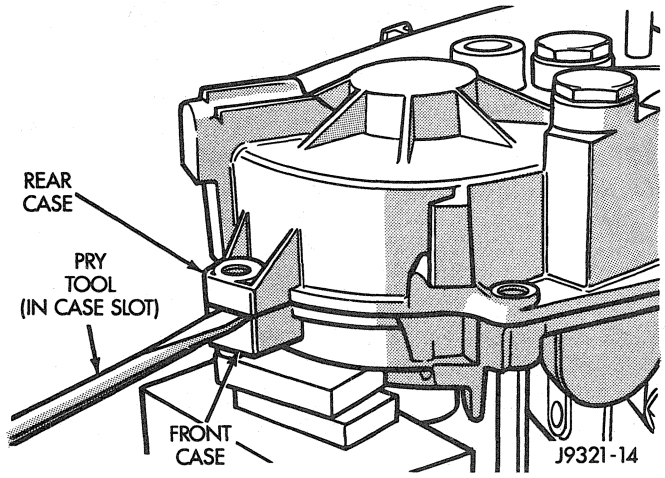


Fig. 19 Loosening Rear Case

(5) Remove oil pickup tube from rear case (Fig. 20).

(6) Remove mode fork spring (Fig. 21).

(7) Pull front output shaft upward and out of front output shaft bearing (Fig. 22).

(8) Remove front output shaft and chain.

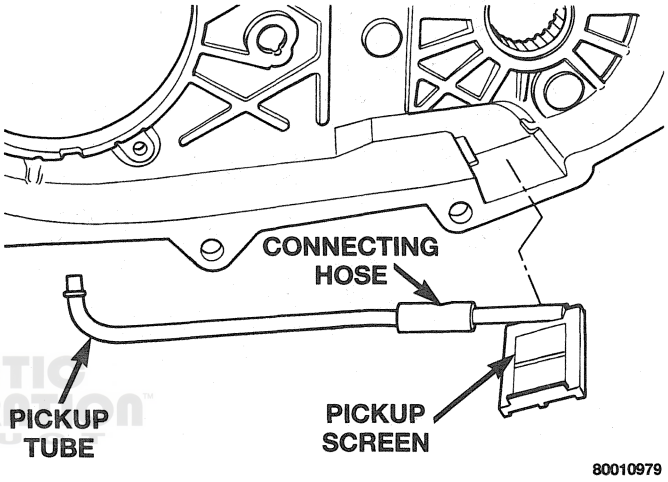


Fig. 20 Oil Pickup Tube Removal

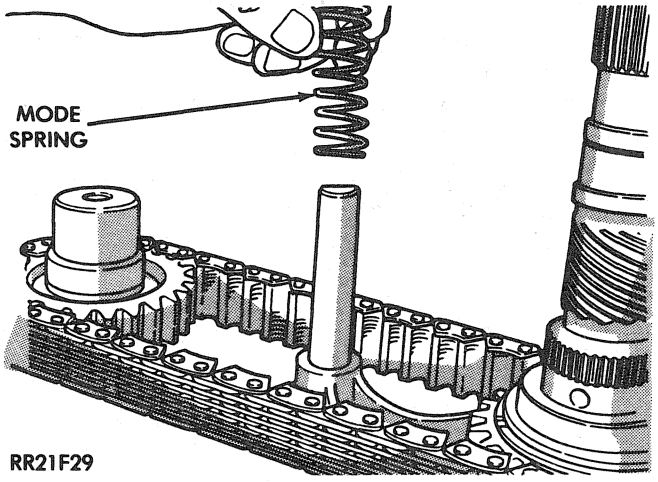


Fig. 21 Mode Fork Spring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

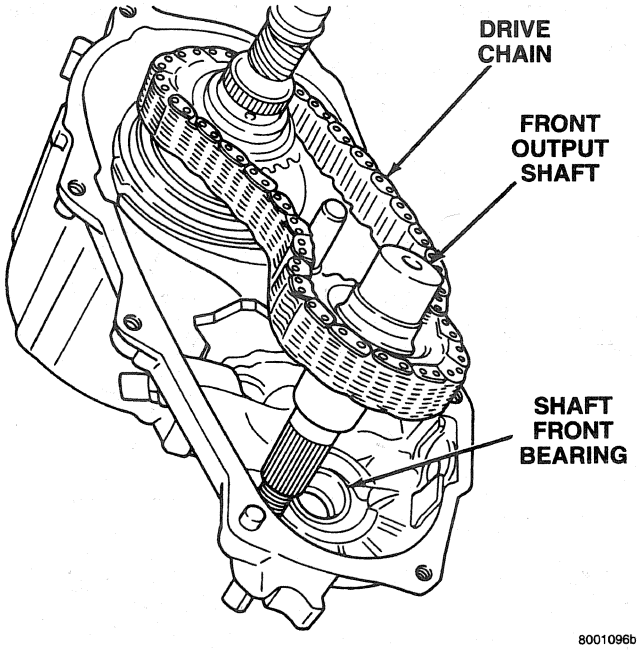


Fig. 22 Remove Front Output Shaft And Chain

SHIFT FORKS AND MAINSHAFT REMOVAL

(1) Remove detent plug, O-ring, detent spring and detent plunger (Fig. 23).

(2) Remove mainshaft from mode sleeve and input gear pilot bearing.

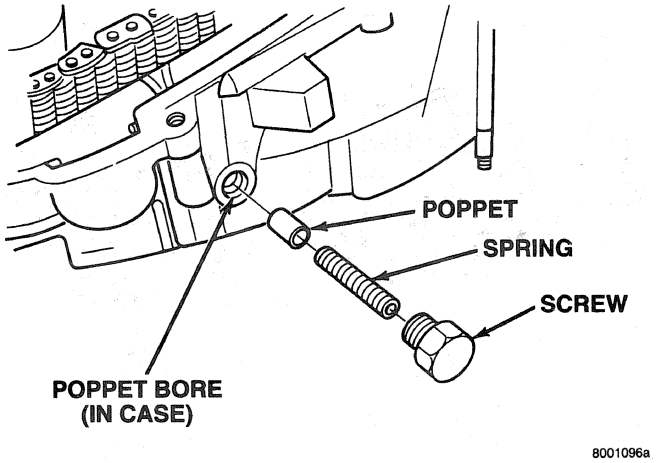


Fig. 23 Detent Plug, Spring And Plunger Removal

(3) Remove mode fork and sleeve as an assembly (Fig. 24). Note position of sleeve for assembly reference. The short side of the sleeve faces upward.

(4) Remove range fork and hub as an assembly (Fig. 25). Note fork position for installation reference.

(5) Remove shift sector from front case (Fig. 26).

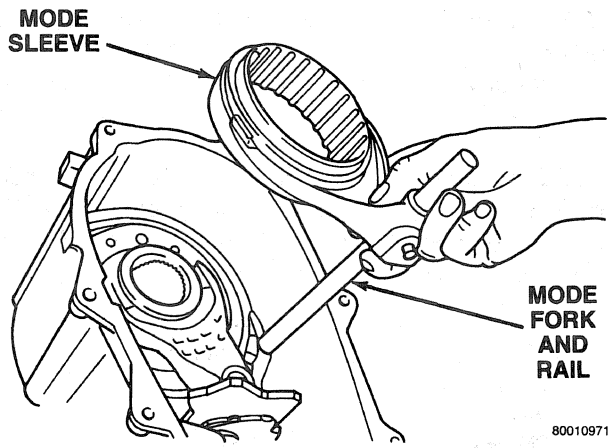


Fig. 24 Mode Fork And Sleeve Removal

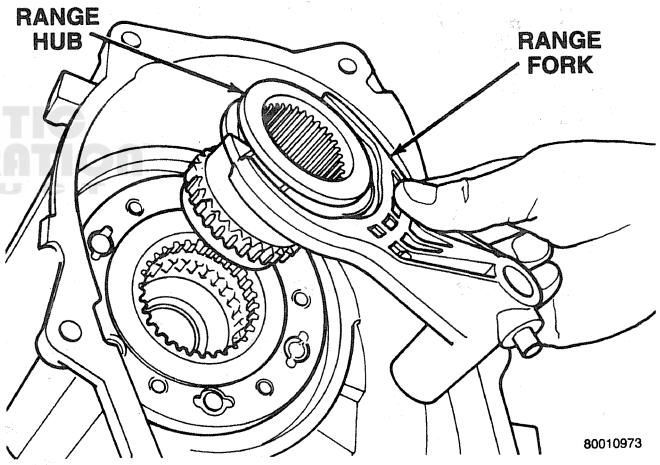


Fig. 25 Range Fork And Hub Removal

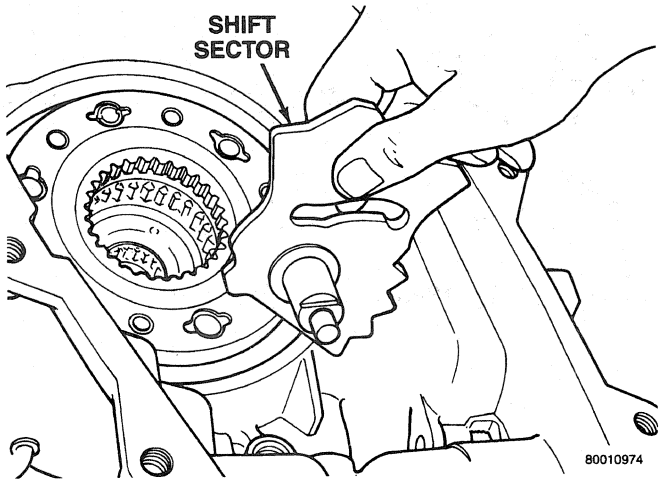


Fig. 26 Shift Sector Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Remove shift sector bushing and O-ring (Fig. 27).

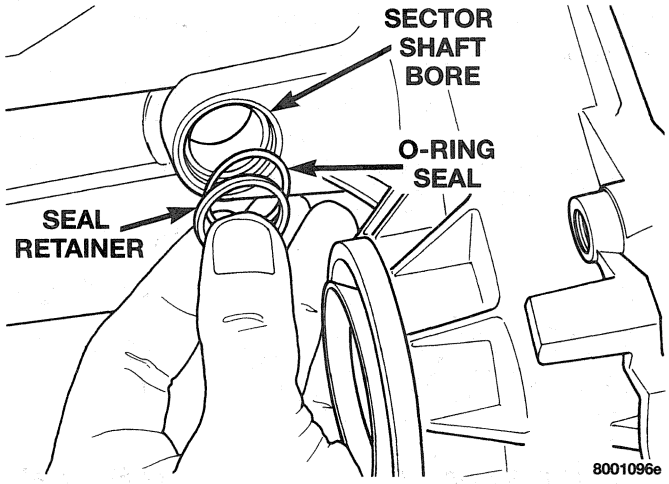


Fig. 27 Sector Bushing And O-Ring Removal

MAINSHAFT DISASSEMBLY

(1) Remove mode hub retaining ring with heavy duty snap-ring pliers (Fig. 28).

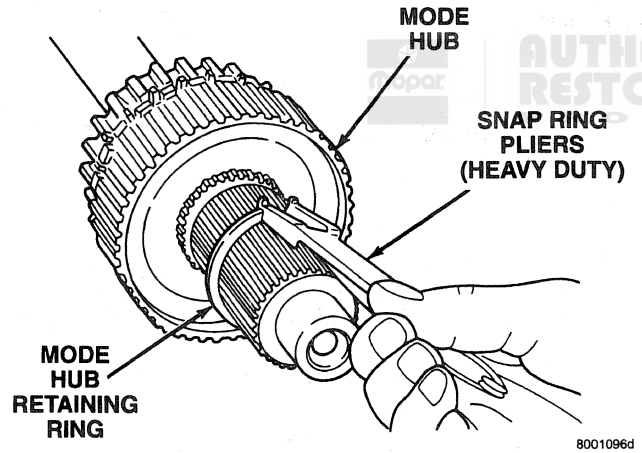


Fig. 28 Mode Hub Retaining Ring Removal

(2) Slide mode hub off mainshaft (Fig. 29).

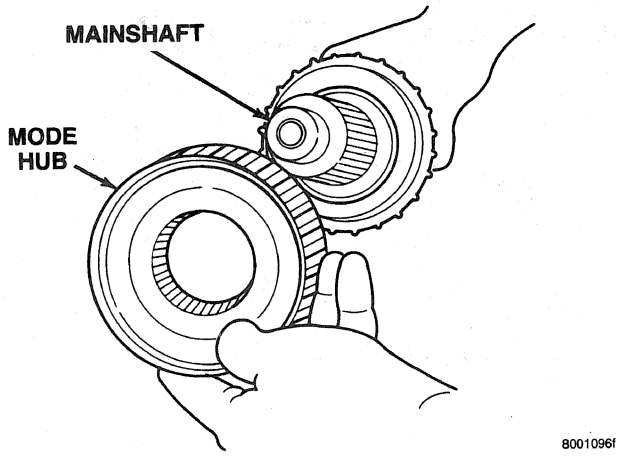


Fig. 29 Mode Hub Removal

(3) Slide drive sprocket off mainshaft (Fig. 30).

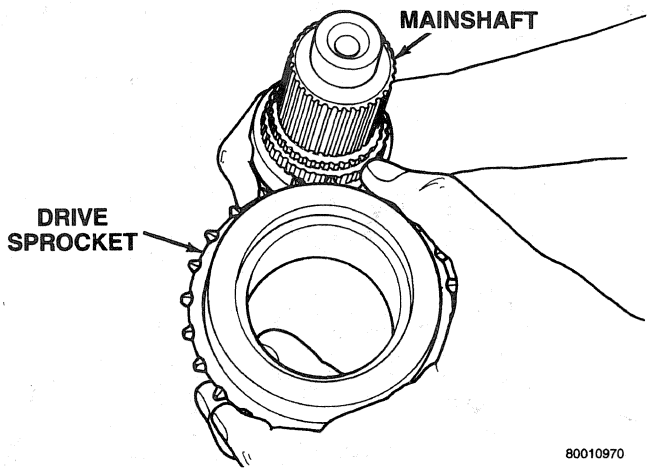


Fig. 30 Drive Sprocket Removal

INPUT GEAR AND LOW RANGE GEAR REMOVAL

(1) Remove front bearing retainer attaching bolts (Fig. 31).

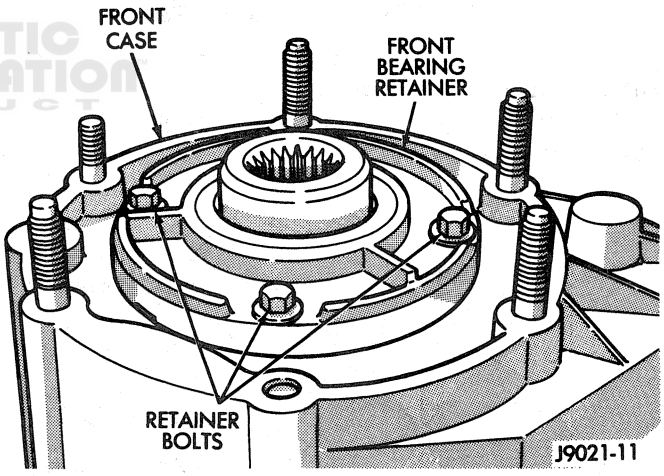


Fig. 31 Front Bearing Retainer Bolts

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Remove front bearing retainer. Pry retainer loose with pry tool positioned in slots at each end of retainer (Fig. 32).

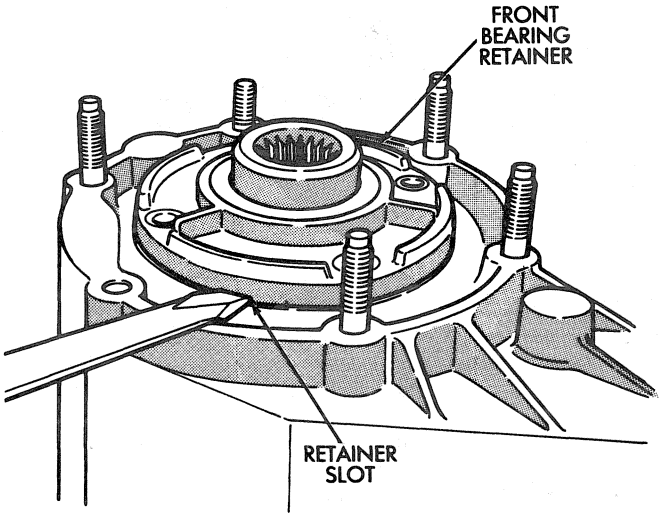


Fig. 32 Front Bearing Retainer Removal

(3) Remove front bearing retainer seal. Tap seal out with drift and hammer.

(4) Remove input gear retaining ring with heavy duty snap-ring pliers (Fig. 33)

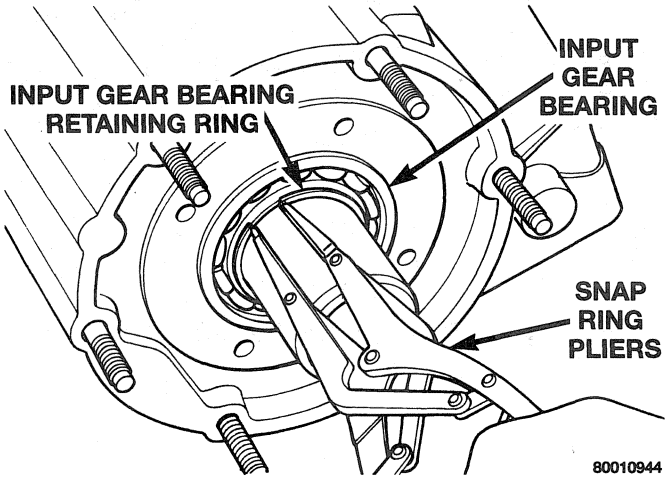


Fig. 33 Removing Input Gear Retaining Ring

(5) Place front case in horizontal position. Then remove input gear and low range gear as an assembly (Fig. 34). Tap gear out of bearing with plastic mallet if necessary.

INPUT AND LOW RANGE GEAR DISASSEMBLY

(1) Remove snap-ring that retains input gear in low range gear (Fig. 35).

(2) Remove retainer (Fig. 36).

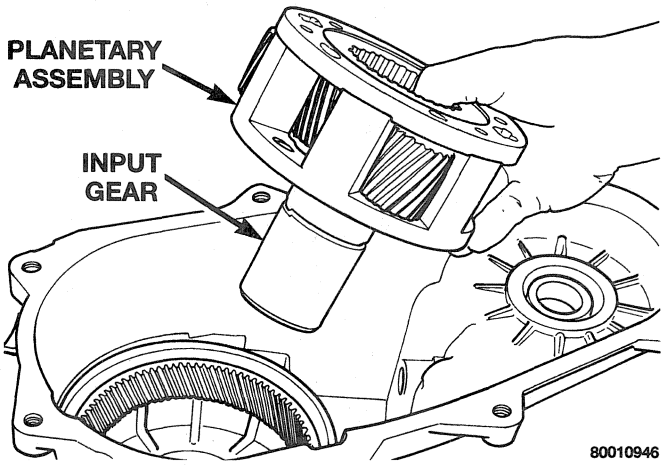


Fig. 34 Input Gear And Planetary Carrier Removal

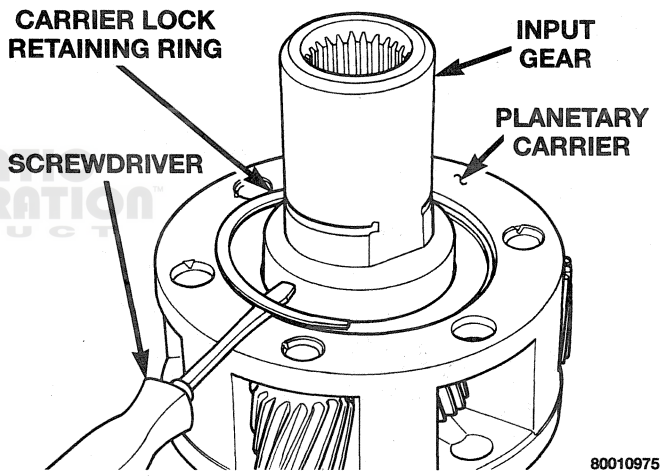


Fig. 35 Input Gear Snap-Ring Removal

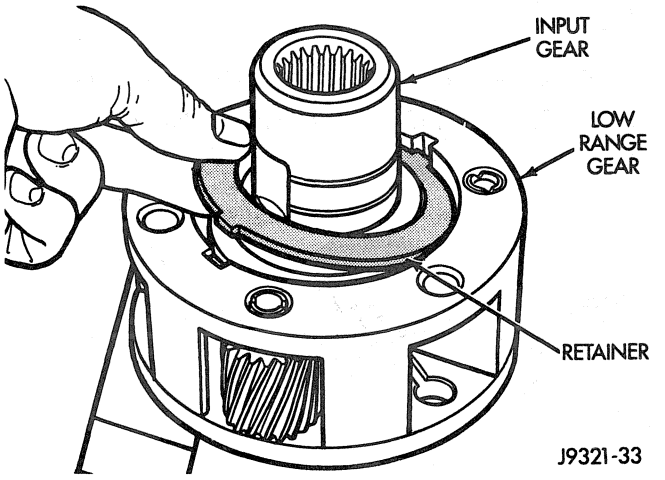


Fig. 36 Input Gear Retainer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove front tabbed thrust washer (Fig. 37).
(4) Remove input gear (Fig. 38).
(5) Remove rear tabbed thrust washer from low range gear (Fig. 39).

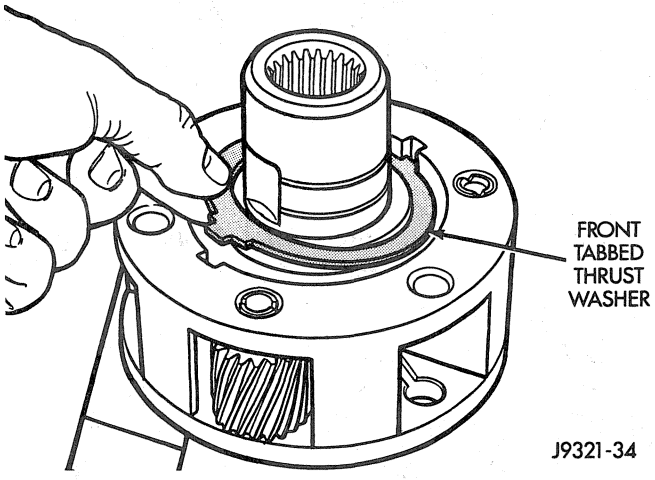


Fig. 37 Front Tabbed Thrust Washer Removal

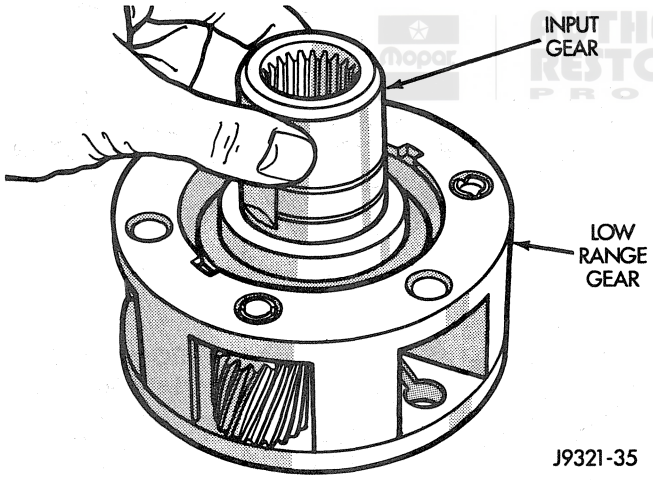


Fig. 38 Input Gear Removal

ASSEMBLY

Lubricate transfer case components with Mopar® Dexron II automatic transmission fluid or petroleum jelly (where indicated) during assembly.

BEARING AND SEAL INSTALLATION

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

(1) Remove front output shaft seal from case with pry tool (Fig. 40).
(2) Remove front output shaft bearing retaining ring with screwdriver (Fig. 41).

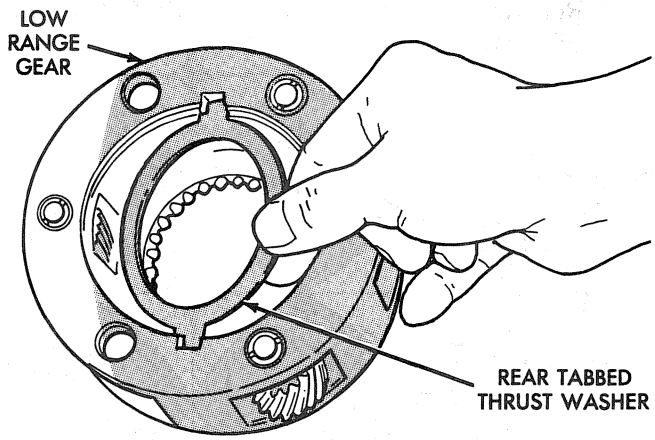


Fig. 39 Rear Tabbed Thrust Washer Removal

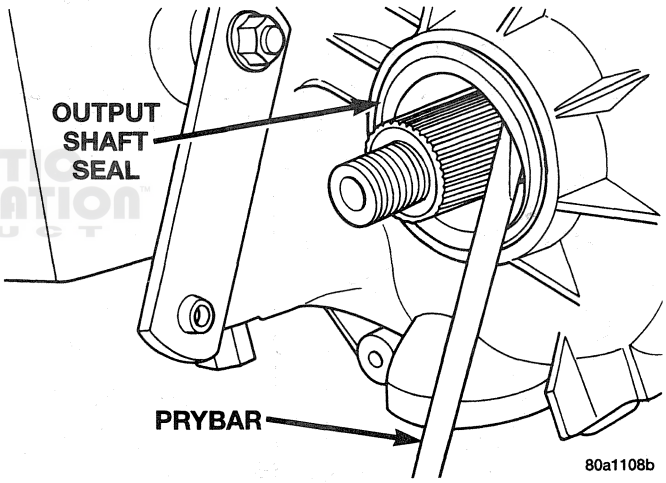


Fig. 40 Front Output Seal Removal

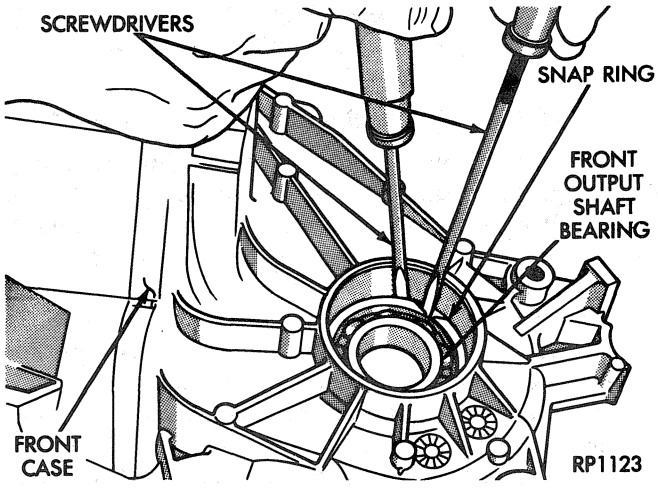


Fig. 41 Front Output Shaft Bearing Retaining Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove bearing with Tool Handle C-4171 and Tool 5065 (Fig. 42).

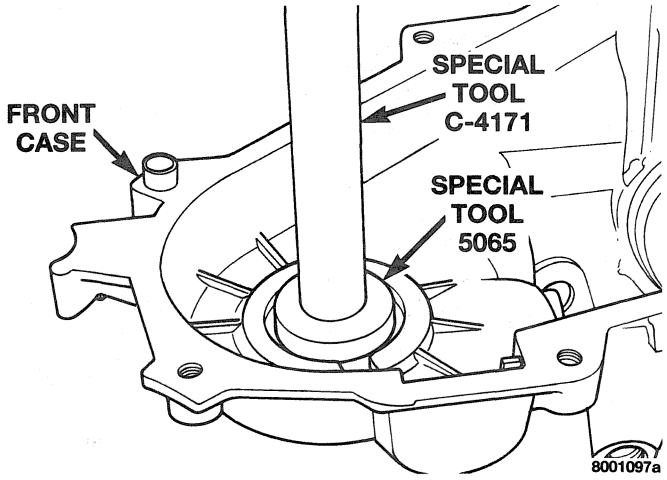


Fig. 42 Front Output Shaft Bearing Removal

(4) Install front output shaft front bearing in case with Tool Handle C-4171 and Installer 5064 (Fig. 43).

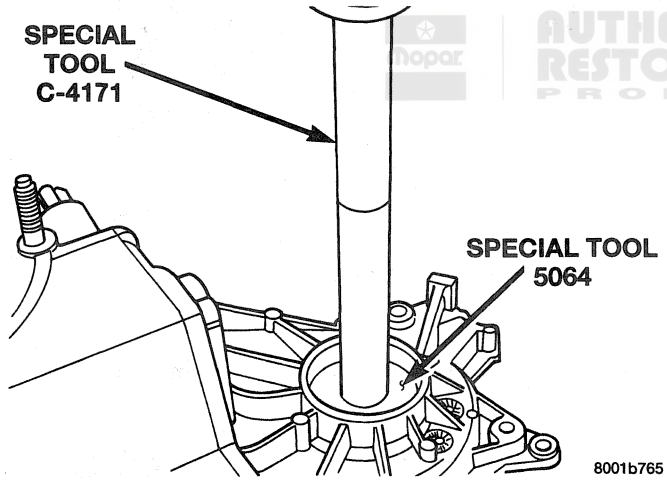


Fig. 43 Front Output Shaft Bearing Installation

(5) Install output shaft front bearing retaining ring (Fig. 44). Start ring into place by hand. Then use small screwdriver to work ring into case groove. Be sure ring is fully seated before proceeding.

(6) Install new front output seal in front case with Installer Tool 8143 as follows:

(a) Place new seal on tool. **Garter spring on seal goes toward interior of case.**

(b) Start seal in bore with light taps from hammer (Fig. 45). Once seal is started, continue tapping seal into bore until installer tool bottoms against case.

(7) Remove the output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 46).

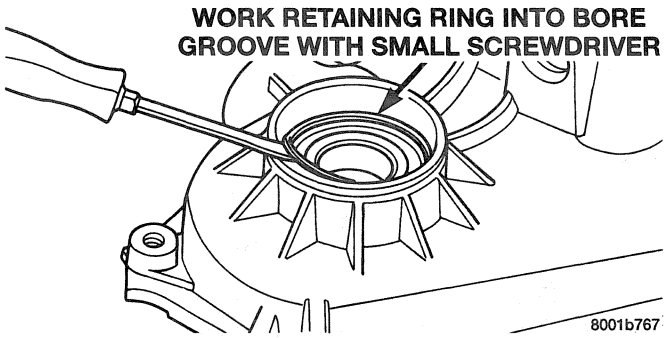


Fig. 44 Installing Output Shaft Front Bearing Retaining Ring

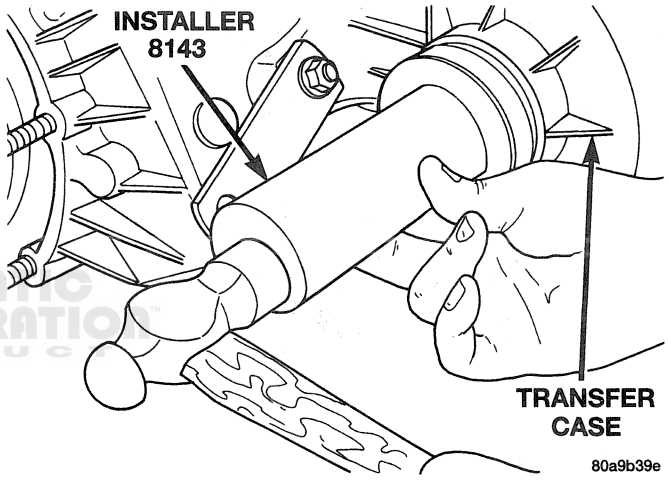


Fig. 45 Front Output Seal Installation

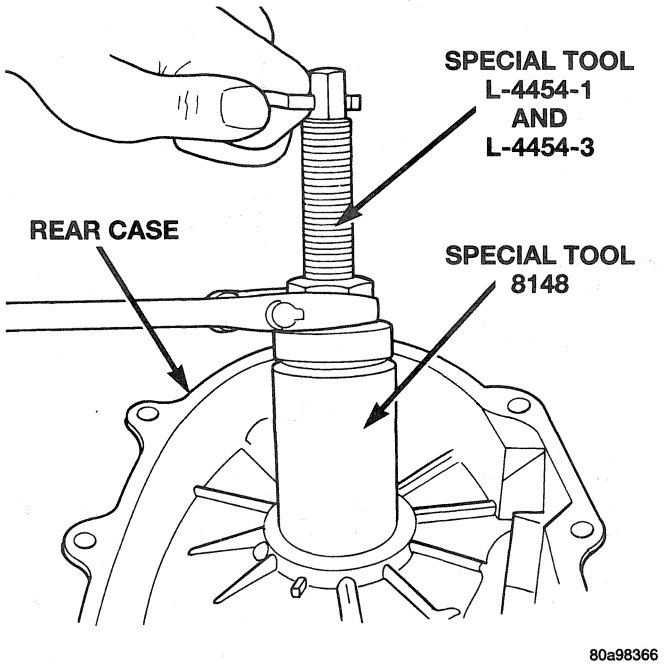


Fig. 46 Output Shaft Rear Bearing Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 47). The bearing bore is chamfered at the top. Install the bearing so it is flush with the lower edge of this chamfer (Fig. 48).

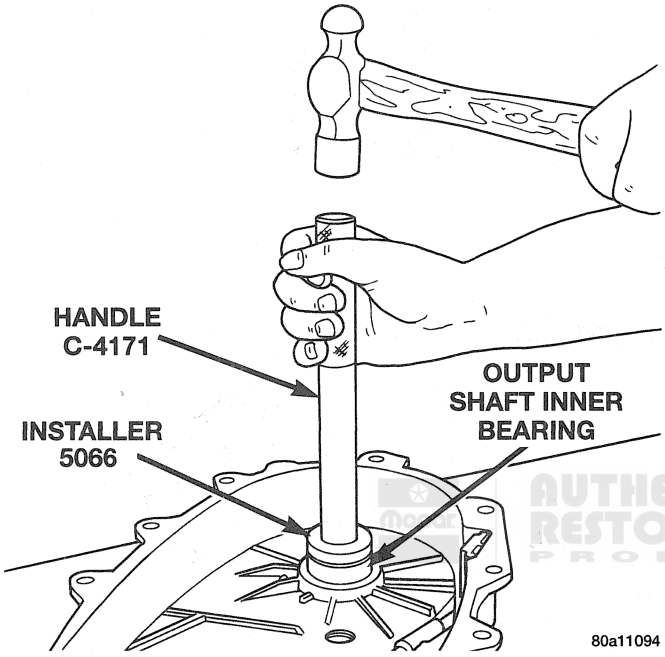


Fig. 47 Output Shaft Rear Bearing Installation

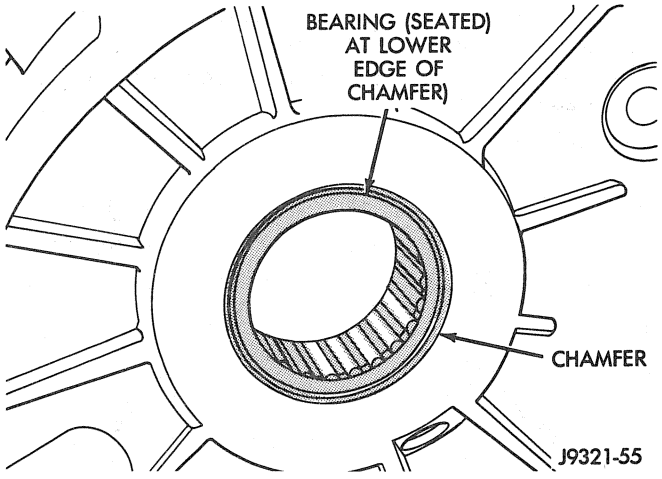


Fig. 48 Output Shaft Rear Bearing Installation Depth

(9) Using Remover C-4210 and Handle C-4171, drive input shaft bearing from inside the annulus gear opening in the case. (Fig. 49).

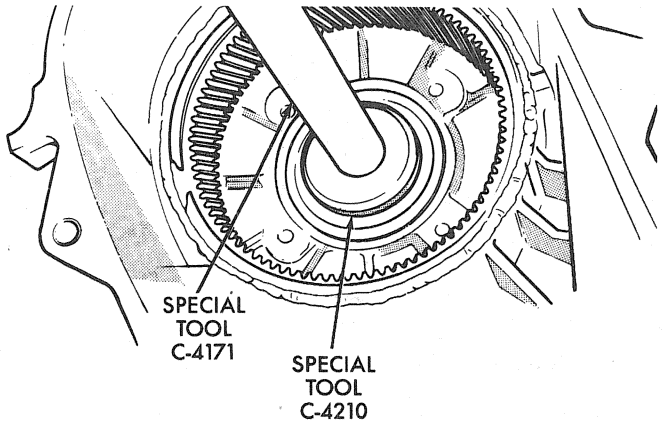


Fig. 49 Input Shaft Bearing Removal

(10) Install locating ring on new bearing.

(11) Position case so forward end is facing upward.

(12) Using Remover C-4210 and Handle C-4171, drive input shaft bearing into case. The bearing locating ring must be fully seated against case surface (Fig. 50).

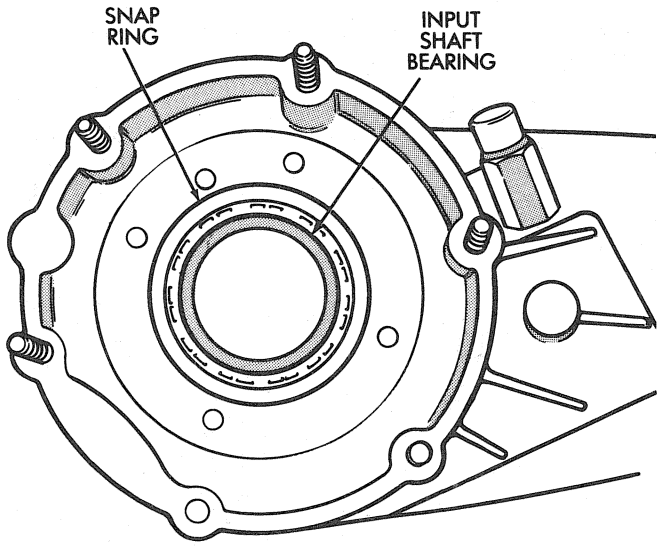


Fig. 50 Seating Input Shaft Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Remove input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 51).

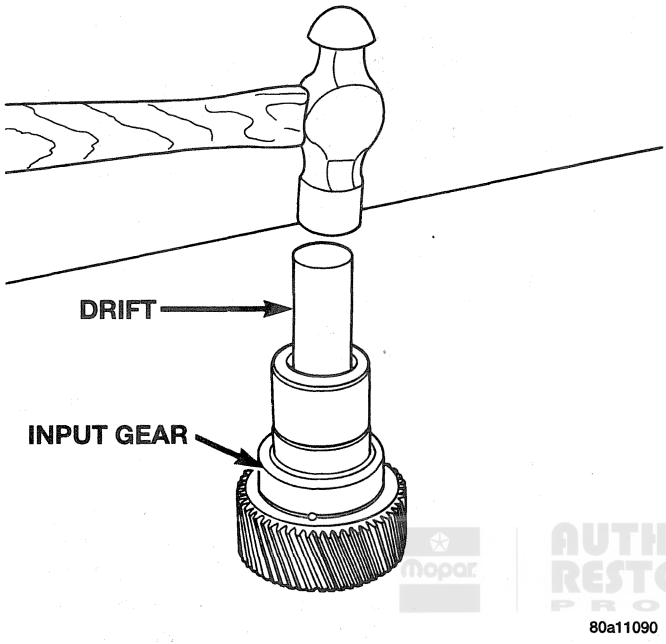


Fig. 51 Remove Input Gear Pilot Bearing

(14) Install new pilot bearing with Installer 5065 and Handle C-4171 (Fig. 52).

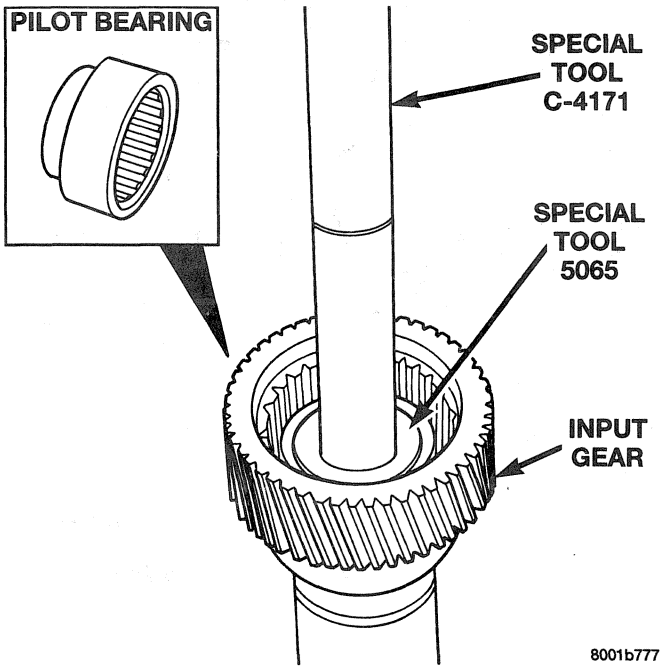


Fig. 52 Install Input Gear Pilot Bearing

(15) Remove front bearing retainer seal with suitable pry tool.

(16) Install new front bearing retainer seal with Installer 7884 (Fig. 53).

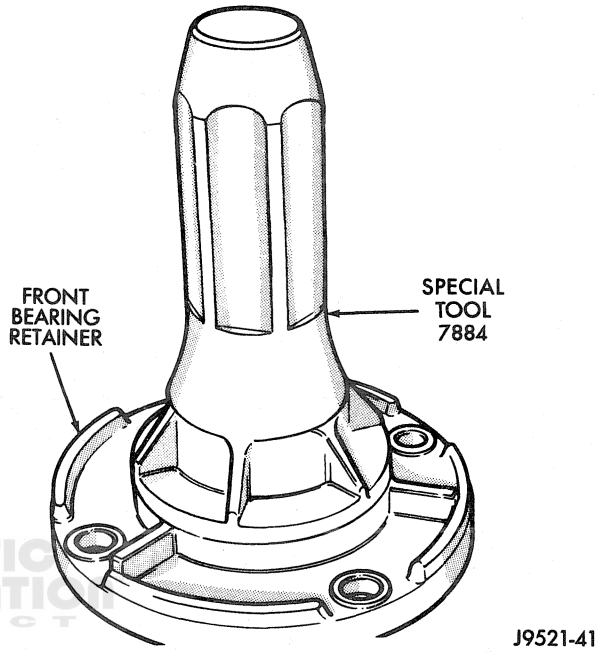


Fig. 53 Install Front Bearing Retainer Seal

(17) Remove seal from oil pump housing with a suitable pry tool

(18) Install new seal in oil pump housing with Installer 7888 (Fig. 54).

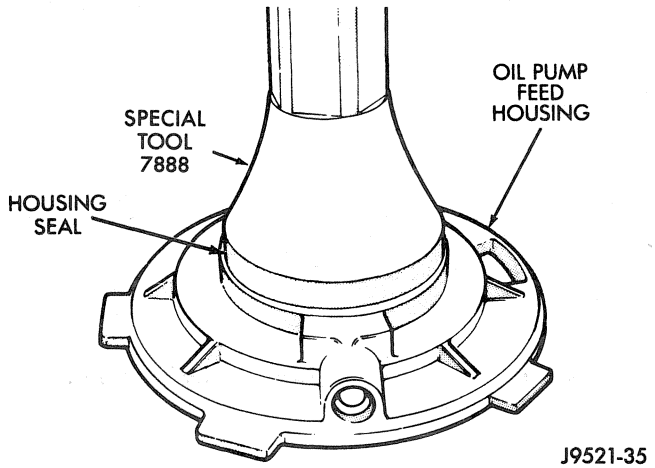


Fig. 54 Oil Pump Seal Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(19) Remove rear retainer bearing with Installer 8128 and Handle C-4171.

(20) Install rear bearing in retainer with Handle C-4171 and Installer 5064 (Fig. 55).

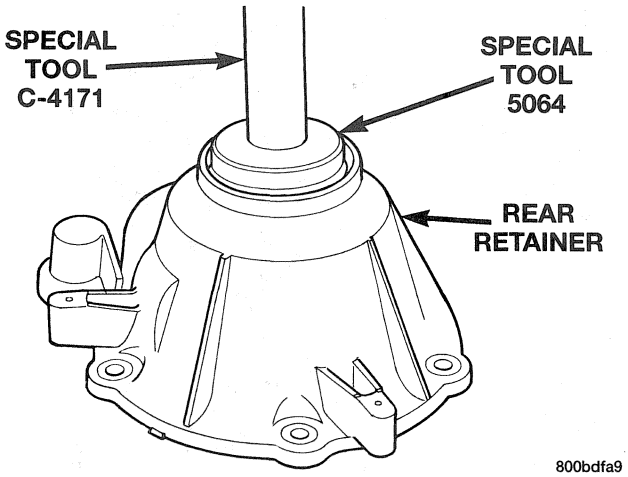


Fig. 55 Installing Rear Bearing In Retainer

INPUT AND LOW RANGE GEAR ASSEMBLY

(1) Lubricate gears and thrust washers (Fig. 56) with recommended transmission fluid.

(2) Install first thrust washer in low range gear (Fig. 56). Be sure washer tabs are properly aligned in gear notches.

(3) Install input gear in low range gear. Be sure input gear is fully seated.

(4) Install remaining thrust washer in low range gear and on top of input gear. Be sure washer tabs are properly aligned in gear notches.

(5) Install retainer on input gear and install snap-ring.

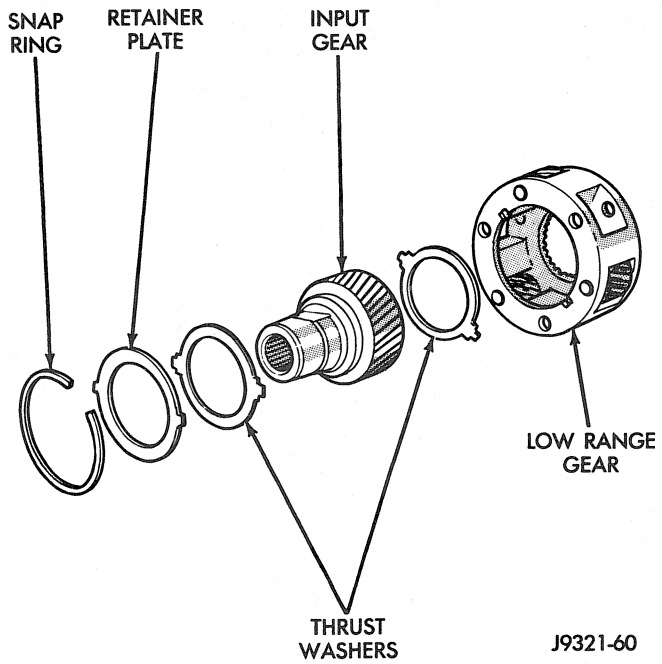


Fig. 56 Input/Low Range Gear Components

INPUT GEAR AND LOW RANGE GEAR INSTALLATION

(1) Align and install low range/input gear assembly in front case (Fig. 57). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

(2) Install snap-ring to hold input/low range gear into front bearing (Fig. 58).

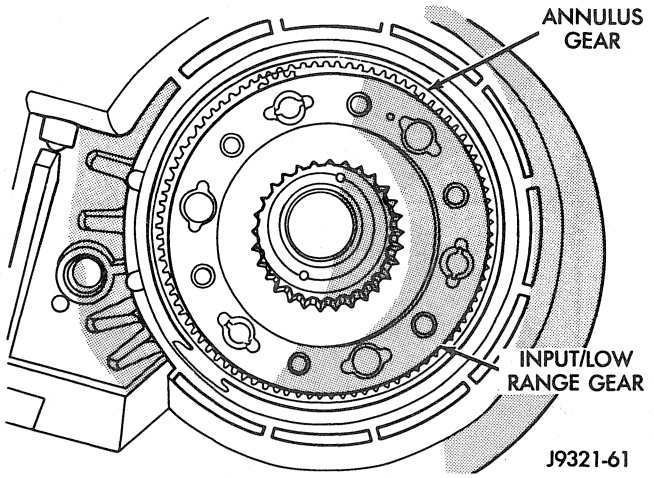


Fig. 57 Input/Low Range Gear Installation

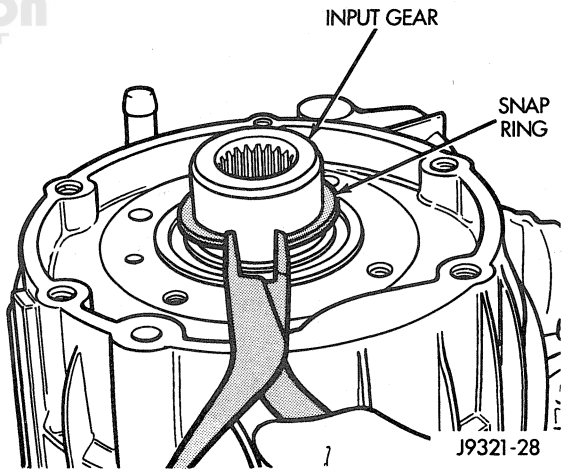


Fig. 58 Install Snap-Ring

(3) Clean gasket sealer residue from retainer and inspect retainer for cracks or other damage.

(4) Apply a 3 mm (1/8 in.) bead of Mopar® gasket maker or silicone adhesive to sealing surface of retainer.

(5) Align cavity in seal retainer with fluid return hole in front of case.

CAUTION: Do not block fluid return cavity on sealing surface of retainer when applying Mopar® gasket maker or silicone adhesive sealer. Seal failure and fluid leak can result.

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install bolts to hold retainer to transfer case (Fig. 59). Tighten to 21 N·m (16 ft. lbs.) of torque.

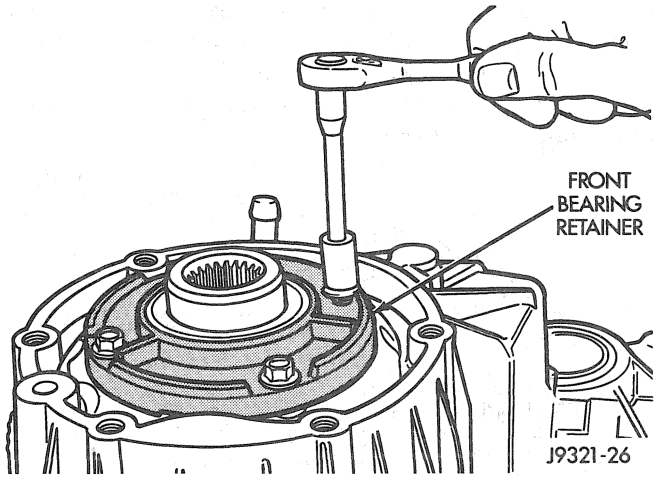


Fig. 59 Install Front Bearing Retainer

MAINSHAFT ASSEMBLY

(1) Lubricate mainshaft splines with recommended transmission fluid.
(2) Slide drive sprocket onto mainshaft.
(3) Slide mode hub onto mainshaft.
(4) Install mode hub retaining ring. Verify that the retaining ring is fully seated in mainshaft groove.

SHIFT FORKS AND MAINSHAFT INSTALLATION

(1) Install new sector shaft O-ring and bushing (Fig. 60).

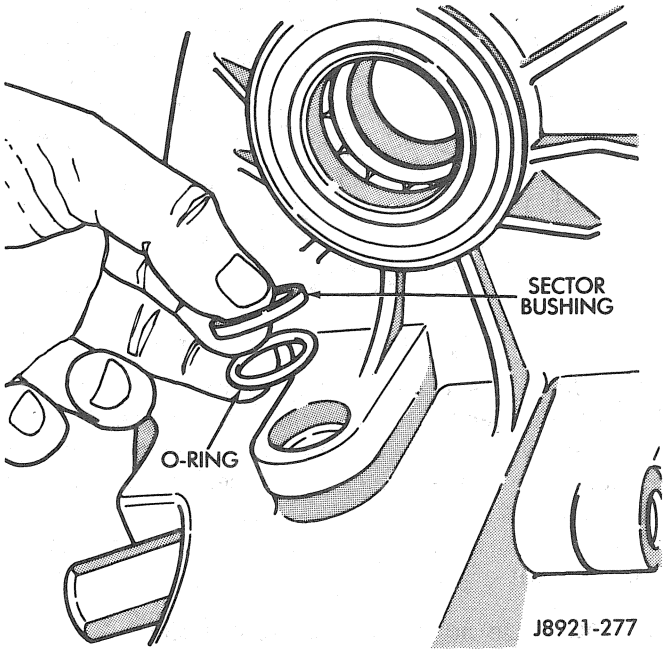


Fig. 60 Sector O-Ring And Bushing Installation

(2) Install shift sector in case (Fig. 61). Lubricate sector shaft with transmission fluid before installation.

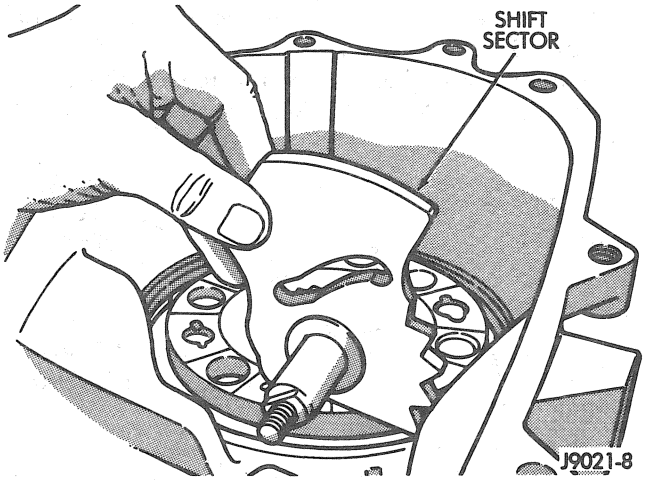


Fig. 61 Shift Sector Installation

(3) Install range lever, washer, and nut on sector shaft (Fig. 62). Tighten range lever nut to 27–34 N.m (20–25 ft. lbs.) torque.

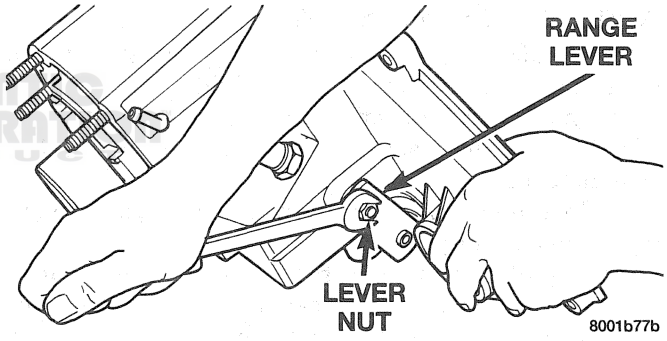


Fig. 62 Range Lever Installation

(4) Assemble and install range fork and hub (Fig. 63). Be sure hub is properly seated in low range gear and engaged to the input gear.
(5) Align and insert range fork pin in shift sector slot.

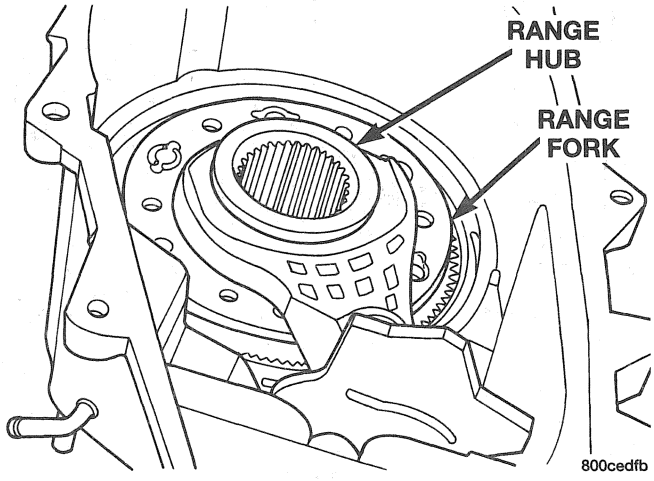


Fig. 63 Install Range Fork And Hub Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install assembled mainshaft (Fig. 64). Be sure shaft is seated in pilot bearing and input gear.

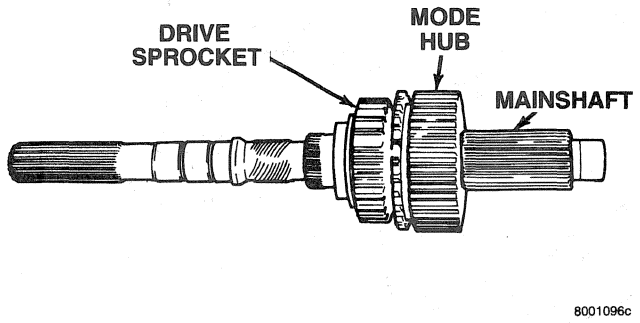


Fig. 64 Mainshaft Assembly Installation

(7) Install new pads on mode fork if necessary.

(8) Insert mode sleeve in mode fork mode fork. Be sure long side of sleeve is toward long end of shift rail (Fig. 65).

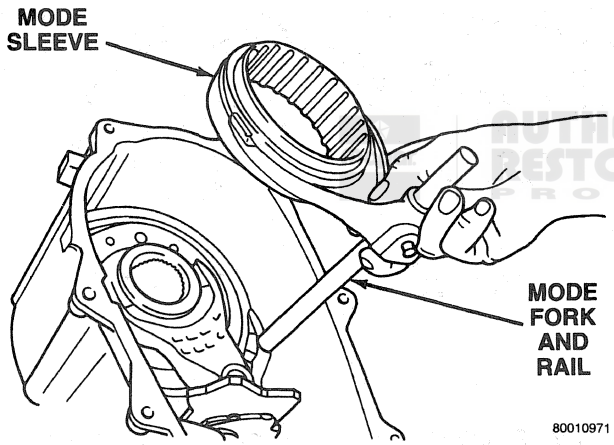


Fig. 65 Assembling Mode Fork And Sleeve

(9) Install assembled mode fork and sleeve (Fig. 66). Be sure fork rail goes through range fork and into case bore. Also be sure sleeve is aligned and seated on mainshaft hub.

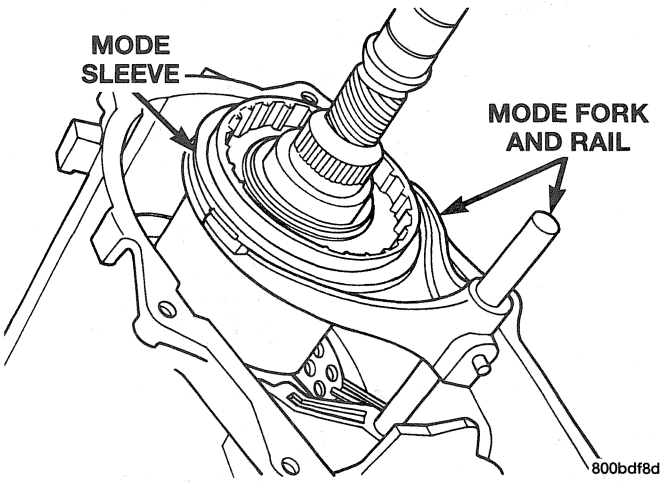


Fig. 66 Mode Fork And Sleeve Installation

(10) Rotate sector to Neutral position.

(11) Install new O-ring on detent plug (Fig. 67).

(12) Lubricate detent plunger with transmission fluid or light coat of petroleum jelly.

(13) Install detent plunger, spring and plug (Fig. 67).

(14) Verify that plunger is properly engaged in sector.

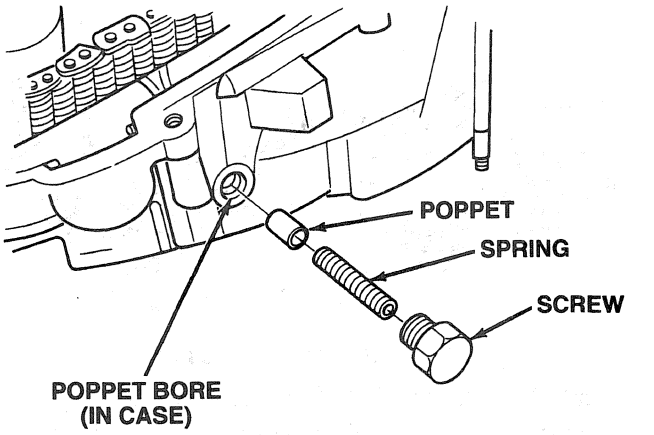


Fig. 67 Shift Detent Components

FRONT OUTPUT SHAFT AND DRIVE CHAIN INSTALLATION

(1) Lubricate front output shaft-sprocket assembly, drive chain and drive sprocket with transmission fluid.

(2) Assemble drive chain and front output shaft (Fig. 68).

(3) Start chain on mainshaft drive sprocket.

(4) Guide front shaft into bearing and drive sprocket onto mainshaft drive gear (Fig. 68).

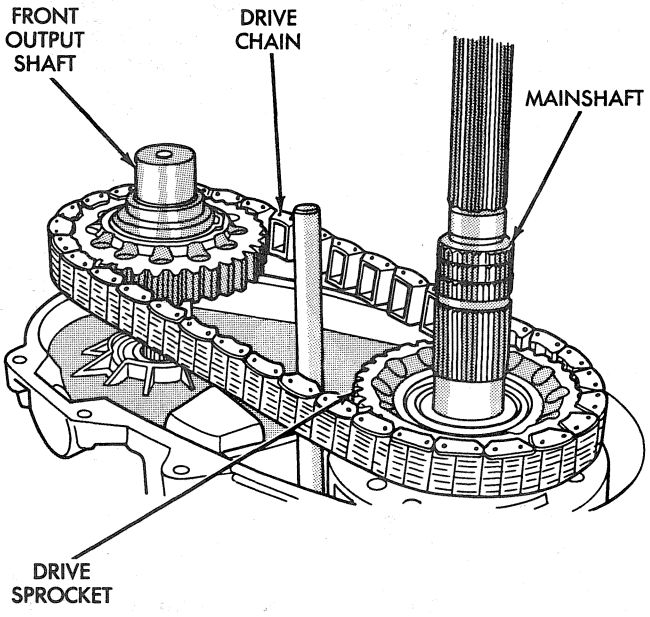


Fig. 68 Installing Drive Chain And Front Output Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Install mode spring on upper end of mode fork shift rail (Fig. 69).

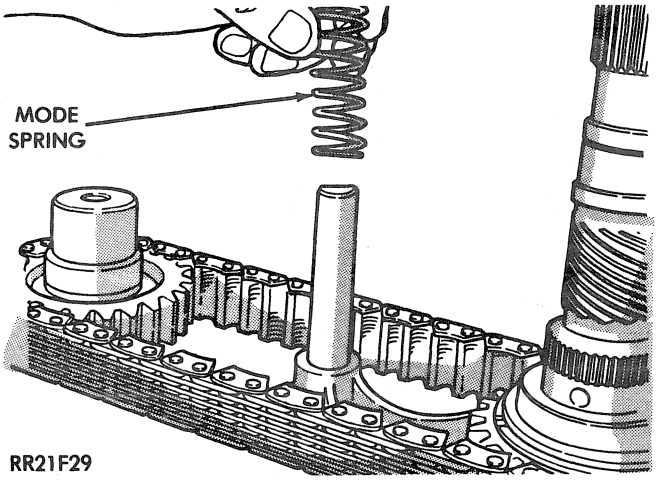


Fig. 69 Install Mode Fork Spring

OIL PUMP AND REAR CASE ASSEMBLY/INSTALLATION

(1) Install magnet in front case pocket (Fig. 70).

(2) Assemble oil pickup screen, connecting hose, and tube.

(3) Install new pickup tube O-ring in oil pump (Fig. 71).

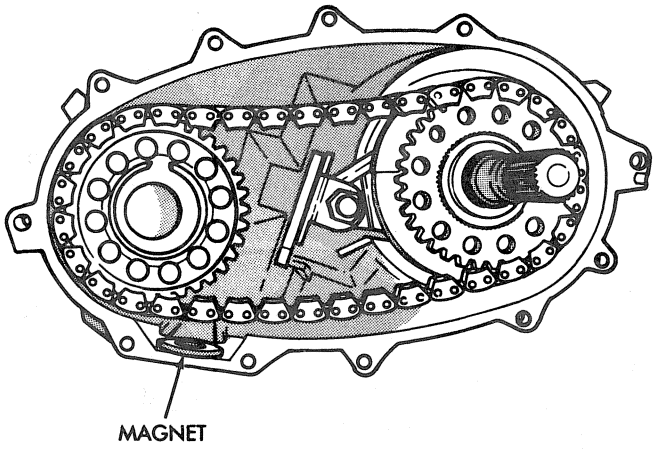


Fig. 70 Installing Case Magnet

(4) Insert oil pickup tube in oil pump inlet.

(5) Position assembled oil pump and pickup tube in rear case. Be sure pickup screen is securely seated in case slot. Also be sure oil pump locating tabs are outside rear case (Fig. 72).

(6) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting flange of front case. Work sealer bead around bolt holes.

(7) Lift rear case and oil pump and carefully position assembly on front case. Be sure case dowels are

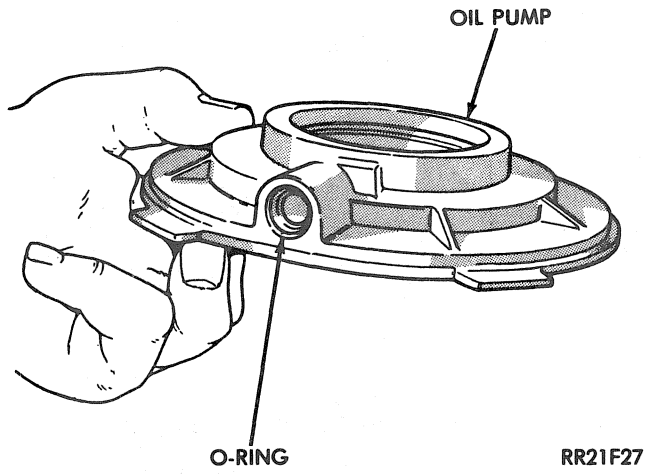


Fig. 71 Pickup Tube O-Ring Position

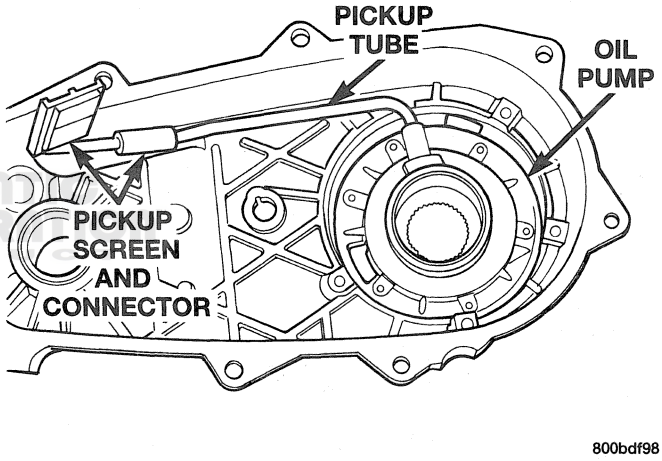


Fig. 72 Oil Pump And Pickup Tube Installation

aligned and that mode fork rail extends through rear case before seating rear case on front case.

(8) Install case attaching bolts. Alignment bolts at each end of case are only ones requiring washers (Fig. 73).

(9) Tighten case bolts to 27-34 N·m (20-25 ft. lbs.) torque.

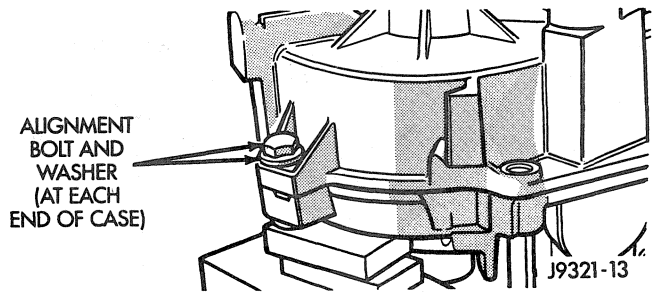


Fig. 73 Alignment Bolt Location

YOKE AND RANGE LEVER INSTALLATION

(1) Install indicator switch in front case. Tighten switch to 20–34 N·m (15–25 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Install range lever, washer and locknut on sector shaft (Fig. 74). Tighten locknut to 27-34 N·m (20-25 ft. lbs.) torque.

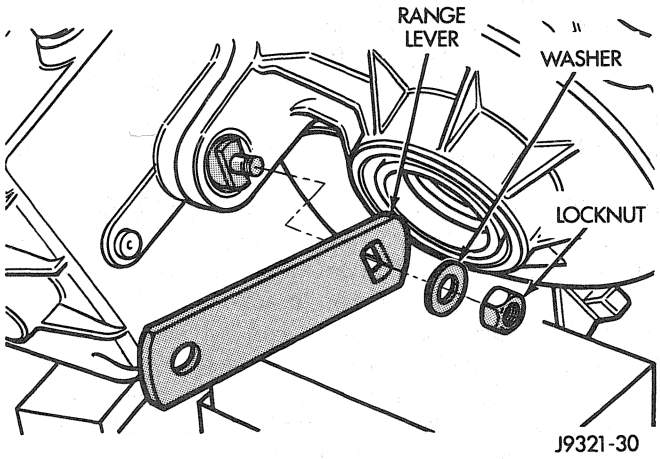


Fig. 74 Range Lever Installation

(3) Install new seal washer on front output shaft (Fig. 76).

(4) Lubricate yoke hub with transmission fluid and install yoke on front shaft.

(5) Install new seal washer on front shaft.

(6) Install yoke and new yoke nut on front output shaft (Fig. 75).

(7) Tighten yoke nut to 122-176 N·m (90-130 ft. lbs.) torque. Use Tool C-3281, or similar tool to hold yoke while tightening yoke nut.

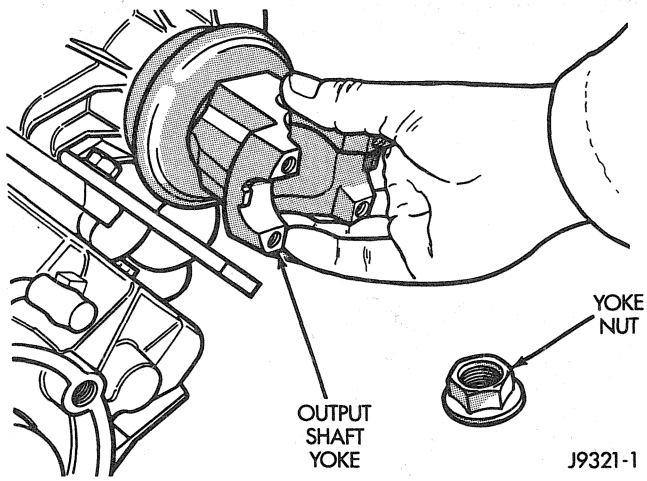


Fig. 75 Output Shaft Yoke Installation

REAR RETAINER INSTALLATION

(1) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 inch.

(2) Install rear retainer on rear case. Tighten retainer bolts to 20–27 N·m (15–20 ft. lbs.) torque.

(3) Install rear bearing I.D. retaining ring and spacer on output shaft.

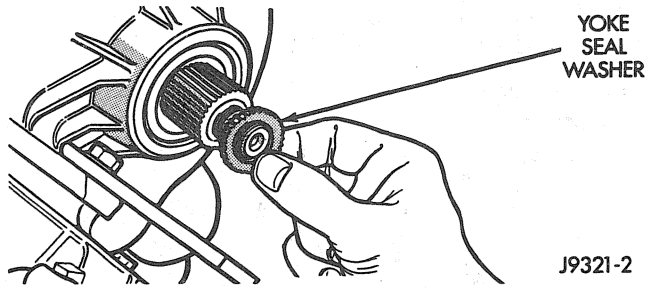


Fig. 76 Yoke Seal Washer Installation

(4) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(5) Slide seal onto Seal Protector 6992 (Fig. 77).

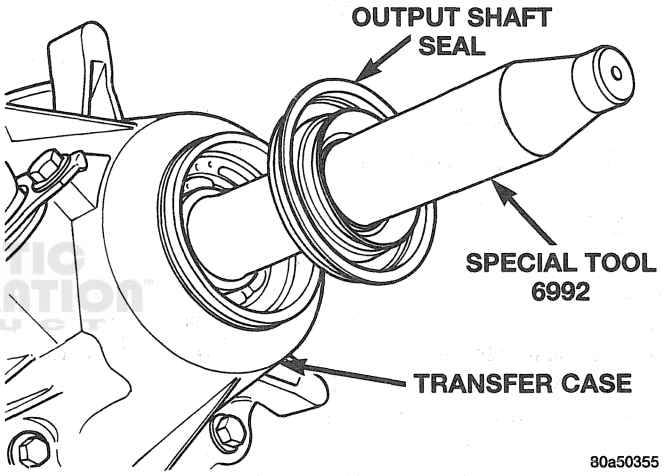


Fig. 77 Output Shaft Seal and Protector

Slide seal protector and seal onto output shaft.

(6) Slide Installer C-4076-B onto seal protector with the recessed side of the tool toward the seal. Drive seal into rear bearing retainer with installer C-4076-B and handle MD-998323 (Fig. 78).

(7) Install rear slinger with installer C-4076-A and handle MD-998323 (Fig. 78).

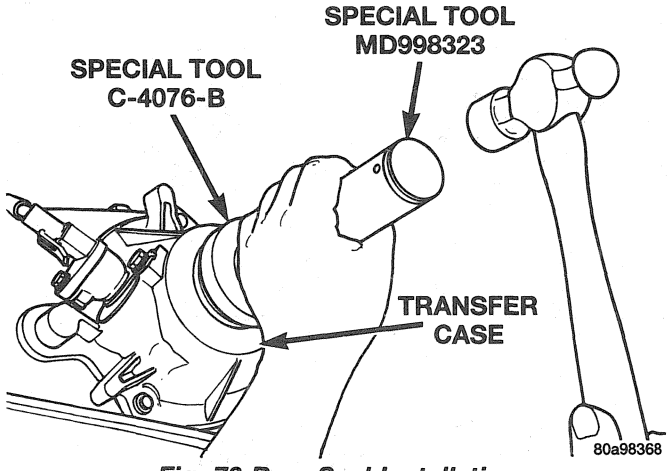


Fig. 78 Rear Seal Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 79).

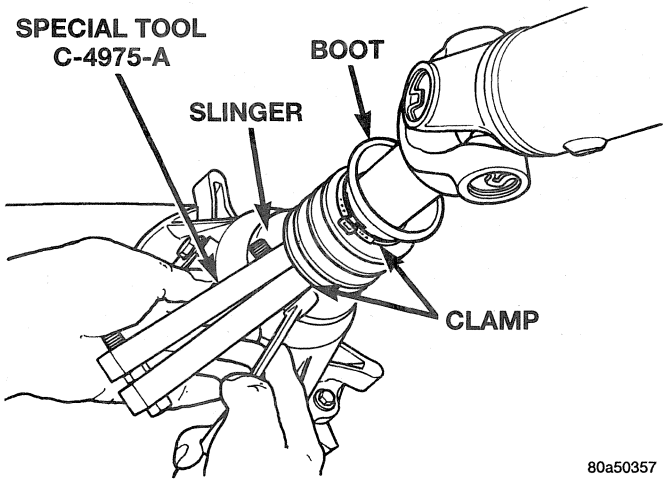


Fig. 79 Slinger Boot Installation

CLEANING AND INSPECTION

NV231 TRANSFER CASE

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket (Fig. 80). Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320–400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 81). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300–400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 82). Minor nicks on the shift rail can be smoothed with 320–400 grit emery cloth.

Inspect the shift fork wear pads (Fig. 83). The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are not serviceable.

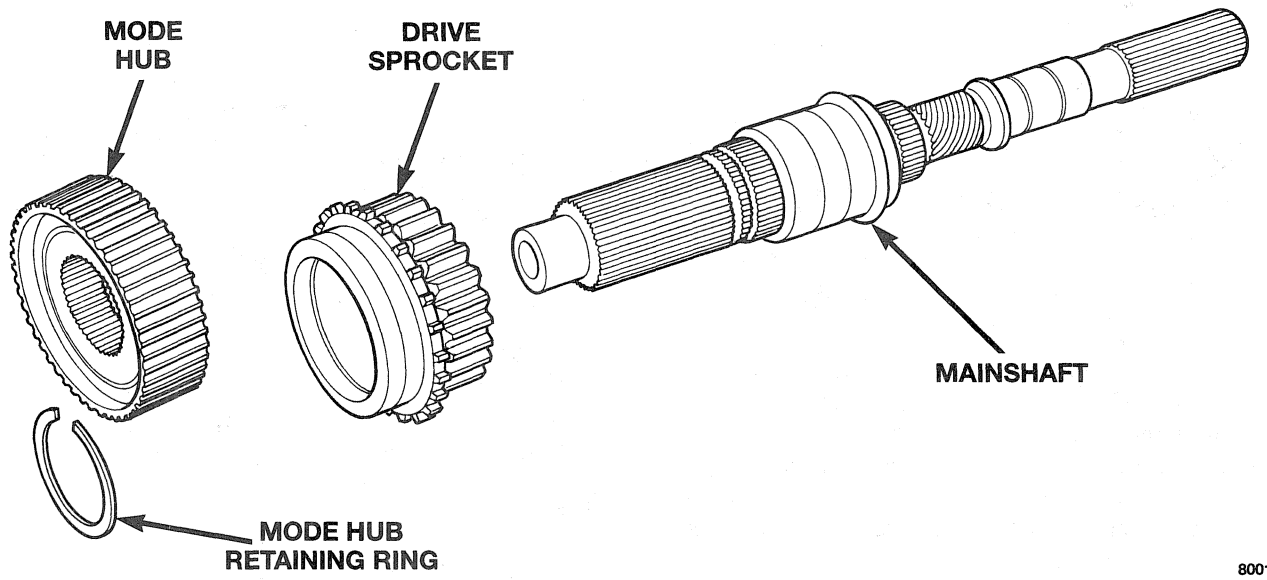


Fig. 80 Mainshaft, Mode Hub, And Drive Sprocket

CLEANING AND INSPECTION (Continued)

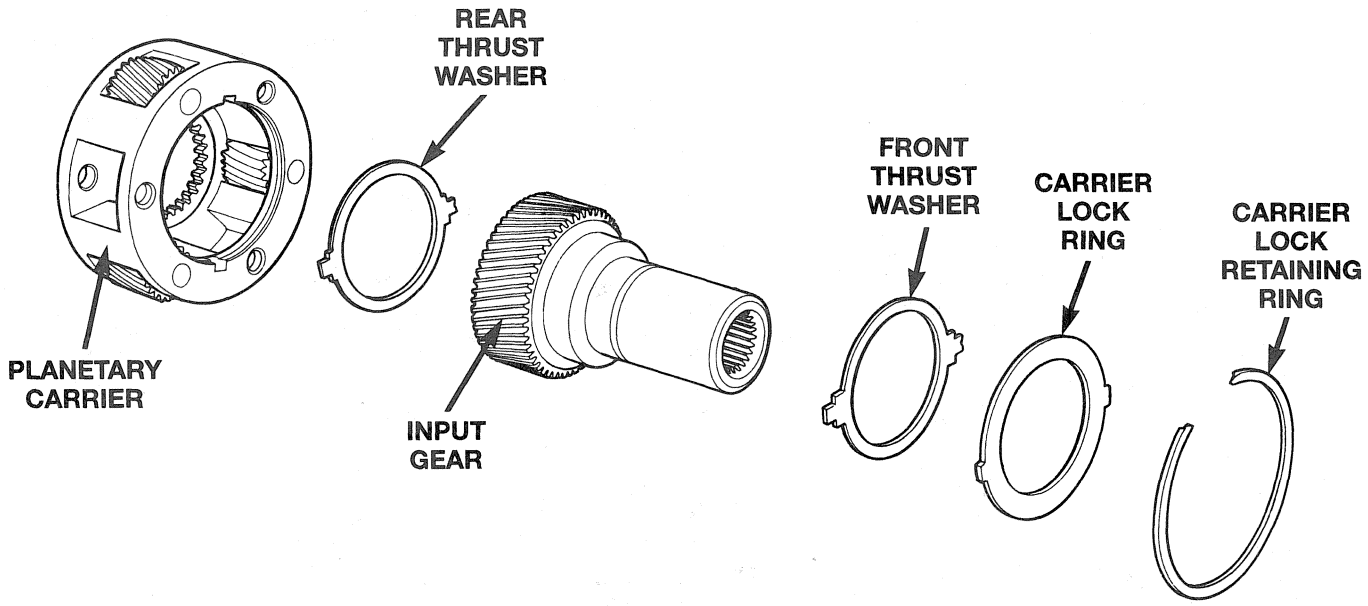


Fig. 81 Input Gear And Carrier Components

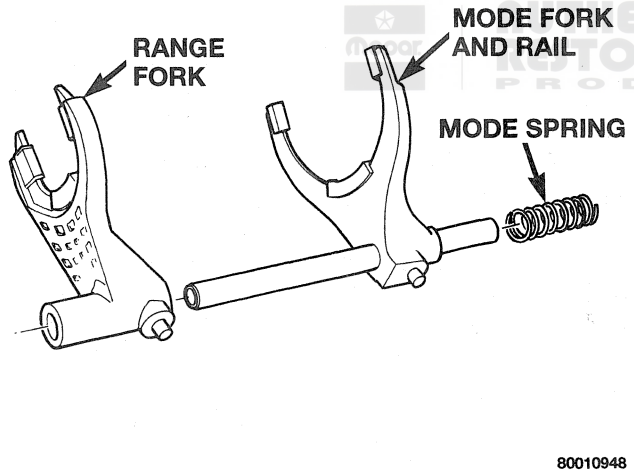


Fig. 82 Shift forks

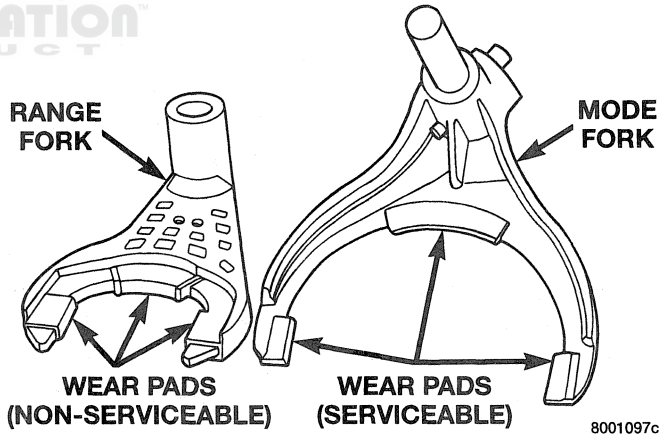


Fig. 83 Shift Fork And Wear Pad Locations

The fork must be replaced as an assembly if the pads are worn or damaged.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/ BOOT

Inspect the retainer components (Fig. 84). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Inspect the retaining rings and washers. Replace any part if distorted, bent, or broken. Reuse is not recommended. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 85). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320–400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if

CLEANING AND INSPECTION (Continued)

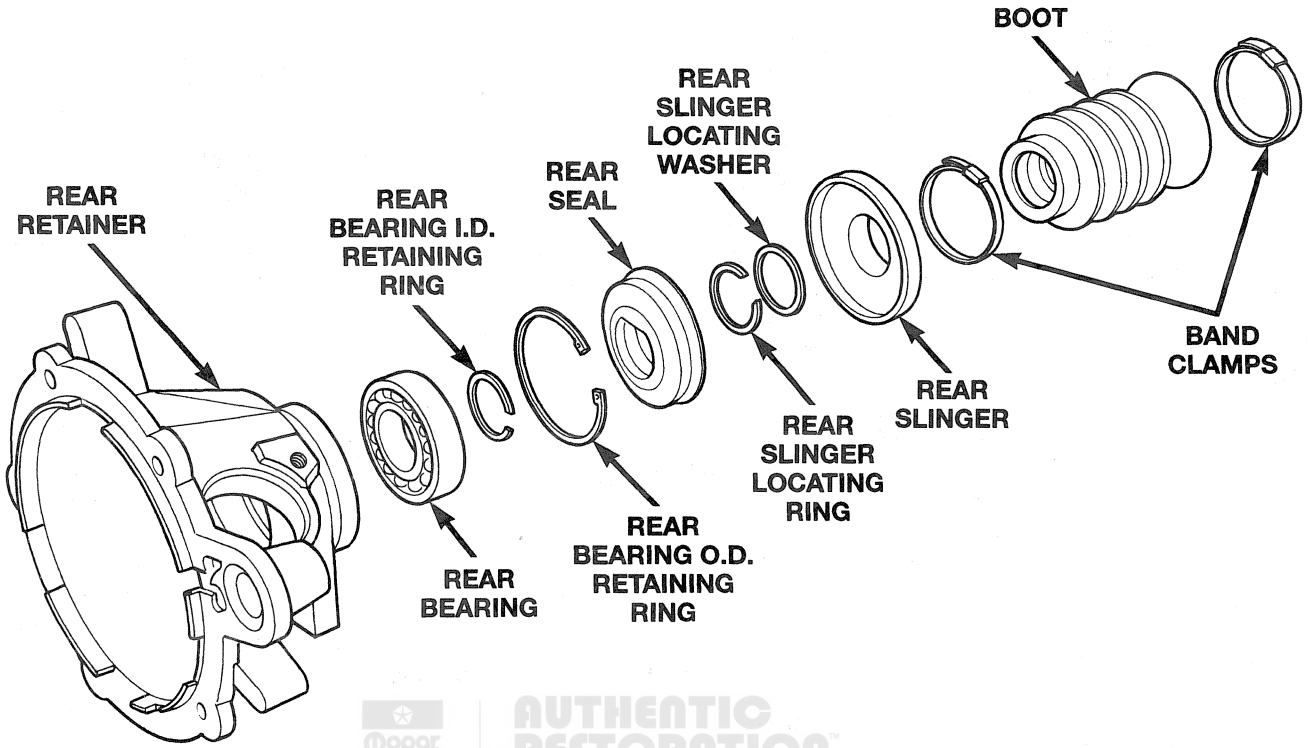


Fig. 84 Rear Retainer Components

necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. replace the chain if stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

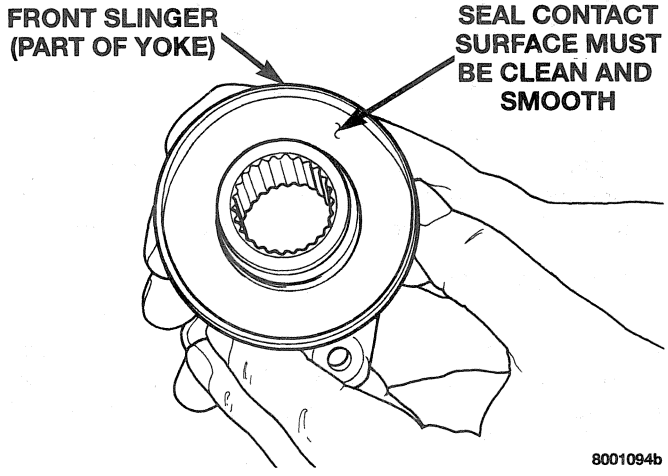


Fig. 85 Seal Contact Surface Of Yoke Slinger

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 86)

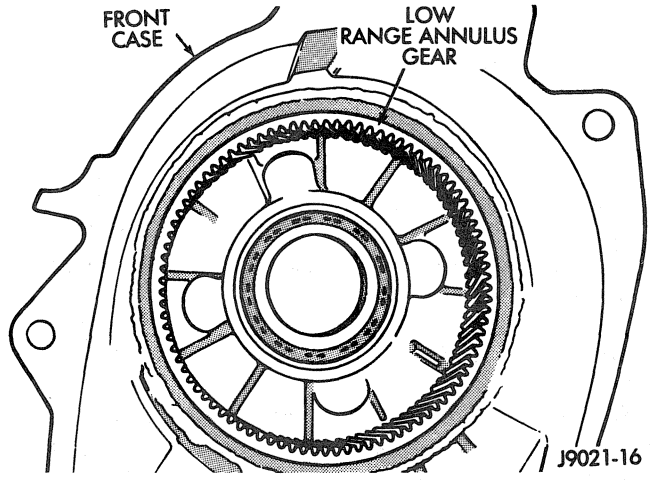


Fig. 86 Low Range Annulus Gear

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and

CLEANING AND INSPECTION (Continued)

3M all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

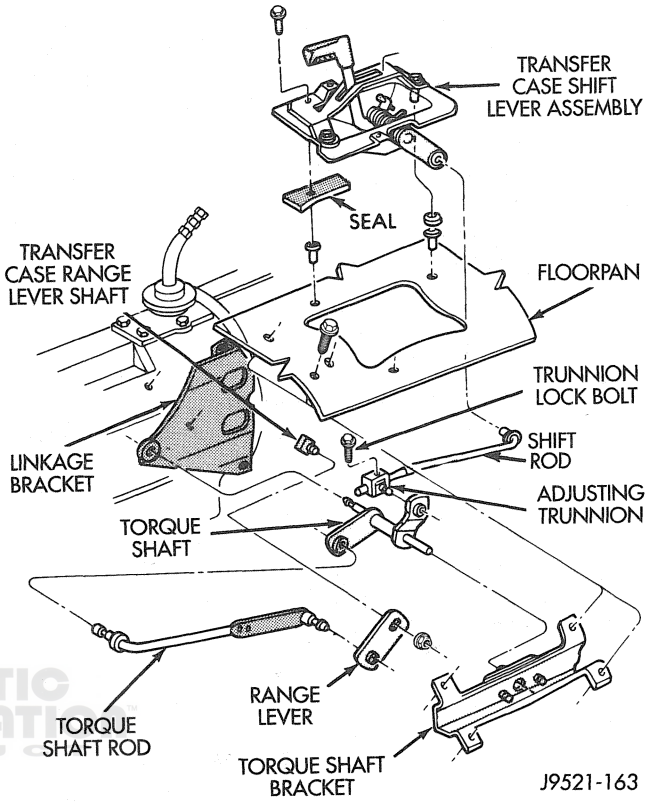


Fig. 87 Shift Linkage

ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT

(1) Shift transfer case into 4L position.
(2) Raise vehicle.
(3) Loosen lock bolt on adjusting trunnion (Fig. 87).
(4) Be sure linkage rod slides freely in trunnion. Clean rod and apply spray lube if necessary.
(5) Verify that transfer case range lever is fully engaged in 4L position.
(6) Tighten adjusting trunnion lock bolt.
(7) Lower vehicle.

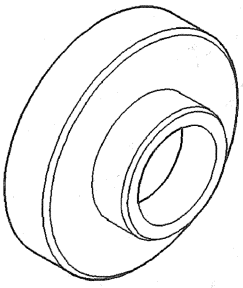
SPECIFICATIONS

TORQUE

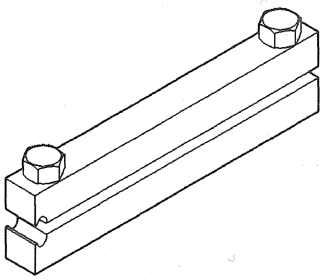
DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Plug, Drain/Fill	40–45 N·m (30–40 ft. lbs.)
Bolt, Extension Housing	35–46 N·m (26–34 ft. lbs.)
Bolt, Front Brg. Retainer	21 N·m (16 ft. lbs.)
Bolt, Case Half	27–34 N·m (20–25 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35–47 N·m (26–35 ft. lbs.)
Switch, Indicator	20–34 N·m (15–25 ft. lbs.)

SPECIAL TOOLS

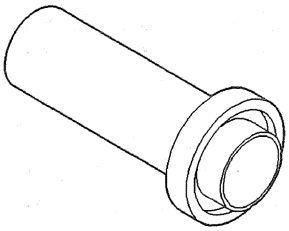
NV231



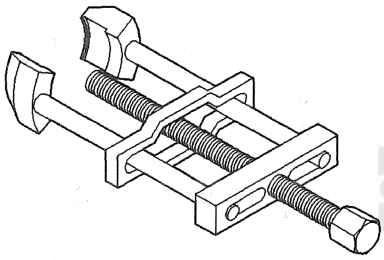
Installer—C-4076-B



Installer, Boot Clamp—C-4975-A

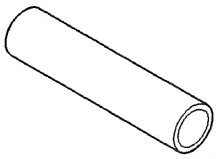


Installer, Seal—8143

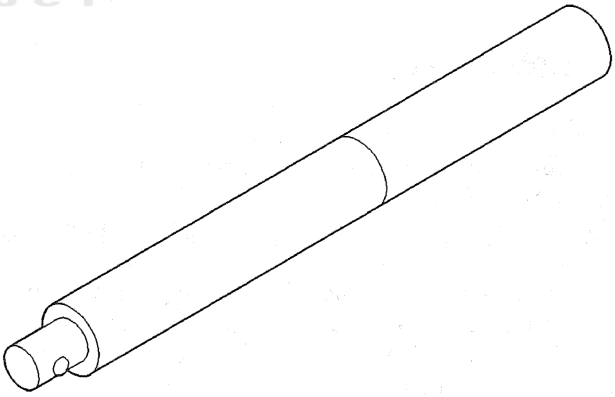


Puller, Slinger—MD-998056–A

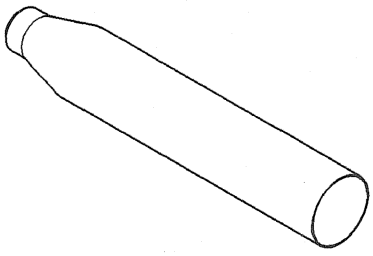
Mopar AUTHENTIC RESTORATION PRODUCT



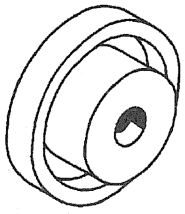
Installer—MD-998323



Handle, Universal—C-4171

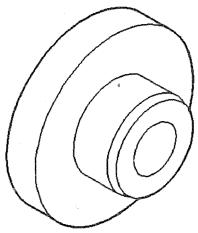


Seal Protector—6992

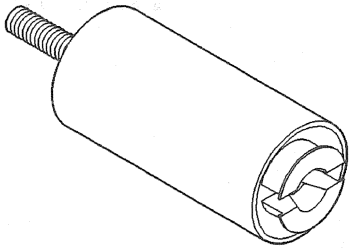


Installer, Seal—C-4210

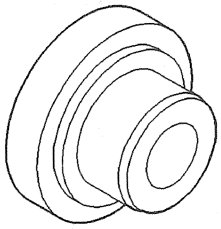
SPECIAL TOOLS (Continued)



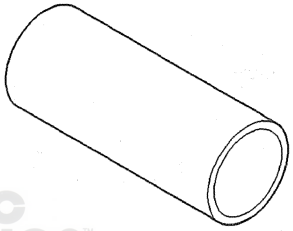
Installer, Bearing—5064



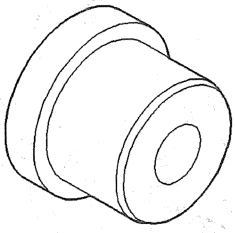
Remover—L-4454



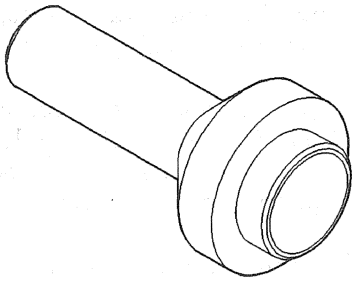
Installer, Bearing—5065



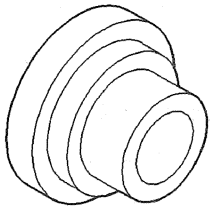
Cup—8148



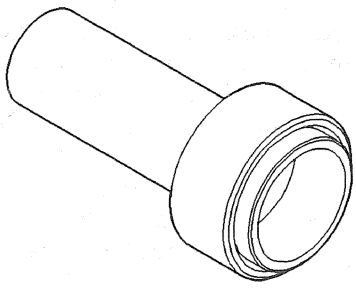
Installer, Bushing—5066



Installer, Seal—7884



Installer, Bearing—8128



Installer, Pump Housing Seal—7888

Mopar AUTHENTIC RESTORATION PRODUCT

NV242 TRANSFER CASE

INDEX

page

GENERAL INFORMATION
NV242 TRANSFER CASE 28
RECOMMENDED LUBRICANT AND FILL LEVEL . 29
TRANSFER CASE IDENTIFICATION 29
DIAGNOSIS AND TESTING
NV242 DIAGNOSIS 30
REMOVAL AND INSTALLATION
FRONT OUTPUT SHAFT SEAL 33
SHIFT LEVER 31
SPEEDOMETER 31
TRANSFER CASE 31

page

DISASSEMBLY AND ASSEMBLY
NV242 TRANSFER CASE 34
CLEANING AND INSPECTION
NV242 TRANSFER CASE 53
ADJUSTMENTS
SHIFT LINKAGE ADJUSTMENT 56
SPECIFICATIONS
TORQUE 56
SPECIAL TOOLS
NV242 57

GENERAL INFORMATION

NV242 TRANSFER CASE

The NV242 is a full and part-time transfer case (Fig. 1). It provides full time 2-wheel, or 4-wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

The input gear is splined to the transmission output shaft. It drives the mainshaft through the planetary gear and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchro mechanism for shifting.

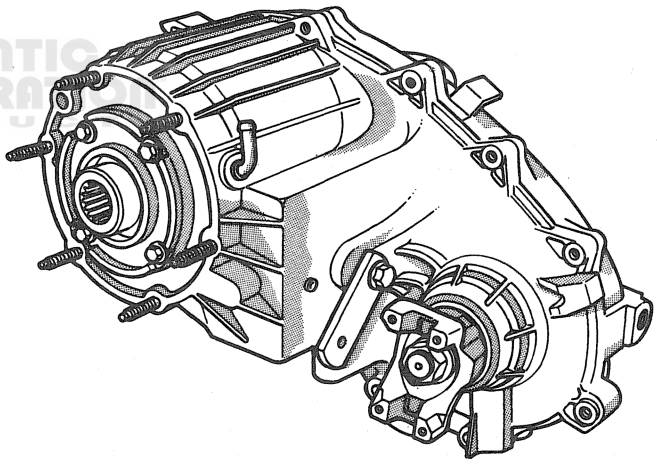
The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

NV242 operating ranges are 2WD (2-wheel drive), 4x4 part-time, 4x4 full time, and 4 Lo.

The 2WD and 4x4 full time ranges can be used at any time and on any road surface.

The 4x4 part-time and 4 Lo ranges are for off road use only. The only time these ranges can be used on hard surface roads, is when the surface is covered with snow and ice.



J8921-243

Fig. 1 NV242 Transfer Case

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate, or on the shift knob.

GENERAL INFORMATION (Continued)

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 2). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

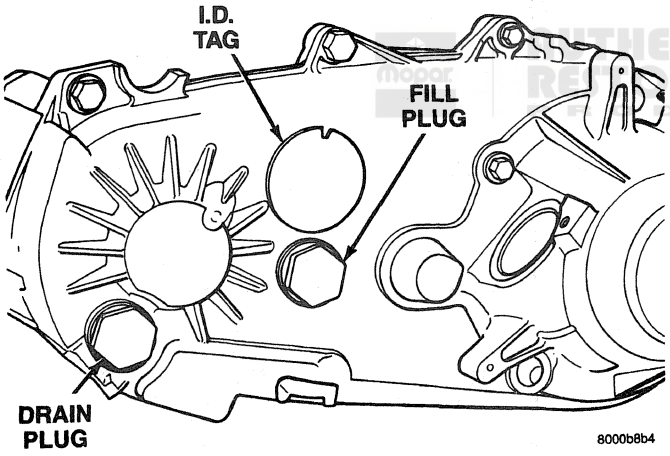


Fig. 2 Fill/Drain Plug And I.D. Tag Locations

RECOMMENDED LUBRICANT AND FILL LEVEL

Recommended lubricant for the NV242 transfer case is Mopar® Dexron II, or ATF Plus. Approximate lubricant fill capacity is 1.35 liters (2.85 pints).

The fill and drain plugs are both in the rear case (Fig. 1). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

DIAGNOSIS AND TESTING

NV242 DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Transfer case external shift linkage binding.	(1) Lubricate, repair or replace linkage, or tighten loose components as necessary.
	(2) Insufficient or incorrect lubricant.	(2) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid.
	(3) Internal components binding, worn or damaged.	(3) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE POSITIONS	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. Check for leaks and repair if necessary **Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.**
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clear or replace vent if necessary.
	(3) Output shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.
TRANSFER CASE WILL NOT SHIFT THROUGH 4 X 4 PART-TIME RANGE (Light Remains On).	(1) Incomplete shift due to drivetrain torque load.	(1) Driver must momentarily release the accelerator pedal to complete the shift.
	(2) Incorrect tire pressure(s).	(2) Inflate all tires equally to correct pressure.
	(3) Excessive tire wear.	(3) Switch tires — Install the two tires with the most wear (one on the front axle and one on the rear axle).
	(4) Excessive vehicle loading.	(4) Check vehicle loading — **Do not exceed the vehicle's GVW.**

Mopar AUTHENTIC RESTORATION PRODUCT

REMOVAL AND INSTALLATION

TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.
(2) Raise vehicle.
(3) Drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember, or skid plate.
(7) Disconnect front/rear propeller shafts at transfer case.
(8) Disconnect vehicle speed sensor wires.
(9) Disconnect transfer case linkage rod from range lever.
(10) Disconnect transfer case vent hose (Fig. 3) and indicator switch harness, if necessary.
(11) Support transfer case with transmission jack.
(12) Secure transfer case to jack with chains.
(13) Remove nuts attaching transfer case to transmission.
(14) Pull transfer case and jack rearward to disengage transfer case.
(15) Remove transfer case from under vehicle.

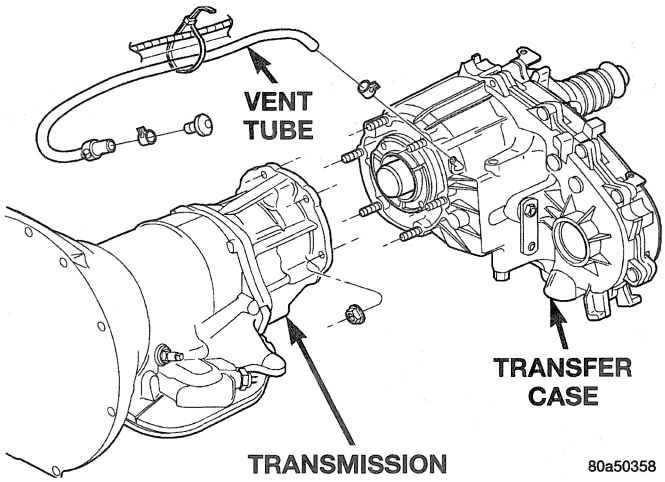


Fig. 3 Transfer Case Mounting

INSTALLATION

(1) Mount transfer case on a transmission jack.
(2) Secure transfer case to jack with chains.
(3) Position transfer case under vehicle.
(4) Align transfer case and transmission shafts and install transfer case on transmission.
(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 3).
(6) Connect vehicle speed sensor wires, and vent hose.
(7) Connect indicator switch harness to transfer case switch, if necessary. Secure wire harness to clips on transfer case.
(8) Align and connect propeller shafts. Tighten shaft attaching bolts to 19 N·m (170 in. lbs.) torque.
(9) Fill transfer case with correct fluid. Refer to Recommended Lubricant And Fill Level section for proper fluid and capacity.
(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
(11) Remove transmission jack and support stand.
(12) Connect shift rod to transfer case range lever.
(13) Adjust transfer case shift linkage.
(14) Lower vehicle and verify transfer case shift operation.

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.
(2) Raise vehicle.
(3) Loosen adjusting trunnion locknut and slide shift rod out of trunnion (Fig. 4). If rod lacks enough travel to come out of trunnion, push trunnion out of torque shaft.
(4) Lower vehicle.
(5) Remove console. Refer to Group 23, Body, for proper procedures.
(6) Remove screws attaching lever assembly to floorpan and remove assembly and shift rod (if left attached).

INSTALLATION

(1) If shift rod was not removed from lever assembly, work rod down through floorpan opening. Then position lever assembly on floorpan and install assembly attaching screws.
(2) Install console. Refer to Group 23, Body, for proper procedures.
(3) Raise vehicle.
(4) Connect trunnion to torque shaft arm. Or, slide shift rod into trunnion on range lever. Be sure shift rod slides freely in trunnion.
(5) Verify that range lever is in 4L position. Then tighten trunnion lock bolt.
(6) Lower vehicle and check transfer case shift operation.

SPEEDOMETER

REMOVAL

(1) Raise vehicle.
(2) Disconnect wires from vehicle speed sensor.
(3) Remove adapter clamp and screw (Fig. 5).
(4) Remove speed sensor and speedometer adapter as an assembly.
(5) Remove speed sensor retaining screw and remove sensor from adapter.
(6) Remove speedometer pinion from adapter. Replace pinion if chipped, cracked, or worn.
(7) Inspect sensor and adapter O-rings (Fig. 5). Remove and discard O-rings if worn or damaged.

REMOVAL AND INSTALLATION (Continued)

	TORQUE
A	3-4 N•m (27-35 in. lbs.)
B	11-14 N•m (97-123 in. lbs.)
C	8-14 N•m (72-120 in. lbs.)

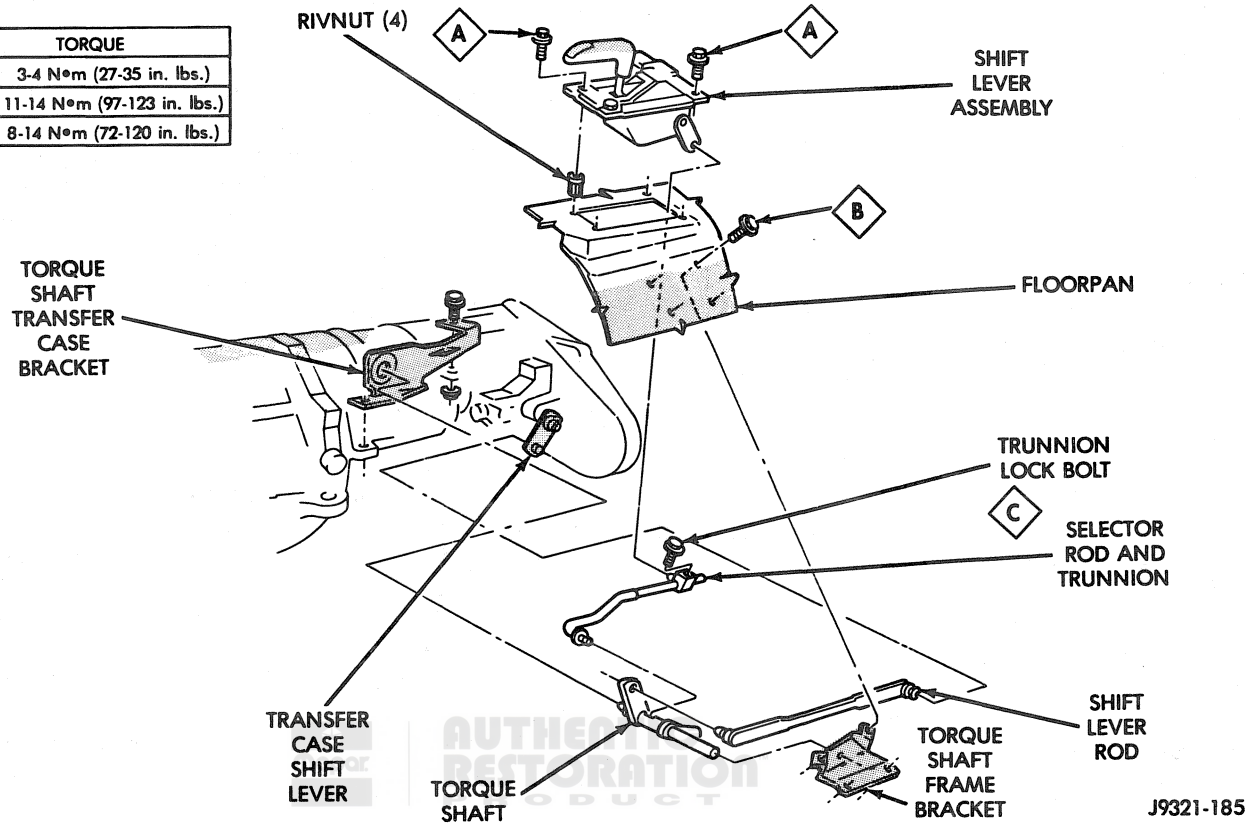


Fig. 4 Shift Linkage

(8) Inspect terminal pins in speed sensor. Clean pins with Mopar® electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or if pins are loose, severely corroded, or damaged.

INSTALLATION AND INDEXING

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean

ITEM	TORQUE
A	2-3 N•m (15-27 in. lbs.)
B	10-12 N•m (90-110 in. lbs.)

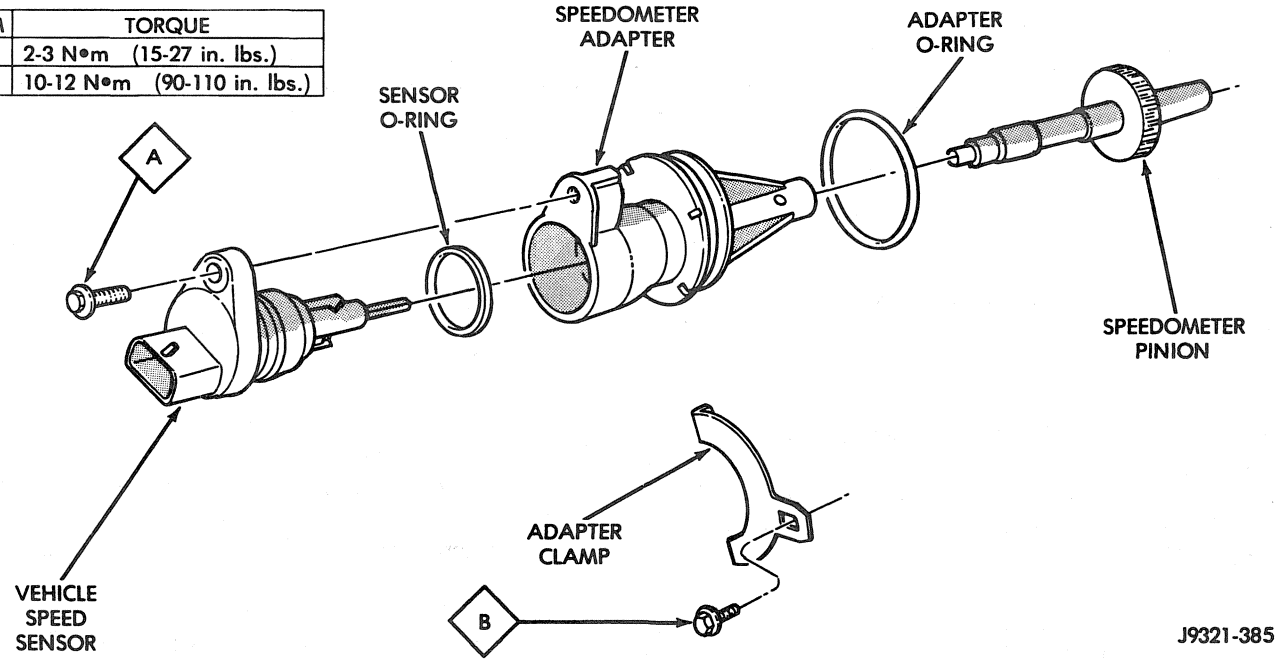


Fig. 5 Speedometer Components

REMOVAL AND INSTALLATION (Continued)

for proper adapter alignment and speedometer operation.

(2) Install new O-rings on speed sensor and speedometer adapter (Fig. 5), if necessary.

(3) Lubricate sensor and adapter O-rings with transmission fluid.

(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.

(5) Install speedometer pinion in adapter.

(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

(7) Note index numbers on adapter body (Fig. 6). These numbers will correspond to number of teeth on pinion.

(8) Install speedometer assembly in housing.

(9) Rotate adapter until required range numbers are at 6 o-clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

(12) Lower vehicle and top off transmission fluid level if necessary.

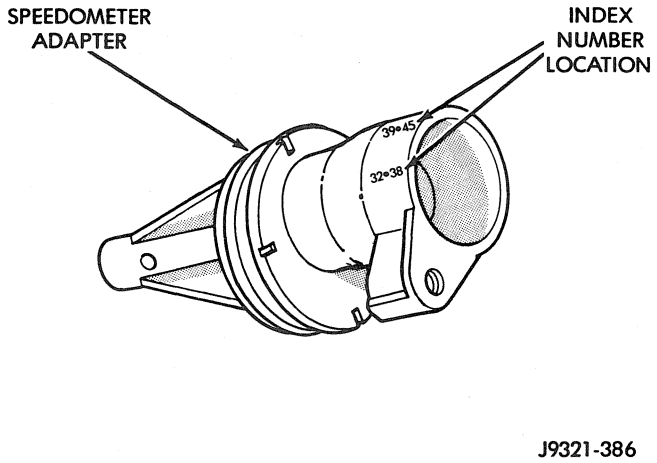


Fig. 6 Location Of Index Numbers On Speedometer Adapter

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

(3) Remove front output shaft yoke.

(4) Remove seal from front case with pry tool (Fig. 7).

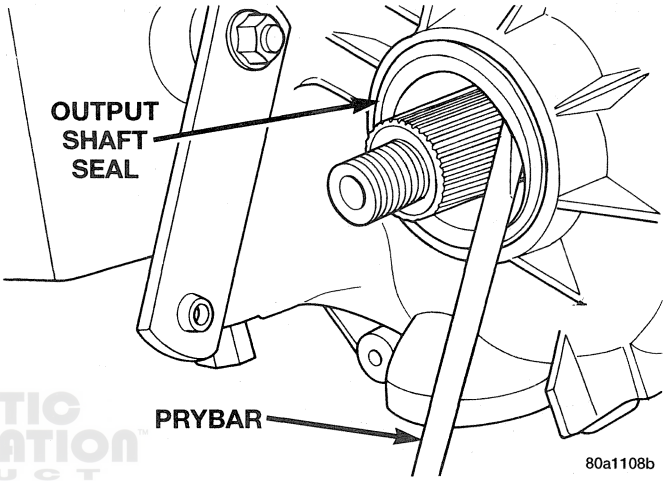


Fig. 7 Remove Front Output Shaft Seal

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 8). Once seal is started, continue tapping seal into bore until installer tool seats against case.

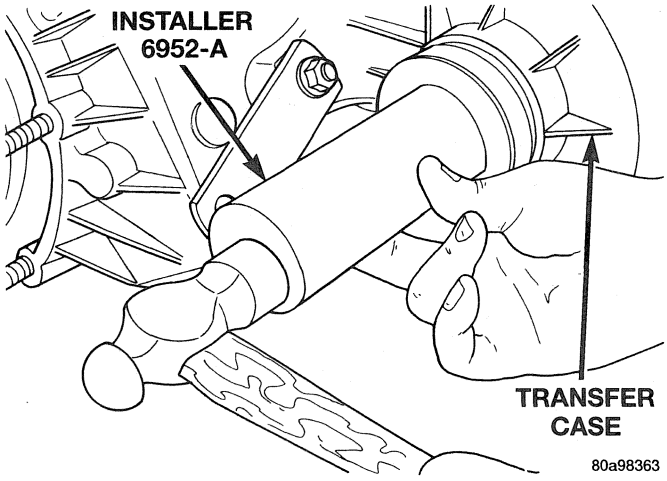


Fig. 8 Front Output Seal Installation

DISASSEMBLY AND ASSEMBLY

NV242 TRANSFER CASE

DISASSEMBLY

REAR RETAINER REMOVAL

(1) Remove output shaft boot. Spread band clamp that secures boot on slinger with a suitable awl. Then slide boot off shaft (Fig. 9).

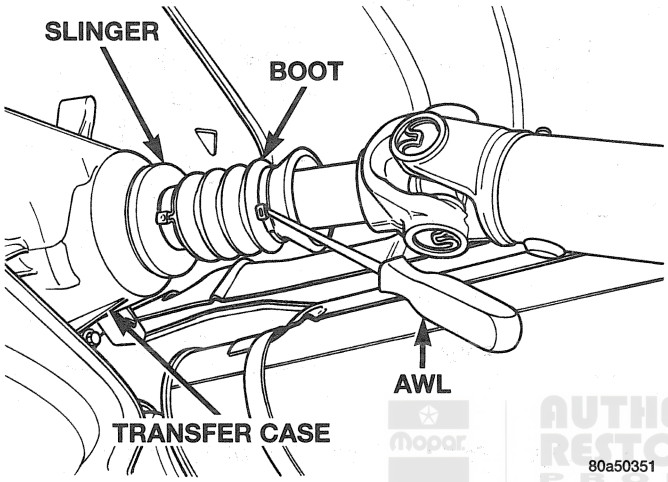


Fig. 9 Output Boot—Typical

(2) Using puller MD-998056-A, remove rear slinger (Fig. 10).

(3) Remove slinger stop spacer and snap-ring from output shaft (Fig. 11).

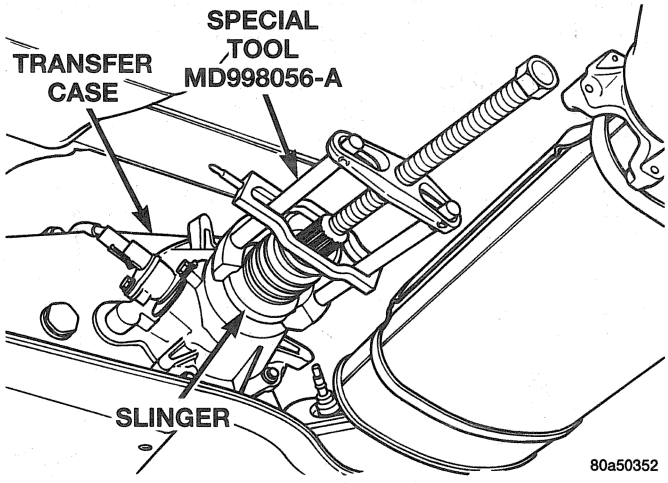


Fig. 10 Rear Slinger Removal

(4) Remove rear seal from retainer (Fig. 12). Use pry tool, or collapse seal with punch to remove it.

(5) Remove rear output bearing I.D. retaining ring (Fig. 13).

(6) Remove speedometer adapter.

(7) Remove rear retainer bolts.

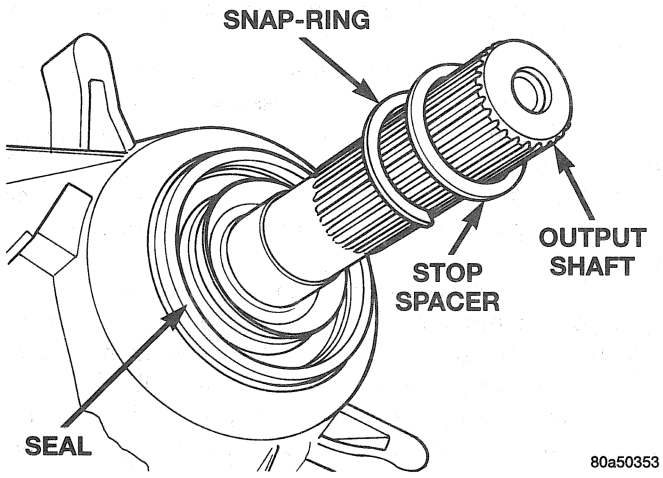


Fig. 11 Slinger Stop Spacer and Snap-ring

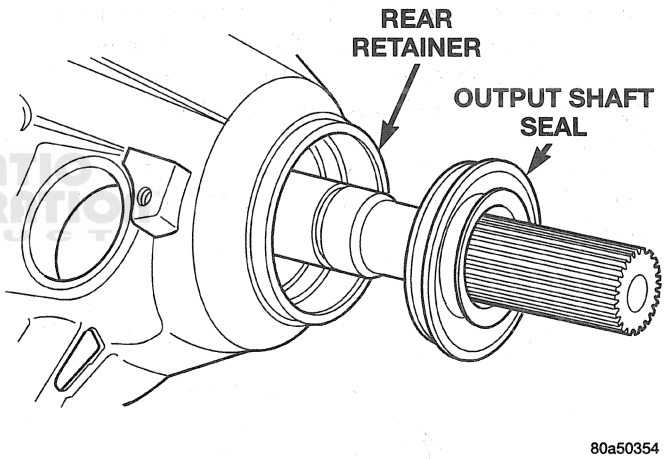


Fig. 12 Rear Seal Removal

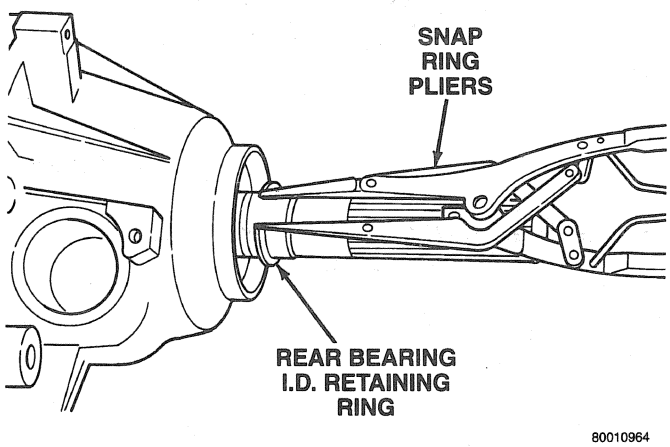


Fig. 13 Rear Bearing I.D. Retaining Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Remove rear retainer. Tap retainer with mallet and pry upward to break sealer bead. Then slide retainer off case and output shaft (Fig. 14).

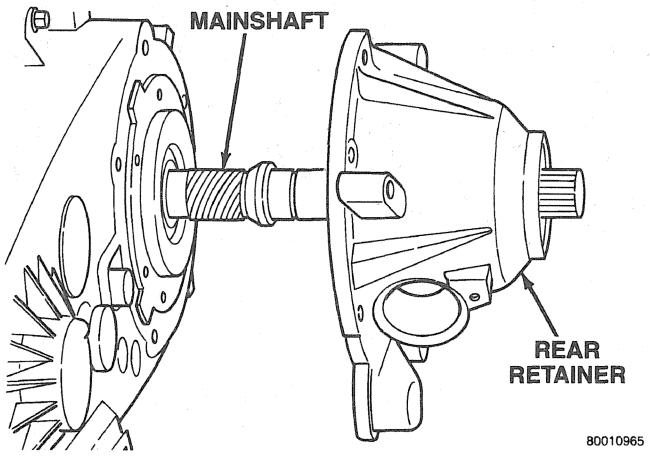


Fig. 14 Rear Retainer Removal

(9) Remove rear bearing O.D. retaining ring with snap ring pliers. Then tilt pump and slide it off output shaft (Fig. 15)

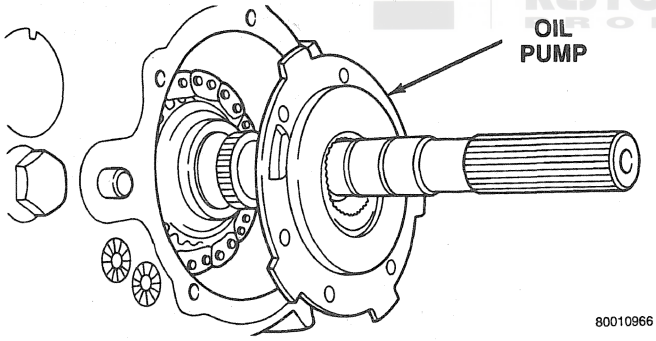


Fig. 15 Oil Pump Removal

(10) Remove pickup tube O-ring from pump (Fig. 16) but do not disassemble pump; it is not a repairable part.

(11) Remove seal from oil pump with pry tool.

(12) Remove bolts attaching rear case to front case (Fig. 17). Note position of the two black finish bolts at each end of the case. These bolts go through the case dowels and require a washer under the bolt head.

(13) Remove rear case from front case (Fig. 18). Insert screwdrivers into slots cast into each end of case. Then pry upward to break sealer bead and remove rear case.

CAUTION: Do not pry on the sealing surface of either case half as the surfaces will become damaged.

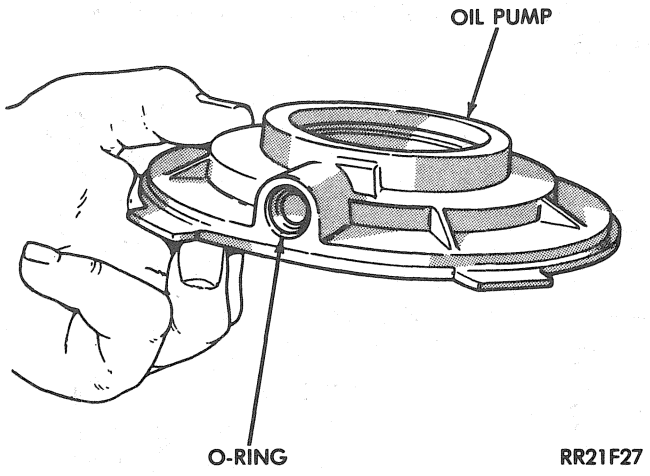


Fig. 16 Pickup Tube O-Ring Location

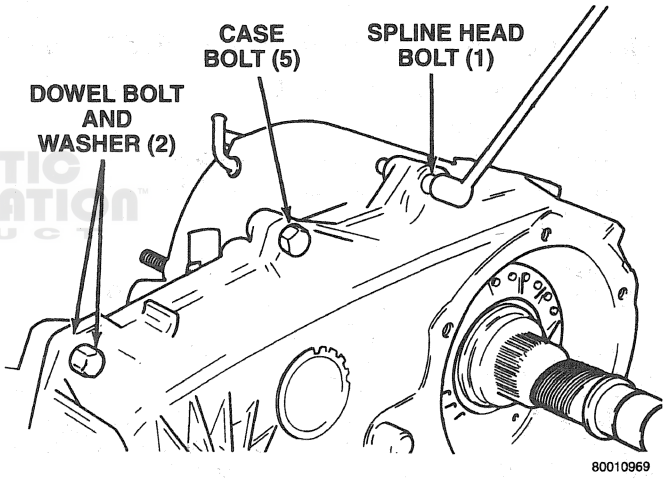


Fig. 17 Spline And Dowel Bolt Locations

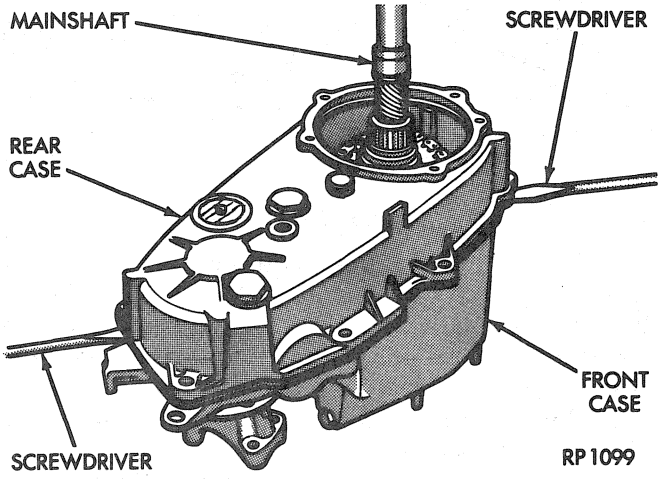


Fig. 18 Loosening/Removing Rear case

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Remove oil pickup tube and screen from rear case (Fig. 19).

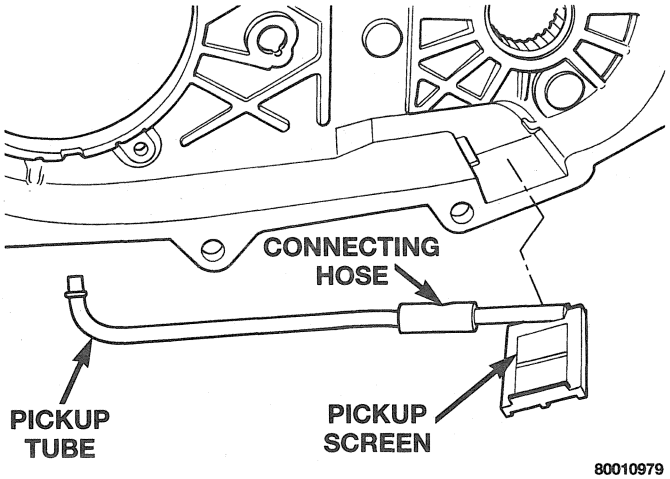


Fig. 19 Oil Pickup Screen, Hose And Tube Removal

YOKE AND RANGE LEVER REMOVAL

(1) Remove front yoke nut:
(a) Move range lever to 4L position.
(b) Remove nut with socket and impact wrench (Fig. 20).

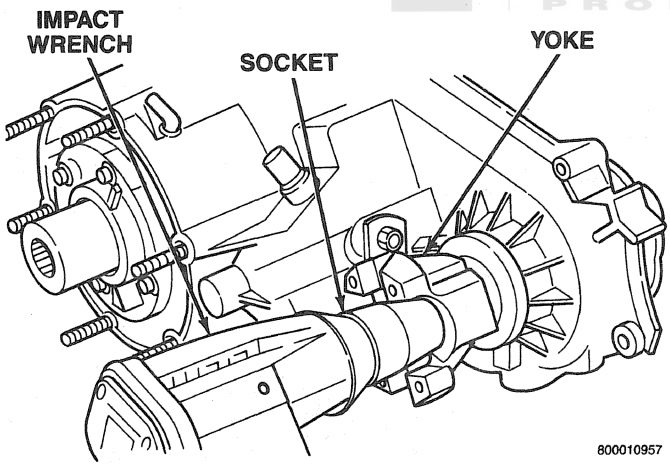


Fig. 20 Yoke Nut Removal

(2) Remove yoke. If yoke is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller (Fig. 21). Be sure puller tool is positioned on yoke and not on slinger as slinger will be damaged.

(3) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(4) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft (Fig. 22).

FRONT OUTPUT SHAFT AND DRIVE CHAIN REMOVAL

(1) Remove drive sprocket snap-ring (Fig. 23).

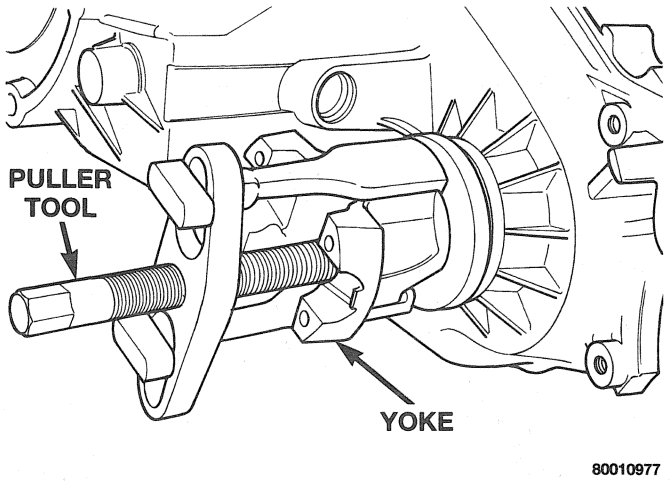


Fig. 21 Yoke Removal

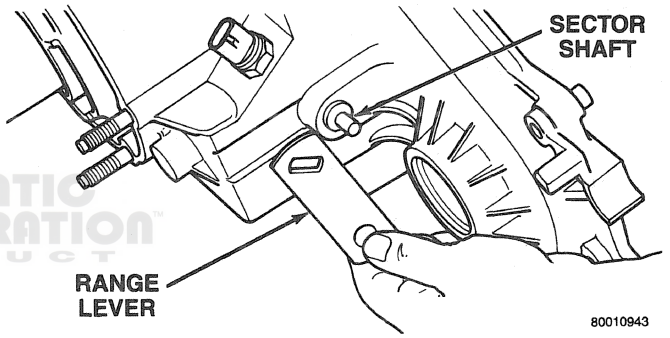


Fig. 22 Range Lever Removal

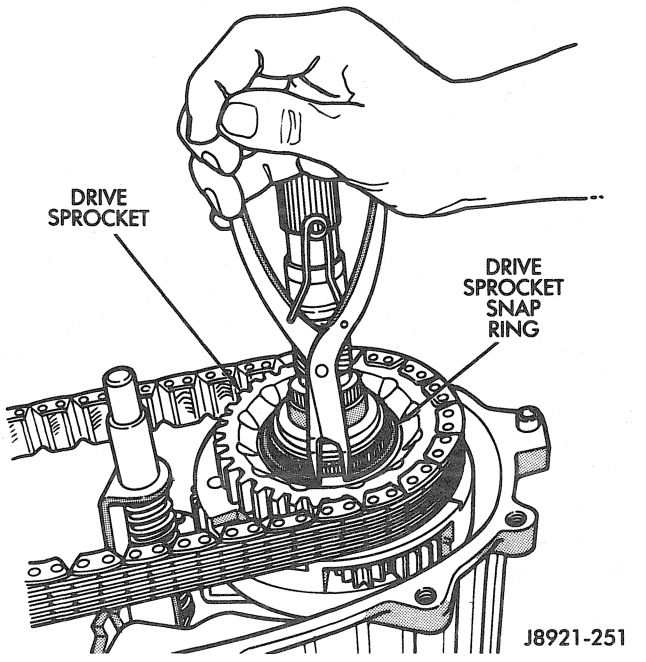


Fig. 23 Drive Sprocket Snap-Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Remove drive sprocket and chain (Fig. 24).
(3) Remove front output shaft (Fig. 25).

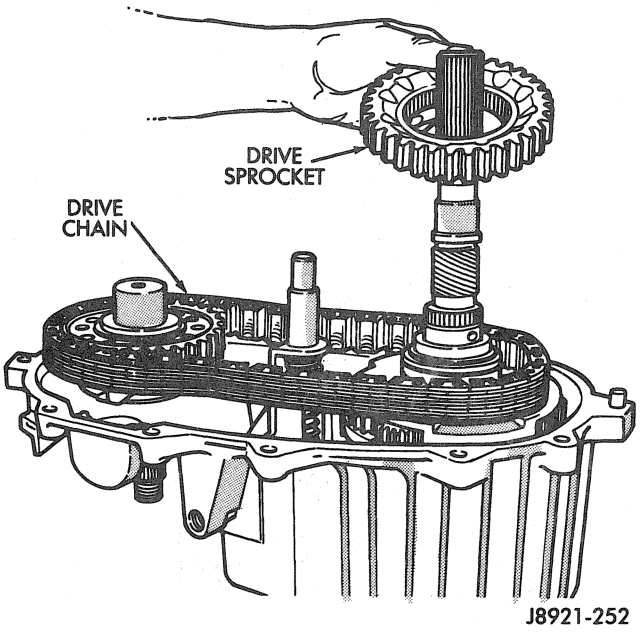


Fig. 24 Drive Sprocket And Chain Removal

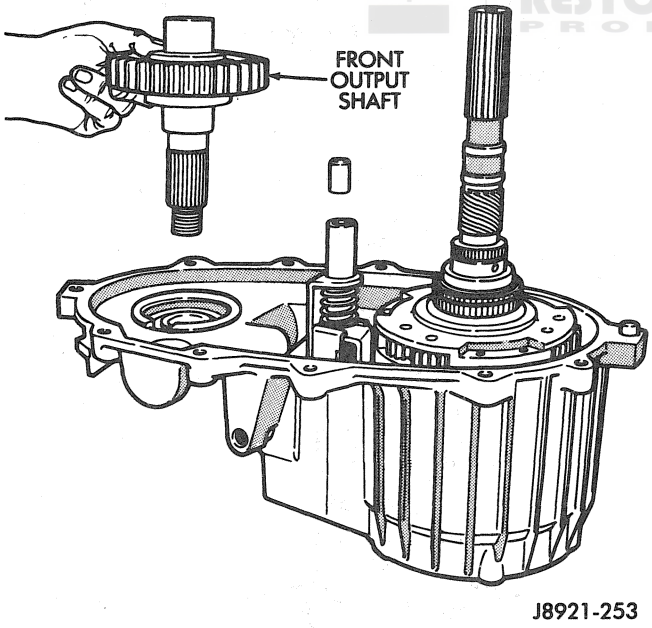


Fig. 25 Removing Front Output Shaft

SHIFT FORKS AND MAINSHAFT REMOVAL AND DISASSEMBLY

(1) Remove shift detent plug, spring and pin (Fig. 26).

(2) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole.

(3) Remove range fork lockpin with size number one easy-out tool as follows:

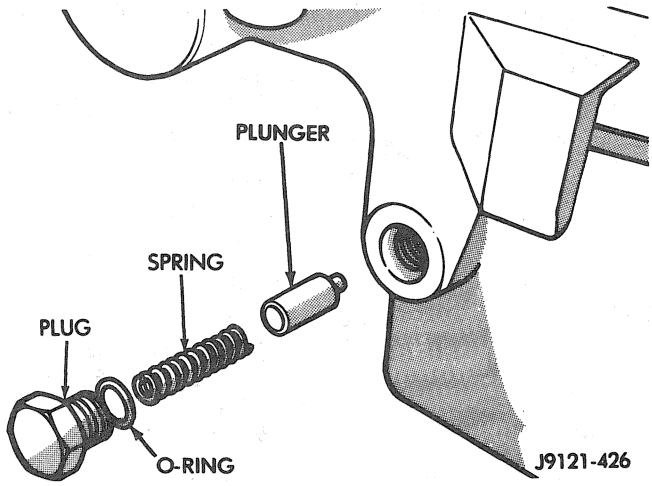


Fig. 26 Detent Component Removal

(a) Insert easy-out tool through access hole in side of transfer case and into lock-pin.

(b) Tap easy-out tool into lock-pin with hammer until tool is securely engaged into the lock-pin.

(c) Install a t-handle, such as from a tap and die set, onto the easy-out tool.

(d) Securely tighten the t-handle onto the tool.

(e) In one motion, pull upward and turn the t-handle counter-clockwise to remove the lock-pin.

(4) Remove shift rail by pulling it straight up and out of fork (Fig. 27).

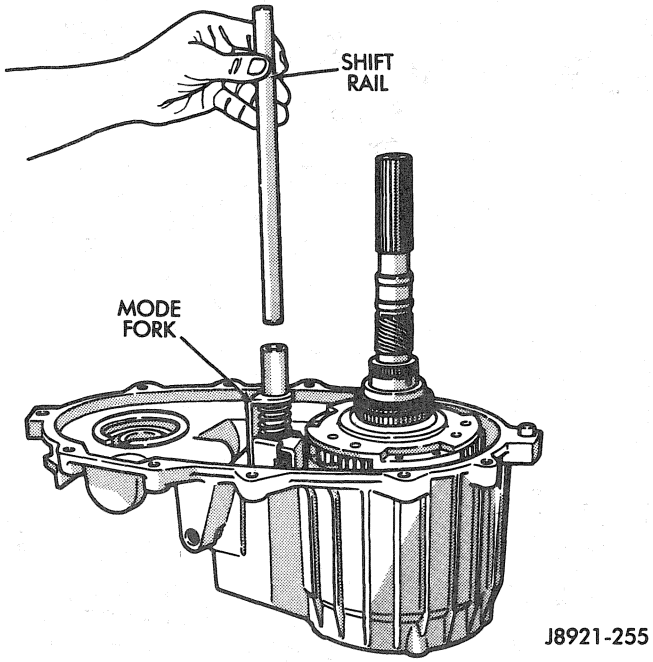


Fig. 27 Shift Rail Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Remove mode fork and mainshaft as assembly (Fig. 28).

(6) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 29). Note position of mode sleeve in fork and remove sleeve.

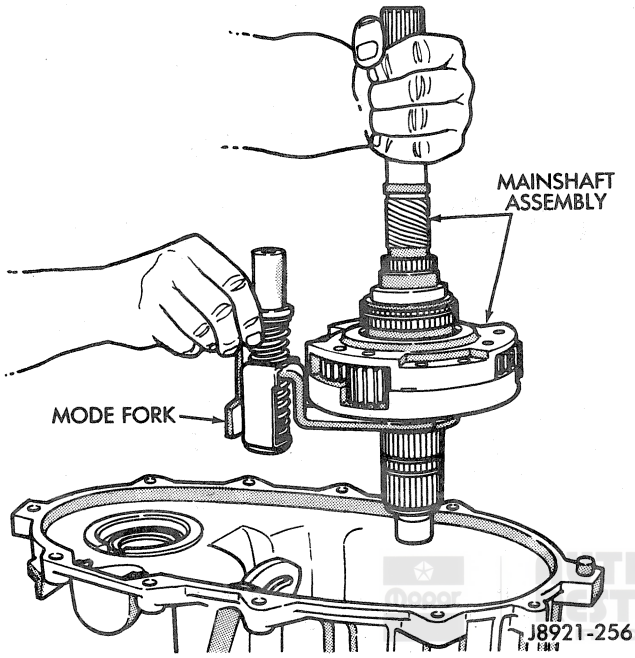


Fig. 28 Mode Fork And Mainshaft Removal

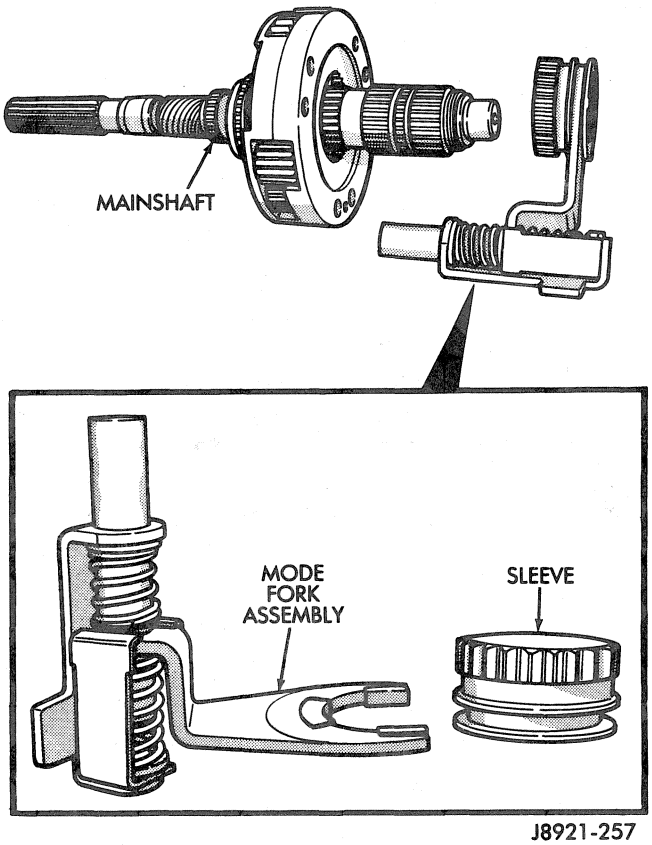


Fig. 29 Mode Fork And Sleeve Removal

(7) Remove intermediate clutch shaft snap-ring (Fig. 30).

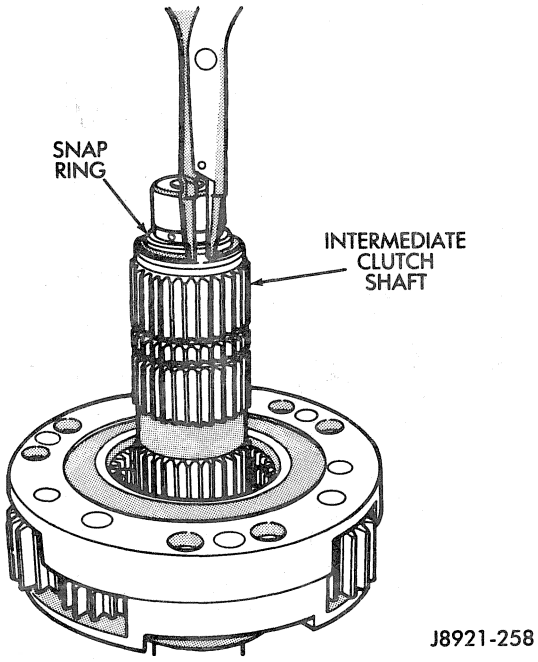


Fig. 30 Intermediate Clutch Shaft Snap-Ring Removal

(8) Remove clutch shaft thrust ring (Fig. 31).

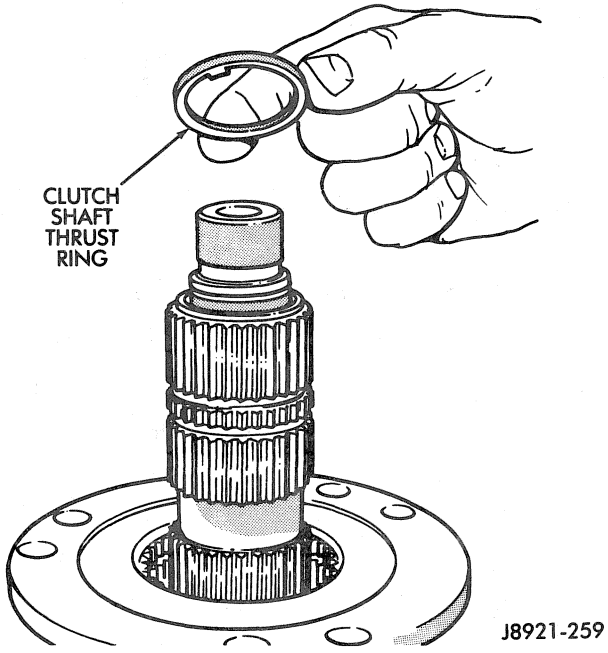


Fig. 31 Clutch Shaft Thrust Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Remove intermediate clutch shaft (Fig. 32).
(10) Remove differential snap-ring (Fig. 33).

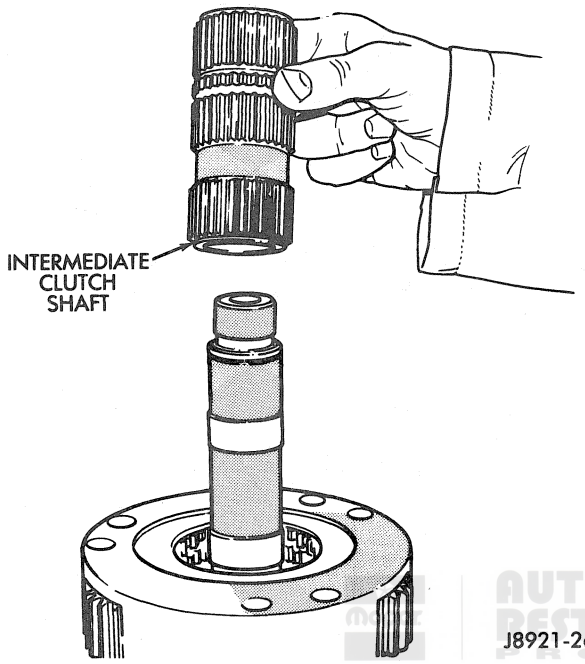


Fig. 32 Intermediate Clutch Shaft Removal

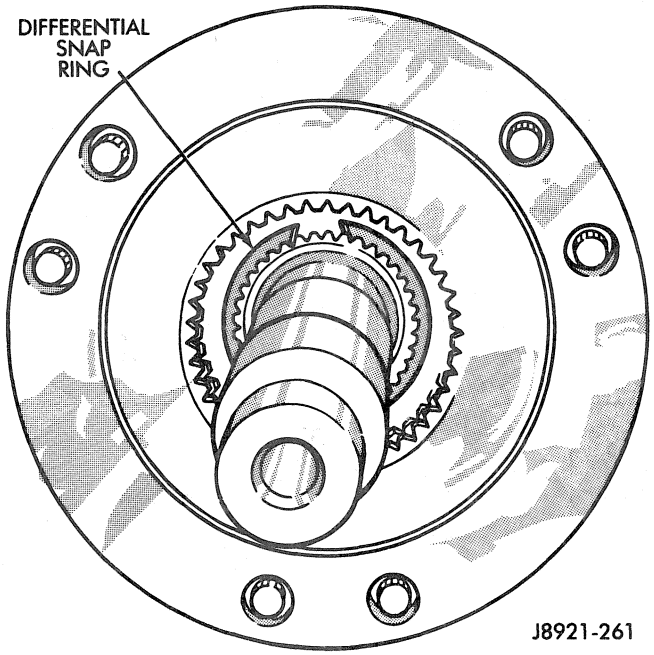


Fig. 33 Differential Snap-Ring Removal

(11) Remove differential (Fig. 34).
(12) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.
(13) Slide low range fork pin out of shift sector slot (Fig. 35).

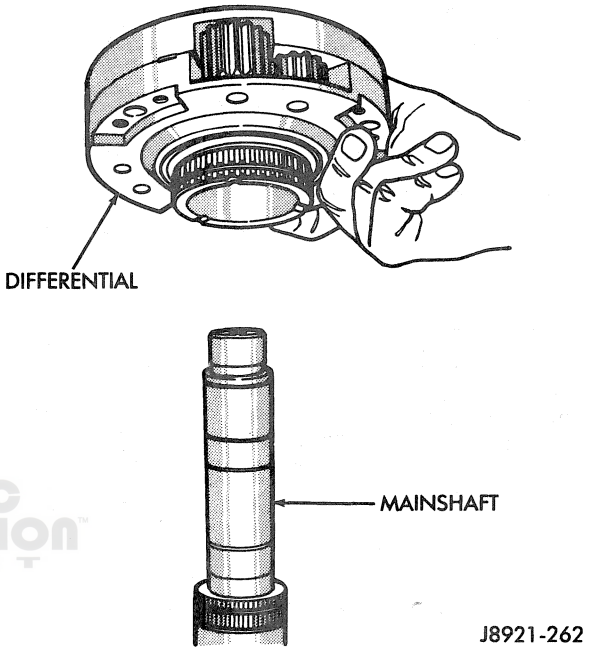


Fig. 34 Differential Removal

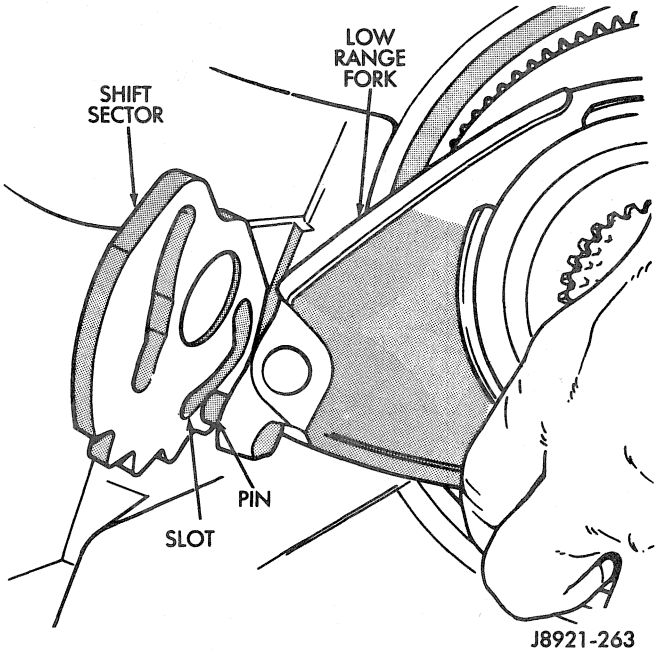


Fig. 35 Disengaging Low Range Fork

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Remove low range fork and hub (Fig. 36).
(15) Remove shift sector (Fig. 37).

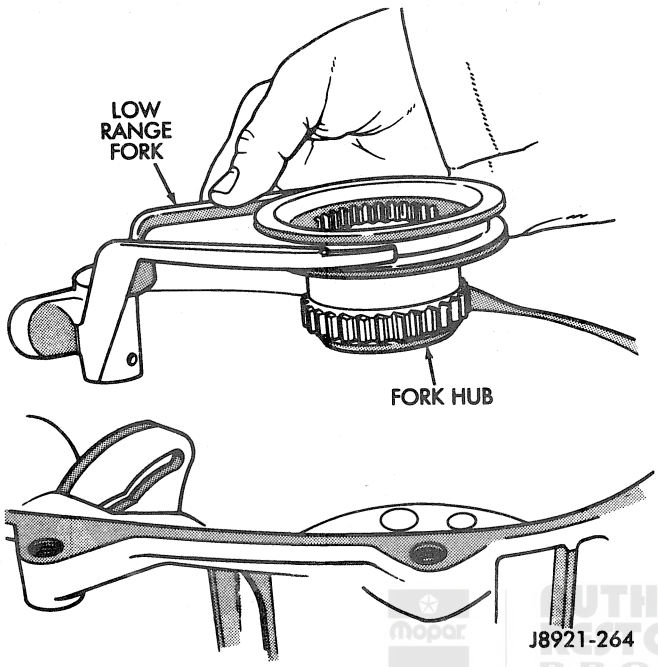


Fig. 36 Low Range Fork And Hub Removal

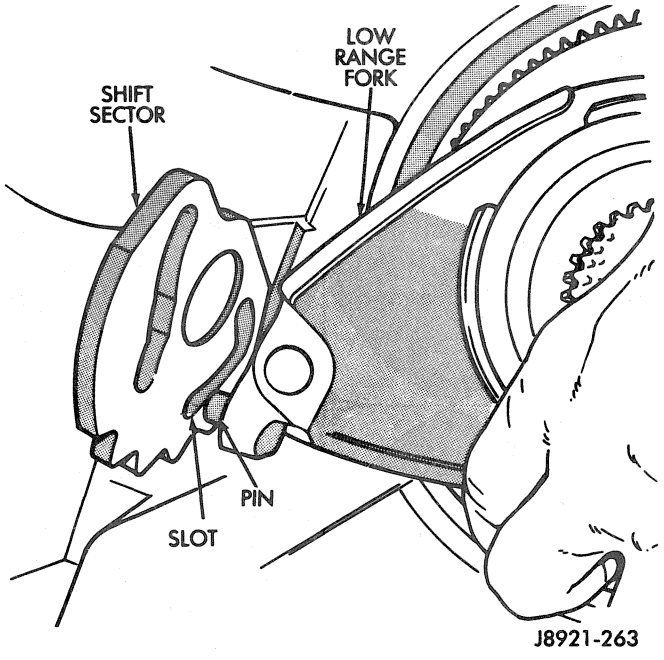


Fig. 37 Shift Sector Position

(16) Remove shift sector bushing and O-ring (Fig. 38).

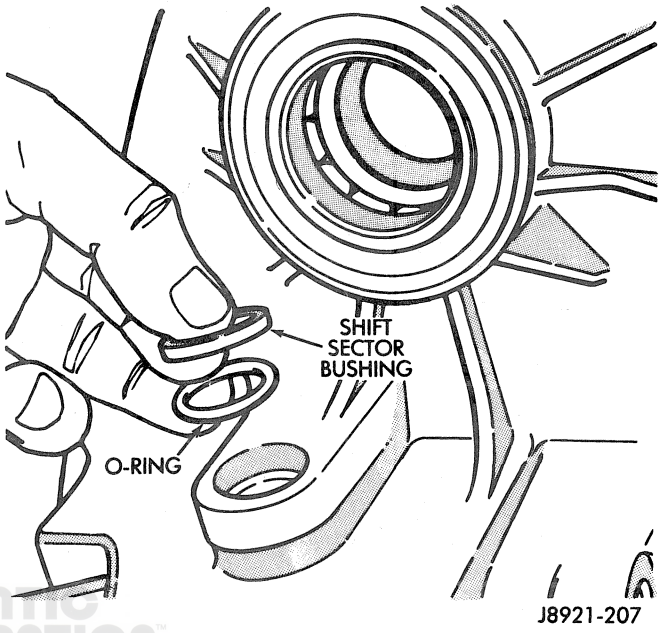


Fig. 38 Sector Bushing And O-Ring Removal

INPUT GEAR/LOW RANGE ASSEMBLY REMOVAL AND DISASSEMBLY

(1) Remove front bearing retainer bolts.
(2) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 39). Position screwdriver in slots cast into retainer.

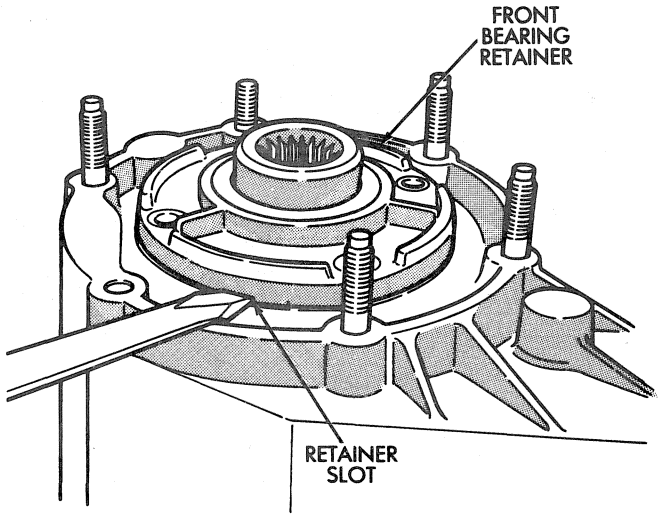


Fig. 39 Front Bearing Retainer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove input gear snap-ring (Fig. 40).

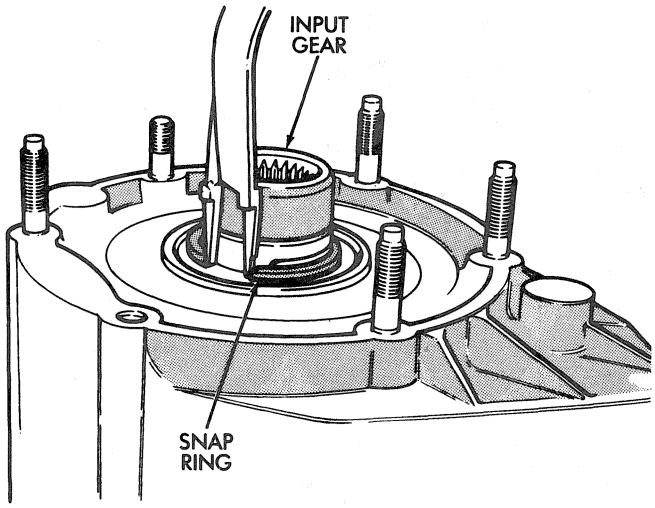


Fig. 40 Input Gear Snap-Ring Removal

(4) Remove input/low range gear assembly from bearing with Tool Handle C-4171 and Tool 7829A (Fig. 41).

(5) Remove low range gear snap-ring (Fig. 42).

(6) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 43).

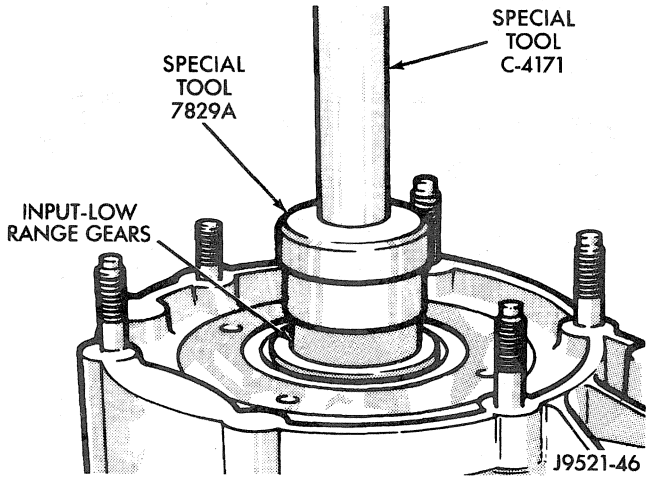


Fig. 41 Input And Low Range Gear Assembly Removal

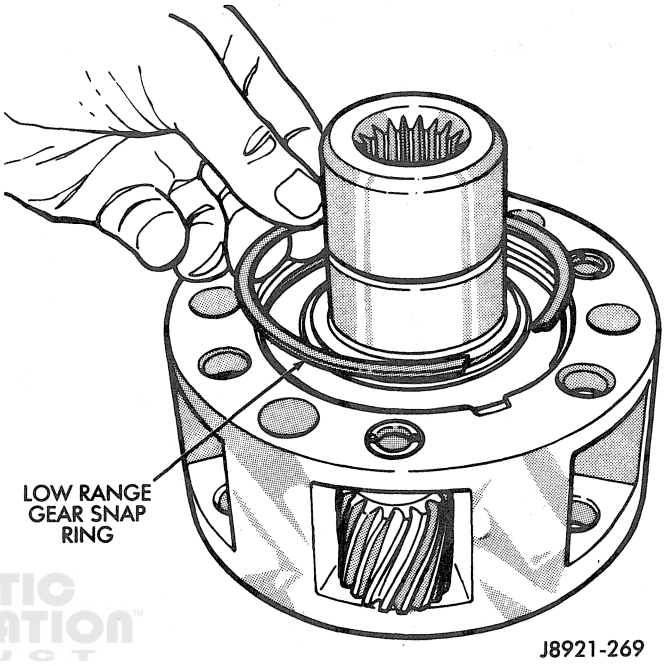


Fig. 42 Low Range Gear Snap-Ring Removal/ Installation

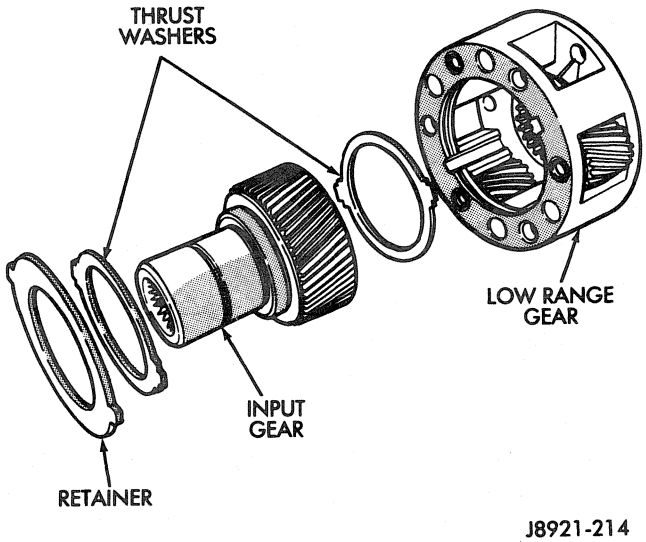


Fig. 43 Low Range Gear Disassembly

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Inspect low range annulus gear (Fig. 44). **Gear is not a serviceable component. If damaged, replace gear and front case as assembly.**

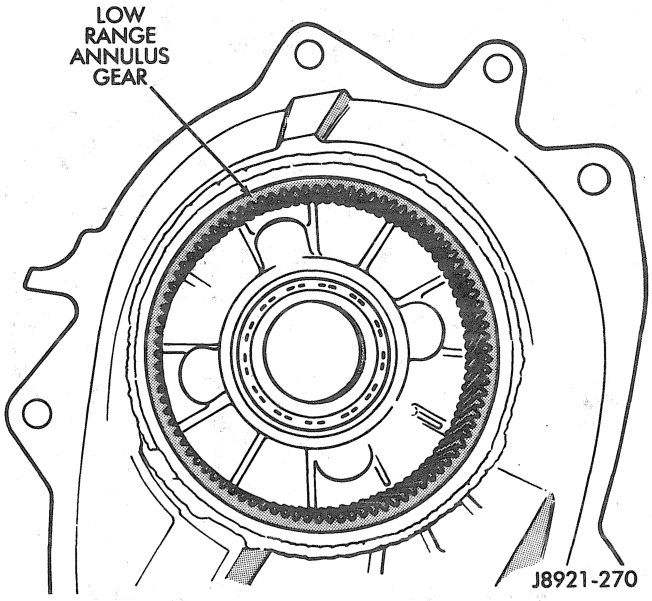


Fig. 44 Inspecting Low Range Annulus Gear

(8) Remove oil seals from following components:
- front bearing retainer.
- rear retainer.
- oil pump.
- case halves.

DIFFERENTIAL DISASSEMBLY

(1) Mark differential case halves for reference.
(2) Remove differential case bolts.
(3) Invert differential on workbench.
(4) Separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 45).
(5) Remove thrust washers and planet gears from case pins (Fig. 46).
(6) Remove mainshaft and sprocket gears from bottom case (Fig. 47). Note gear position for reference before separating them.

ASSEMBLY

Lubricate transfer case components with automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

BEARING AND SEAL INSTALLATION

(1) Remove snap-ring that retains front output shaft front bearing in case (Fig. 48). Then remove bearing. Use hammer handle, or hammer and brass punch to tap bearing out of case.
(2) Install new front output shaft front bearing with Tool Handle C-4171 and Installer 8033A with the tapered cone upward (Fig. 49).
(3) Install front bearing snap-ring (Fig. 48).
(4) Remove front output shaft seal using an appropriate pry tool (Fig. 50) or slide-hammer mounted screw.

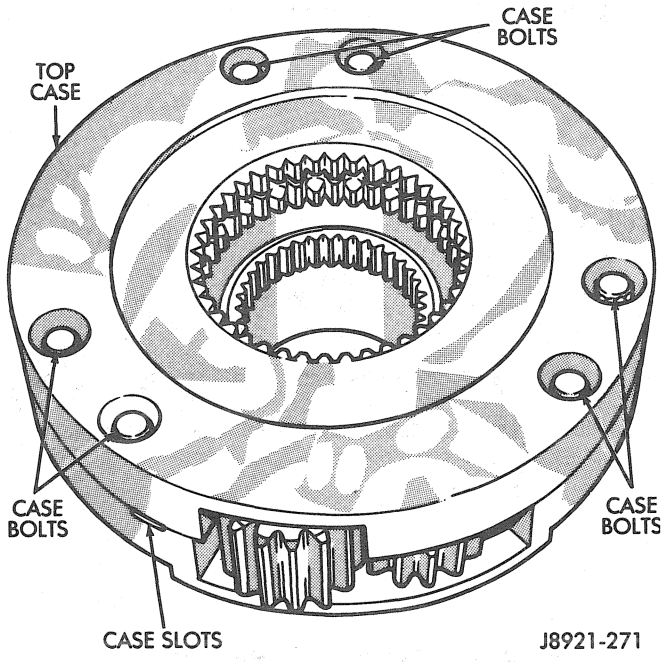


Fig. 45 Separating Differential Case Halves

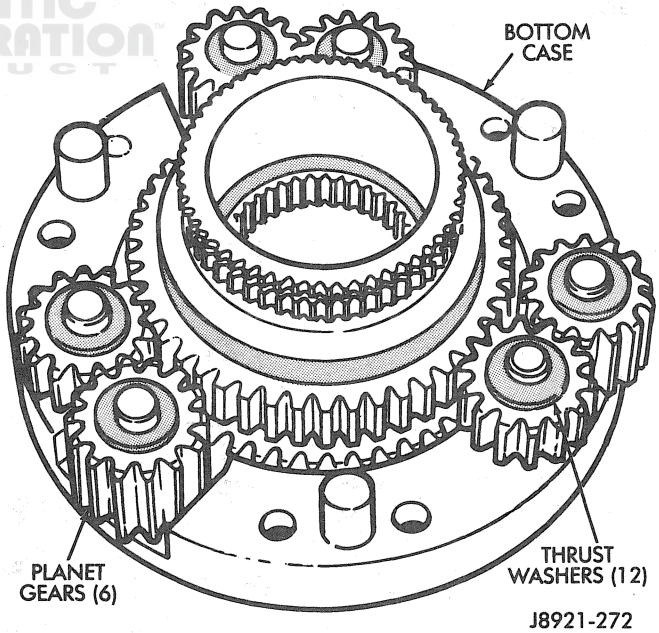


Fig. 46 Planet Gears And Thrust Washer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

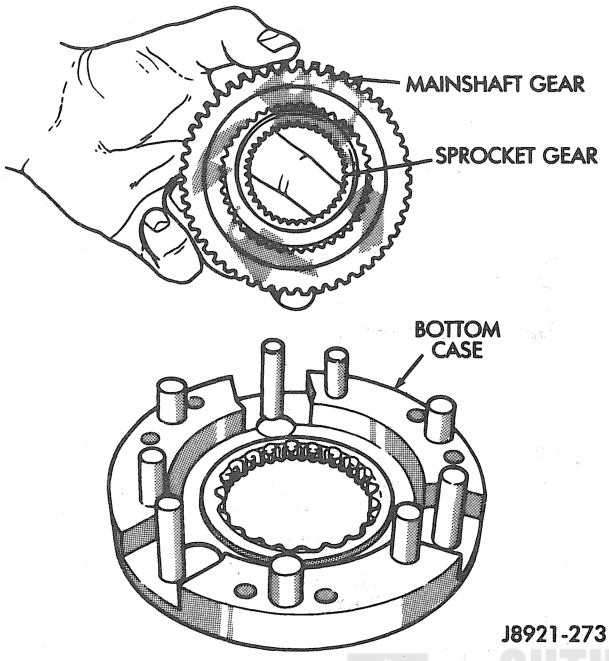


Fig. 47 Mainshaft And Sprocket Gear Removal

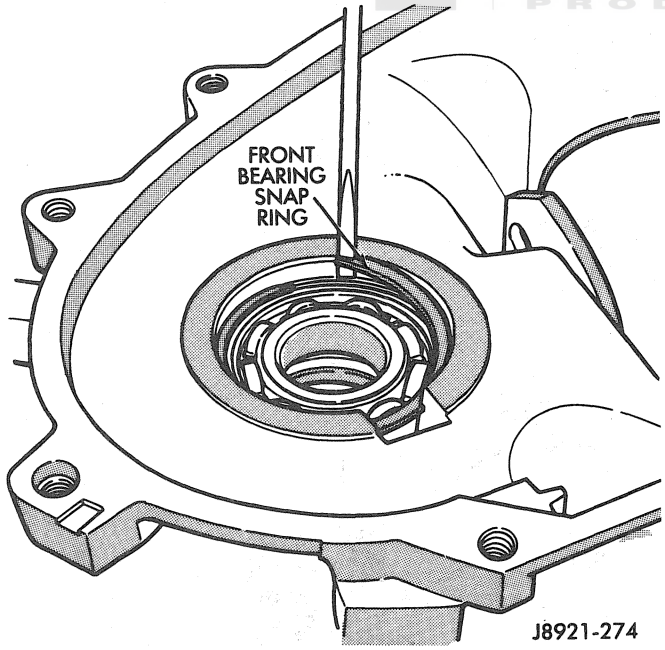


Fig. 48 Front Output Shaft Front Bearing Snap-Ring Removal

(5) Install new front output shaft oil seal with Installer 6952-A (Fig. 51).

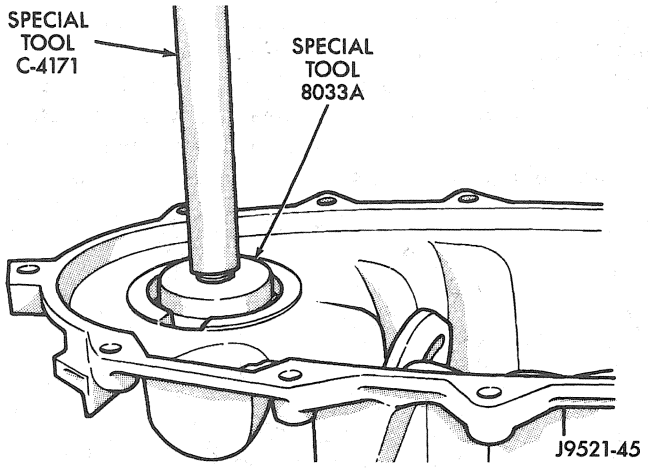


Fig. 49 Front Output Shaft Front Bearing Installation

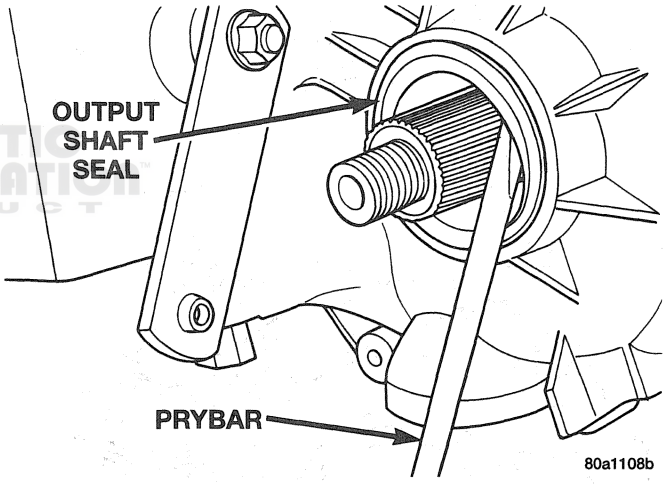


Fig. 50 Remove Front Output Shaft Seal

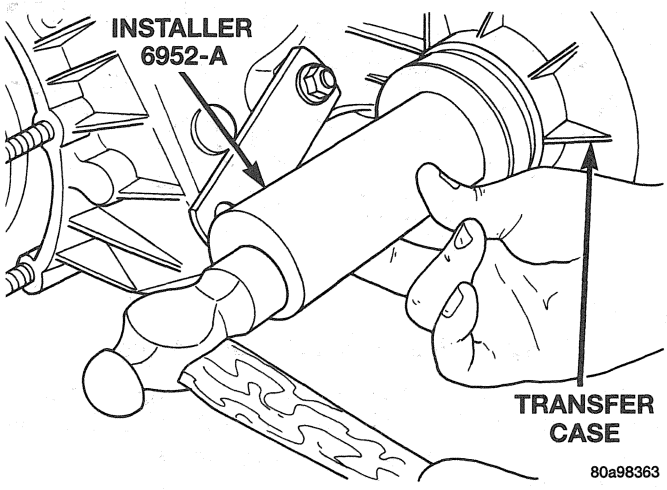


Fig. 51 Install Front Output Shaft Seal

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Remove input gear bearing with Tool Handle C-4171 and Remover C-4210 (Fig. 52).

(7) Install snap-ring on new input gear bearing.

(8) Install new input gear bearing with Tool Handle C-4171 and Remover C-4210. Install bearing far enough to seat snap-ring against case (Fig. 53).

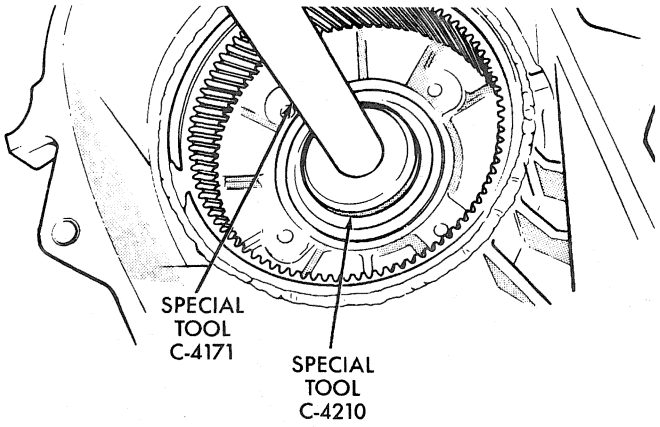


Fig. 52 Input Gear Bearing Removal

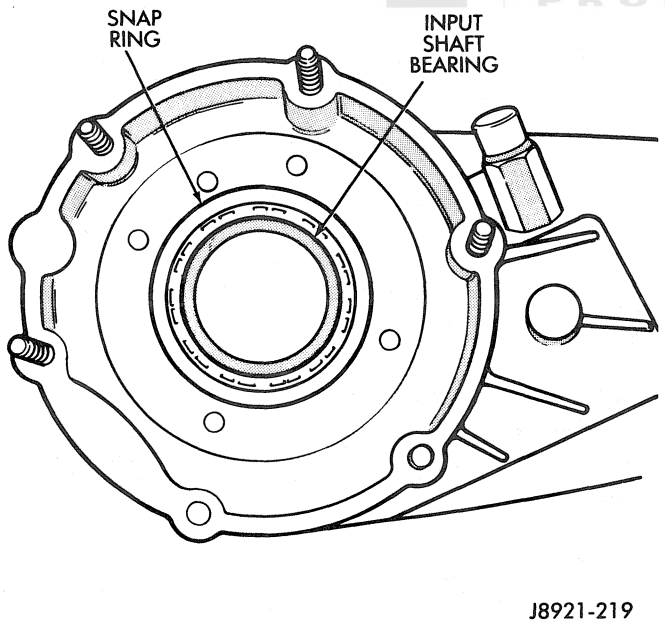


Fig. 53 Seating Input Gear Bearing

(9) Remove the input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 54).

(10) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 55).

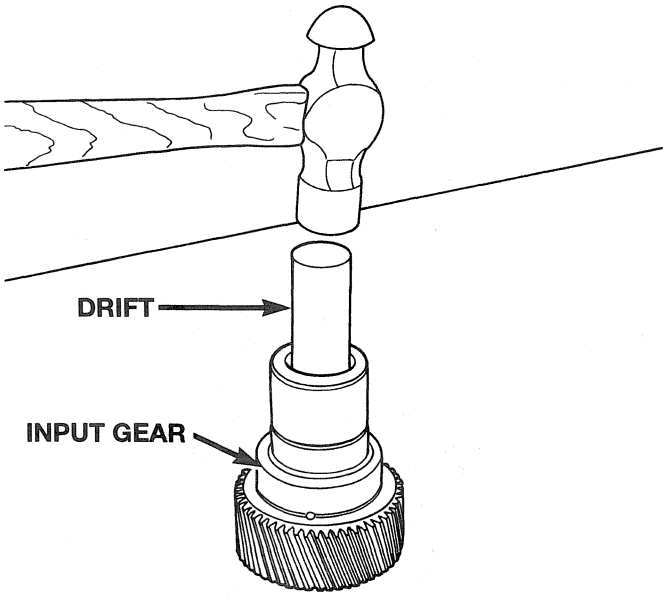


Fig. 54 Remove Input Gear Pilot Bearing

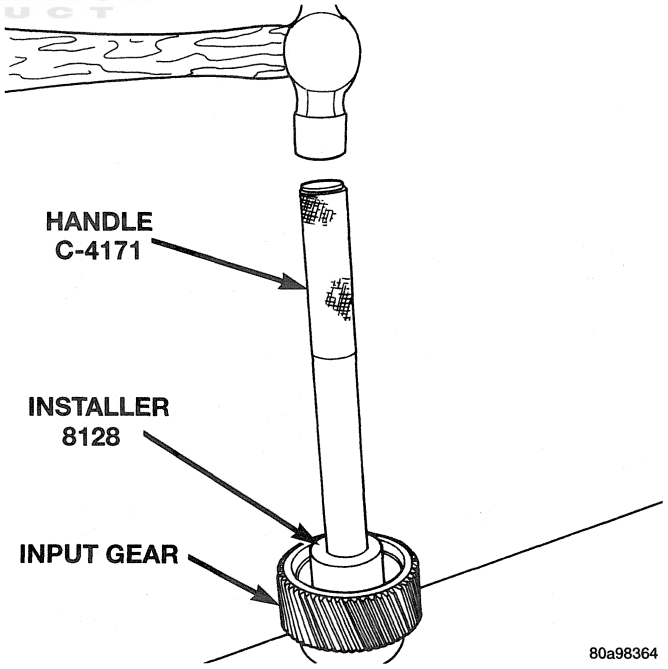


Fig. 55 Install Input Gear Pilot Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

(11) Install new seal in front bearing retainer with Installer 7884 (Fig. 56).

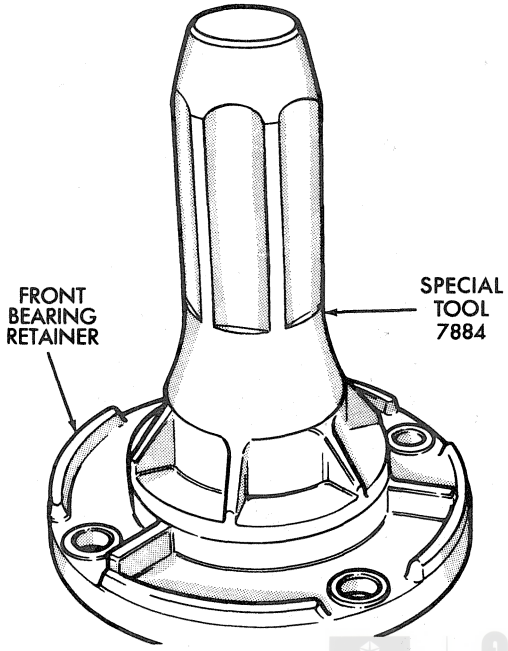


Fig. 56 Front Bearing Retainer Seal Installation

(12) Remove output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 57).

(13) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 58). Lubricate bearing after installation.

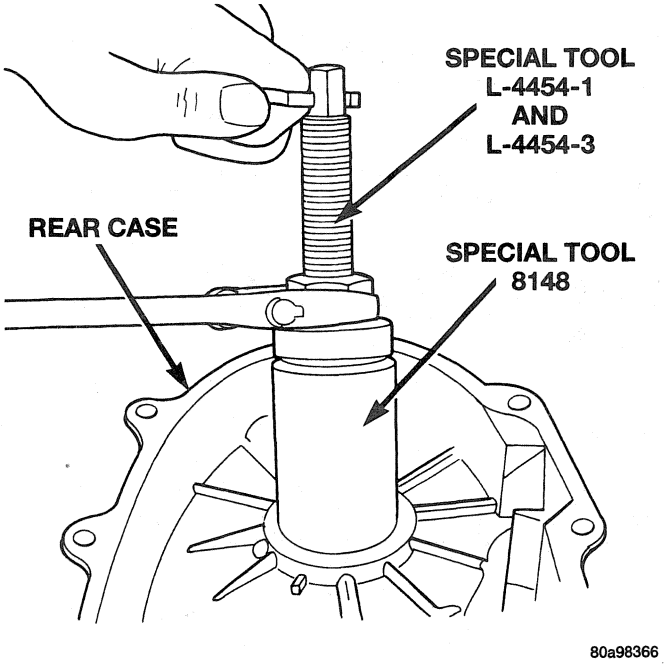


Fig. 57 Remove Front Output Shaft Rear Bearing

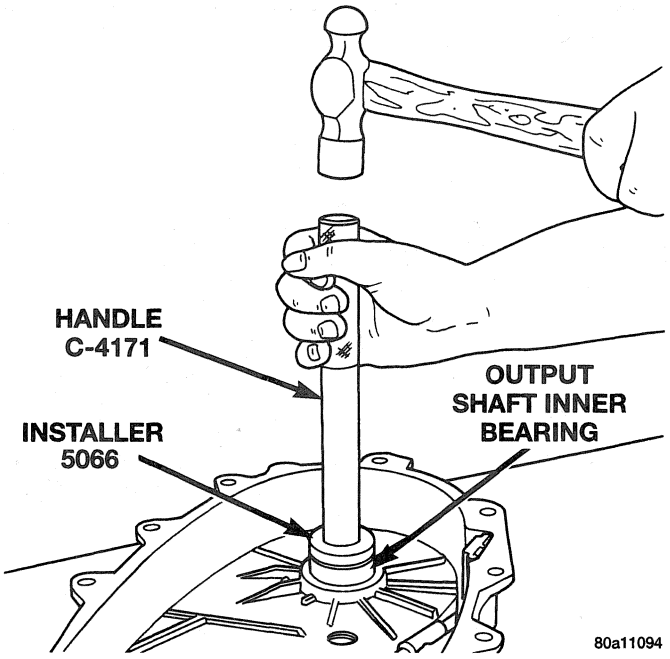


Fig. 58 Install Front Putput Shaft Rear Bearing

(14) Install new seal in oil pump feed housing with Special Tool 7888 (Fig. 59).

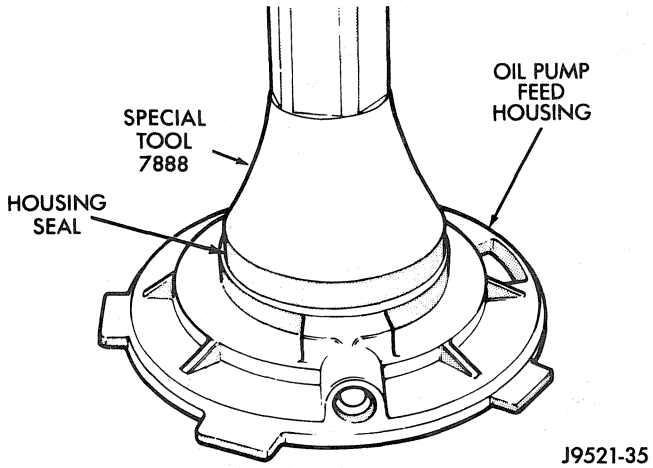


Fig. 59 Oil Pump Seal Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Install new pickup tube O-ring in oil pump (Fig. 60).

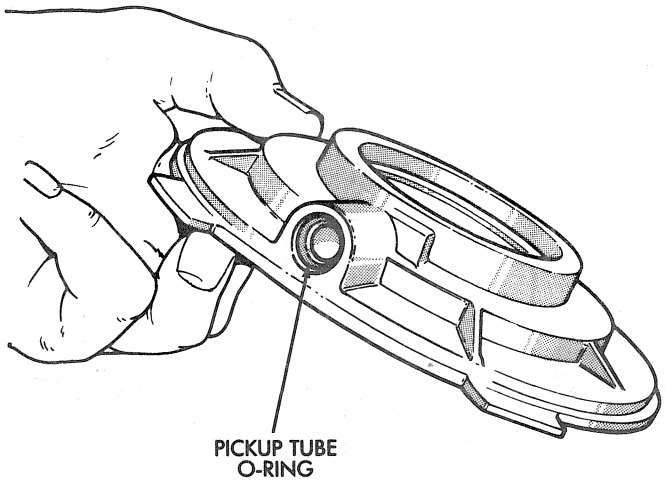


Fig. 60 Pickup Tube O-Ring Installation

DIFFERENTIAL ASSEMBLY

(1) Lubricate differential components with automatic transmission fluid.

(2) Install sprocket gear in differential bottom case (Fig. 61).

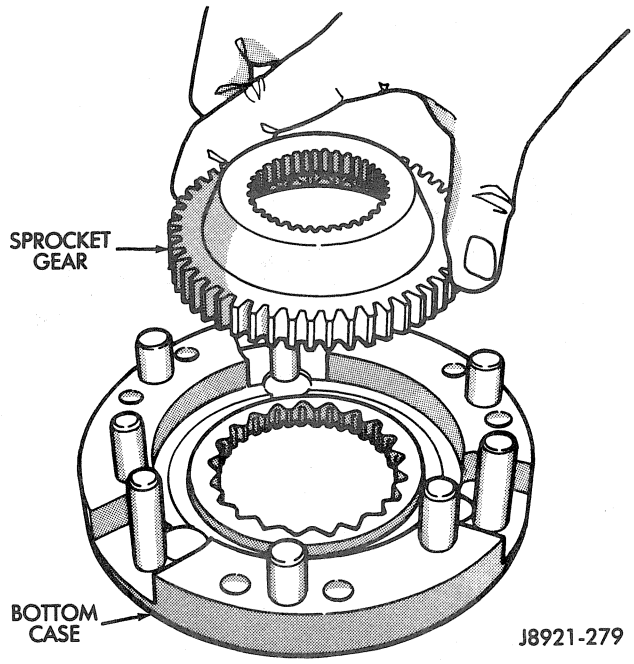


Fig. 61 Installing Differential Sprocket Gear

(3) Install differential planet gears and new thrust washers (Fig. 62). **Be sure thrust washers are installed at top and bottom of each planet gear.**

(4) Install differential mainshaft gear (Fig. 62).

(5) Align and position differential top case on bottom case (Fig. 63). Align using scribe marks made at disassembly.

(6) While holding differential case halves together, invert the differential and start the differential case bolts.

(7) Tighten differential case bolts to specified torque.

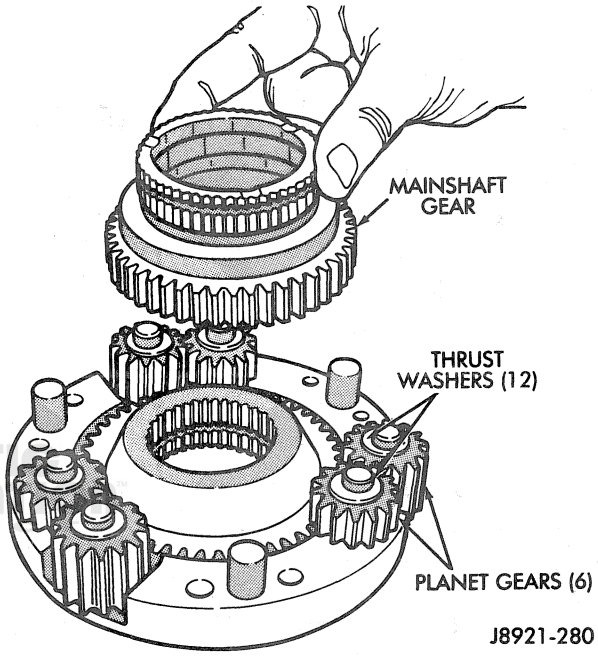


Fig. 62 Installing Mainshaft And Planet Gears

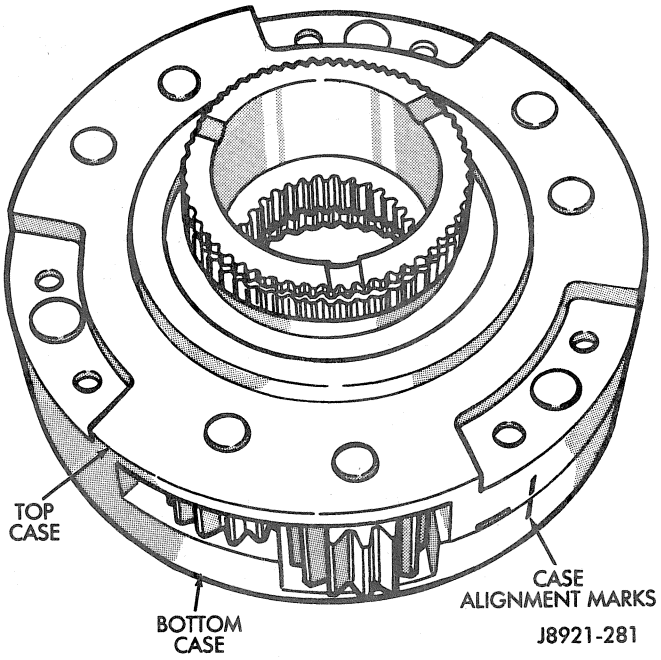


Fig. 63 Differential Case Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 64).

(2) Install low range gear snap ring (Fig. 65).

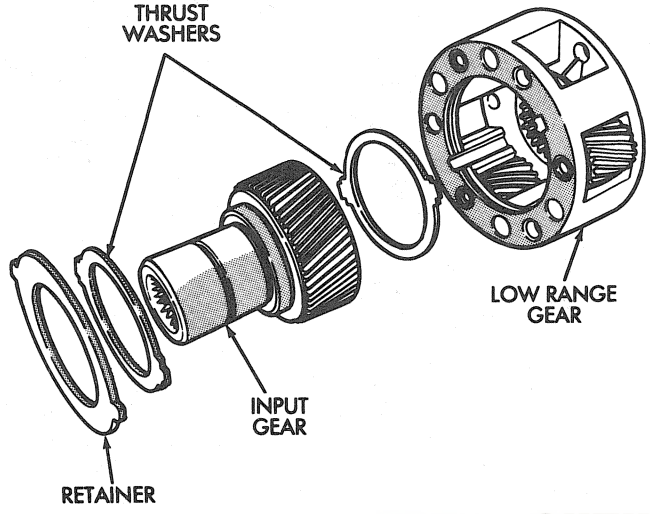


Fig. 64 Low Range And Input Gear Assembly

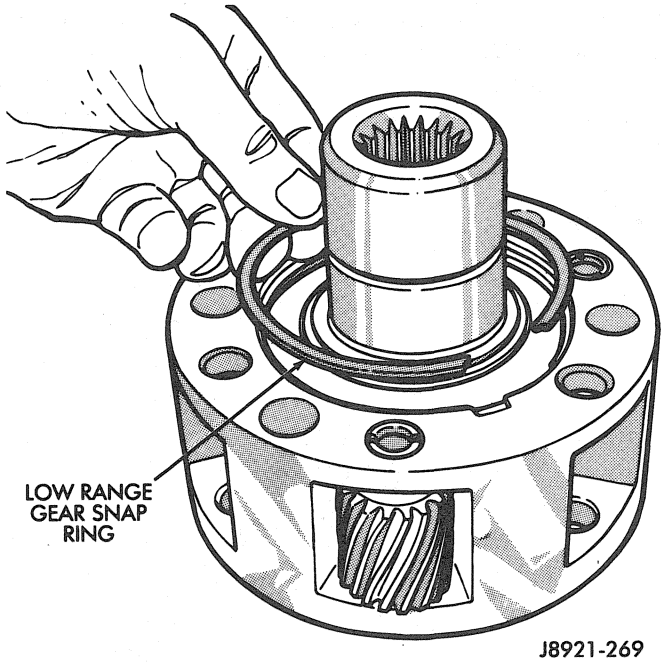


Fig. 65 Install Low Range Gear Snap Ring

(3) Lubricate input gear and low range gears with automatic transmission fluid.

(4) Start input gear shaft into front case bearing.

(5) Press input gear shaft into front bearing.

(6) Install new input gear snap ring (Fig. 66).

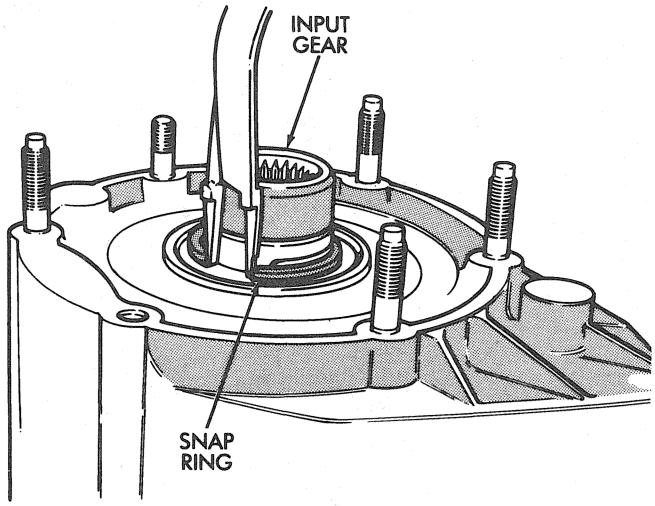


Fig. 66 Input Gear Snap Ring Installation

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front bearing retainer.

(8) Install front bearing retainer (Fig. 67). Tighten retainer bolts to 16 ft. lbs. (21 N·m) torque.

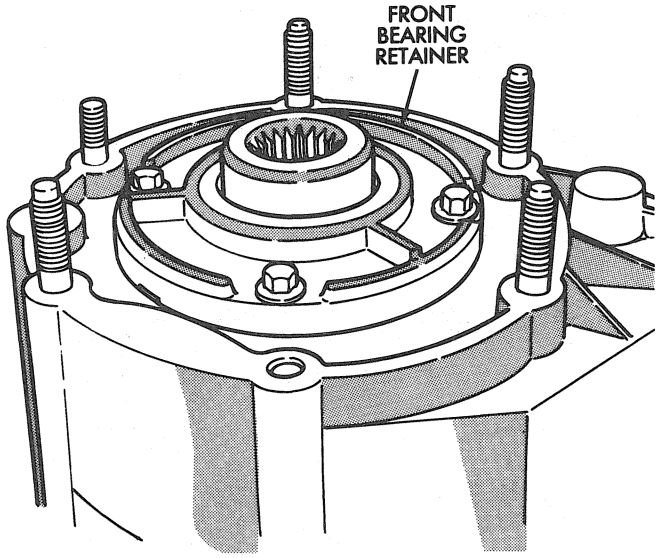


Fig. 67 Installing Front Bearing Retainer

DISASSEMBLY AND ASSEMBLY (Continued)

SHIFT FORKS AND MAINSHAFT INSTALLATION

(1) Install new sector shaft O-ring and bushing (Fig. 68).

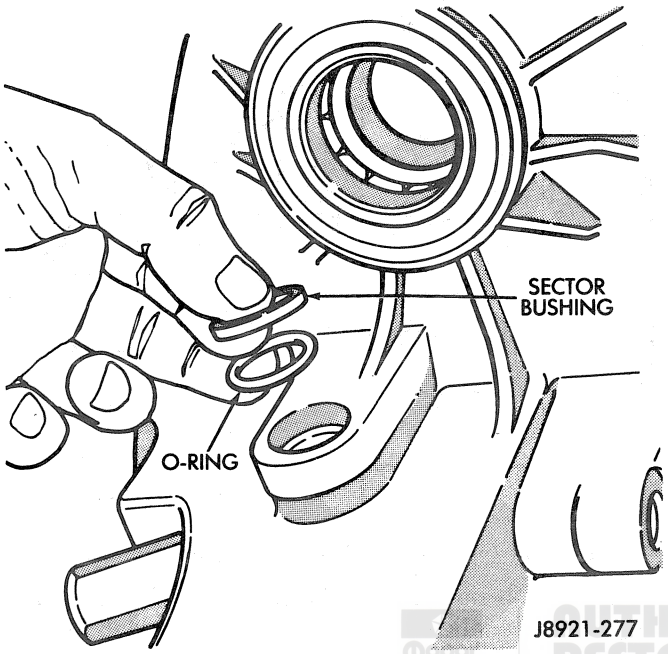


Fig. 68 Sector O-Ring And Bushing Installation

(2) Install shift sector.

(3) Install new pads on low range fork, if necessary, (Fig. 69).

(4) Assemble low range fork and hub (Fig. 69).

(5) Position low range fork and hub in case. Be sure low range fork pin is engaged in shift sector slot (Fig. 70).

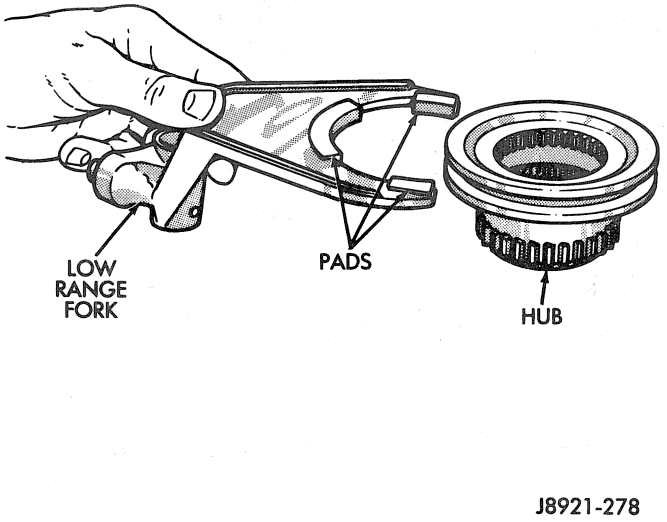


Fig. 69 Assembling Low Range Fork And Hub

(6) Install first mainshaft bearing spacer on mainshaft (Fig. 71).

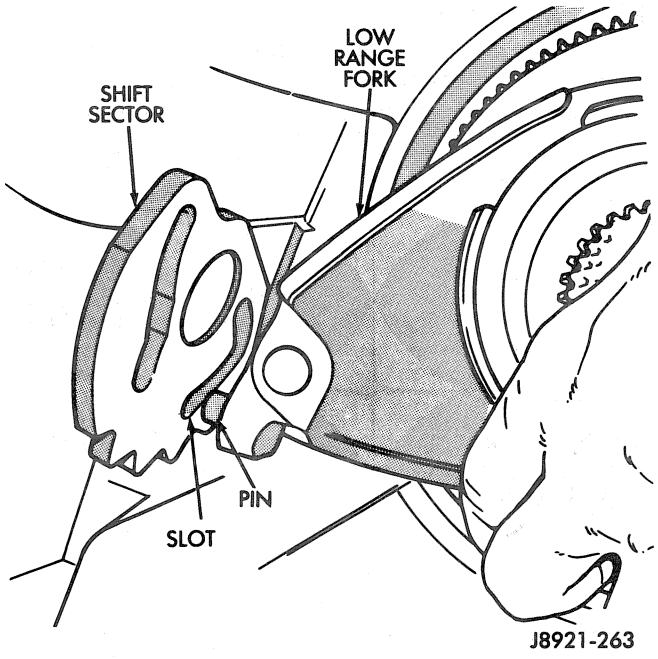


Fig. 70 Positioning Low Range Fork

(7) Install bearing rollers on mainshaft (Fig. 71). **Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.**

(8) Install remaining bearing spacer on mainshaft (Fig. 71). Do not displace any bearings while installing spacer.

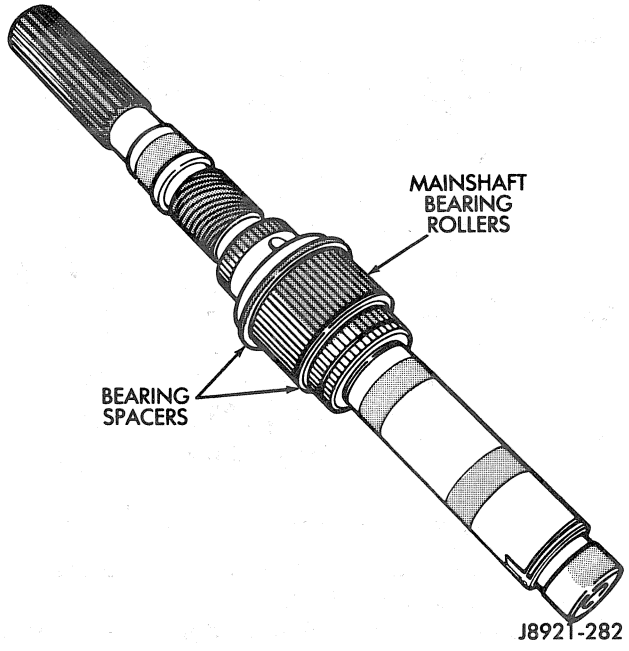


Fig. 71 Installing Mainshaft Bearing Rollers and Spacers

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Install differential (Fig. 72). **Do not displace mainshaft bearings when installing differential.**

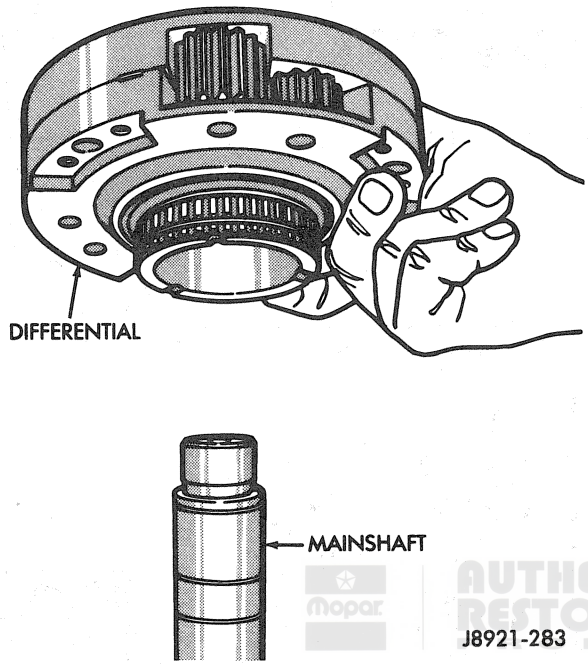


Fig. 72 Differential Installation

(10) Install differential snap-ring (Fig. 73).

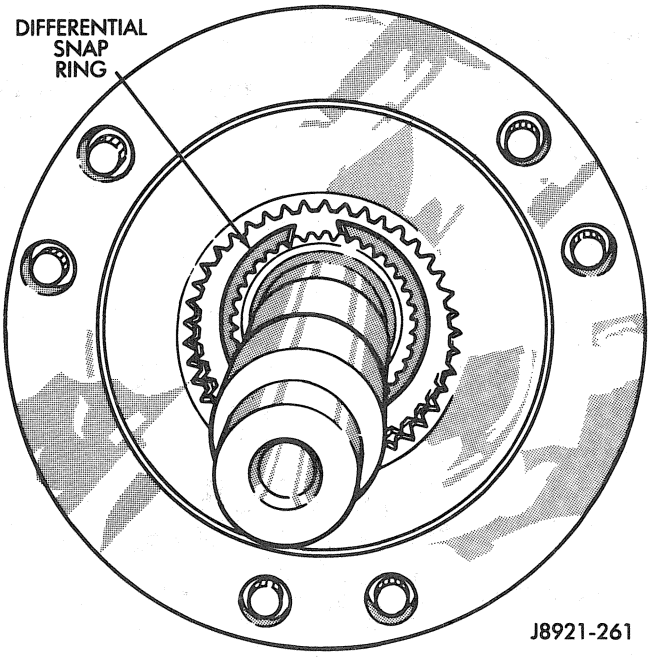


Fig. 73 Installing Differential Snap-Ring

(11) Install intermediate clutch shaft (Fig. 74).

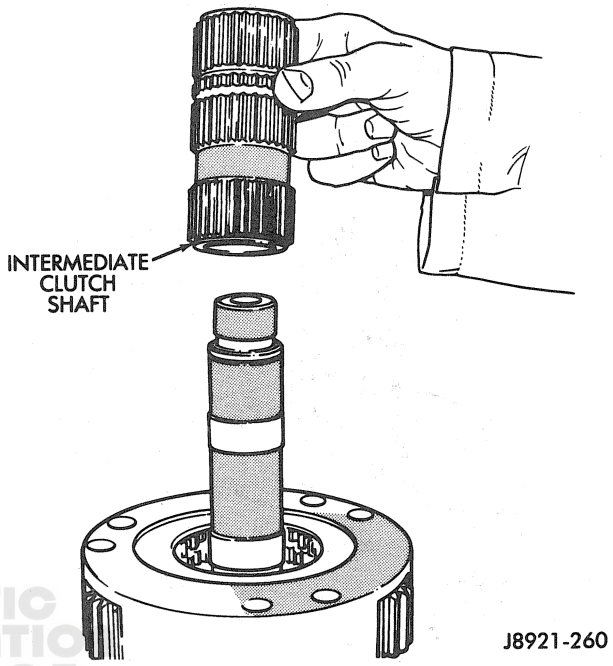


Fig. 74 Installing Intermediate Clutch Shaft

(12) Install clutch shaft thrust washer (Fig. 75).

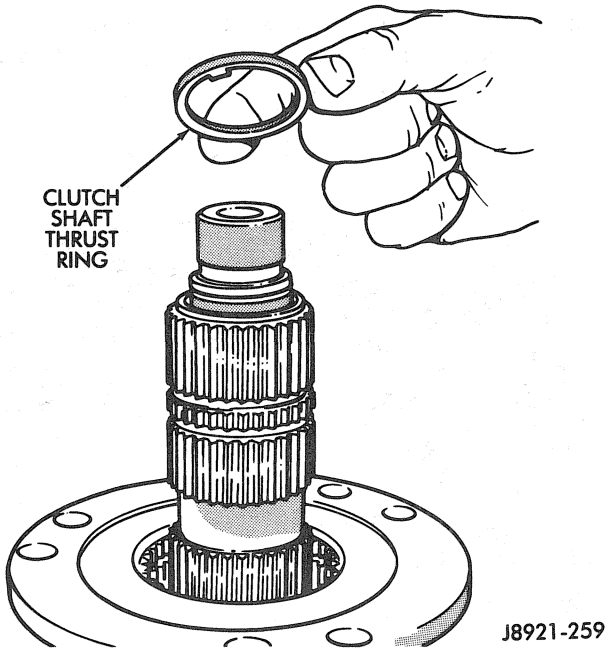


Fig. 75 Installing Clutch Shaft Thrust Washer

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Install clutch shaft snap-ring (Fig. 76).

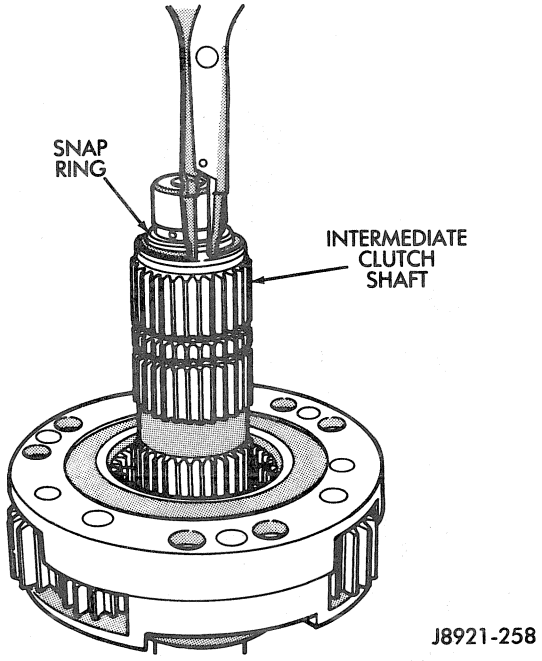


Fig. 76 Installing Clutch Shaft Snap-Ring

(14) Inspect mode fork assembly (Fig. 77). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 77). Replace worn, damaged components.

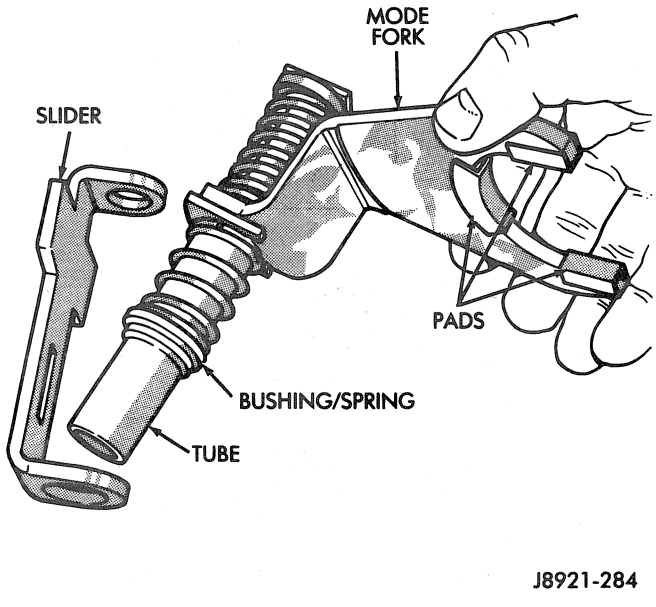


Fig. 77 Mode Fork Assembly Inspection

(15) Install mode sleeve in mode fork (Fig. 78). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.

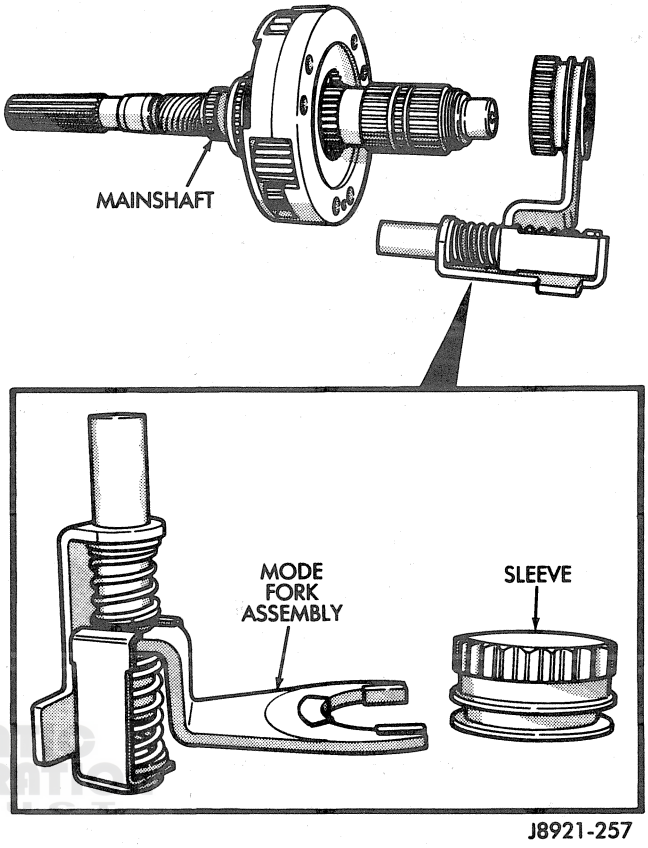


Fig. 78 Installing Mode Fork And Sleeve

(16) Install mode fork and mainshaft assembly in case (Fig. 79). Rotate mainshaft slightly to engage shaft with low range gears.

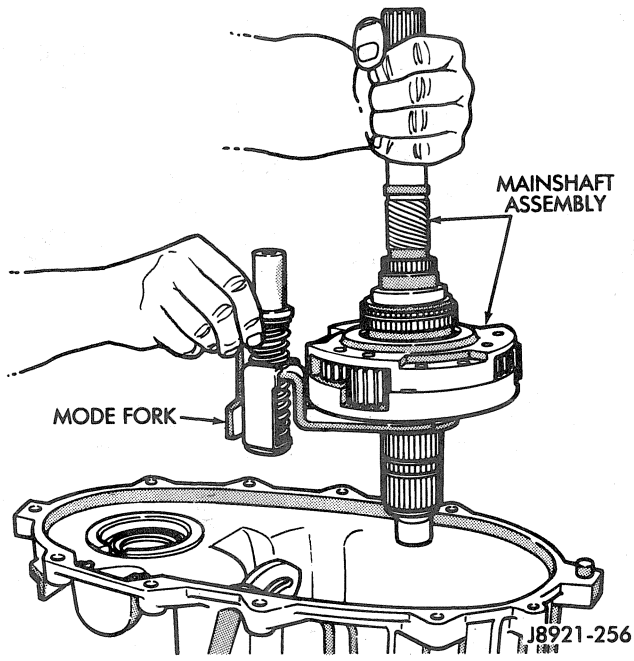


Fig. 79 Assembled Mainshaft And Mode Fork Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(17) Rotate mode fork pin into shift sector slot.

(18) Install shift rail (Fig. 80). **Be sure rail is seated in both shift forks.**

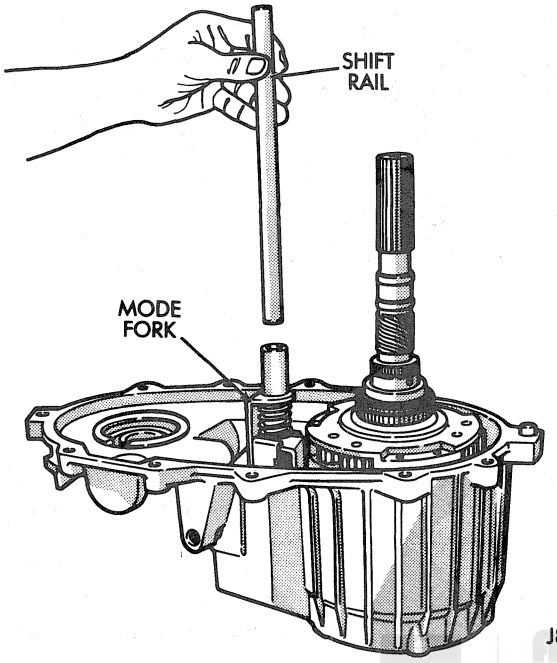


Fig. 80 Shift Rail Installation

(19) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(20) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 81). **Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.**

(21) Insert lockpin through access hole and into shift fork (Fig. 81). Then remove easy-out and seat the pin with pin punch.

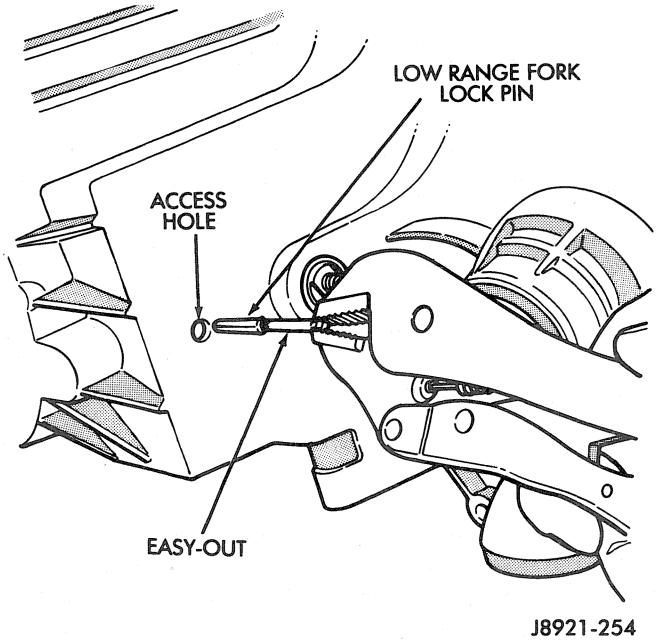


Fig. 81 Installing Low Range Fork Lockpin

(22) Install plug in lockpin access hole.

(23) Install detent plunger, detent spring and detent plug in case (Fig. 82).

FRONT OUTPUT SHAFT AND DRIVE CHAIN INSTALLATION

(1) Install front output shaft (Fig. 83).

(2) Install drive chain (Fig. 83). Engage chain with front output shaft sprocket teeth.

(3) Install drive sprocket (Fig. 83). Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.

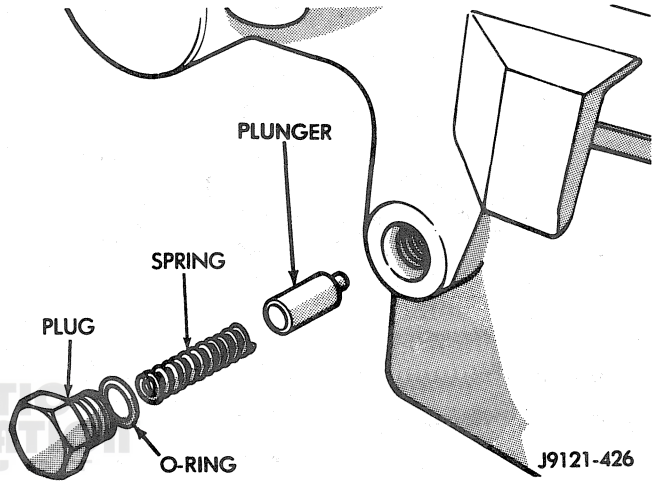


Fig. 82 Detent Pin, Spring And Plug Installation

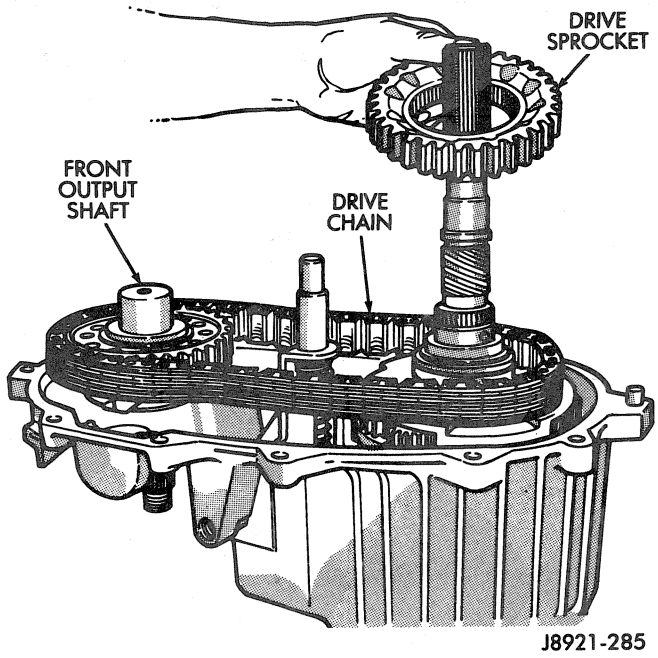


Fig. 83 Drive Chain And Sprocket Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Install drive sprocket snap-ring (Fig. 84).

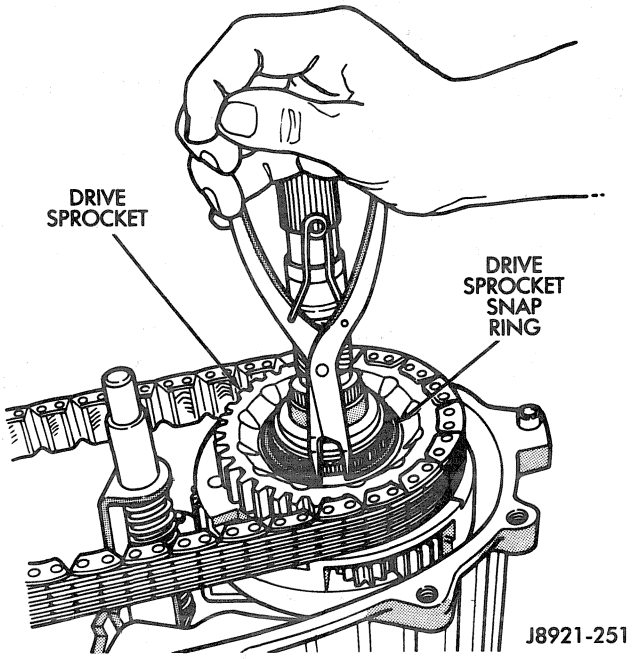


Fig. 84 Drive Sprocket Snap-Ring Installation

OIL PUMP AND REAR CASE INSTALLATION

(1) Insert oil pickup tube in oil pump and attach oil screen and connector hose to pickup tube. Then install assembled pump, tube and screen in rear case (Fig. 85). Be sure screen is seated in case slot as shown.

(2) Install magnet in front case pocket (Fig. 86).

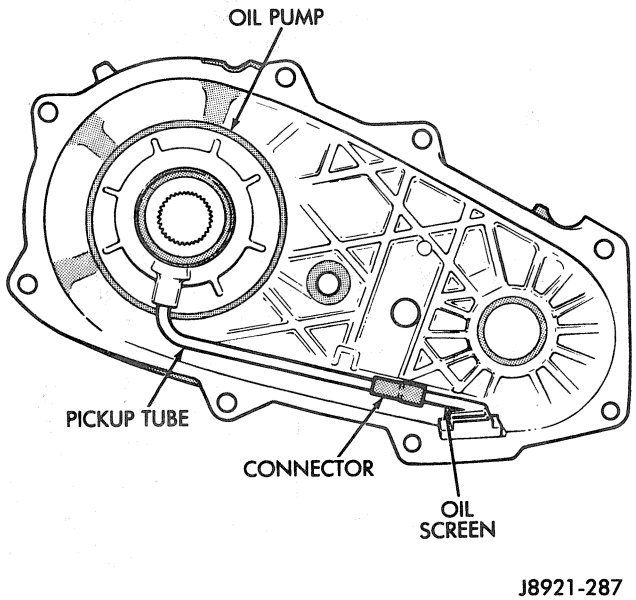


Fig. 85 Oil Screen And Pickup Tube Installation

(3) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker or silicone adhesive sealer to seal surface of front case.

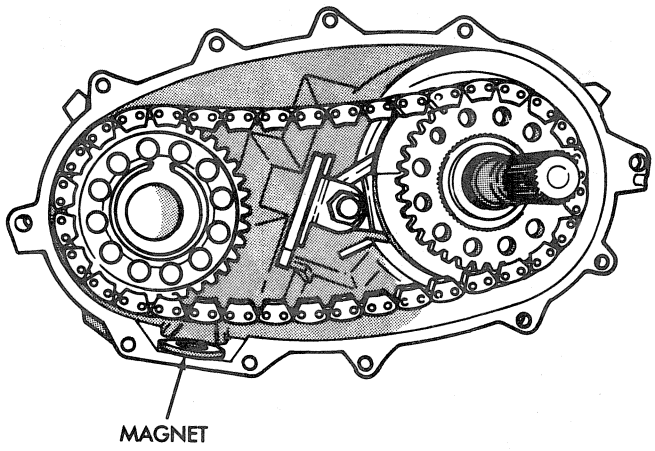


Fig. 86 Installing Case Magnet

(4) Align and install rear case on front case. Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

(5) Install and tighten front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each bolt used at case dowel locations.**

REAR RETAINER INSTALLATION

(1) Remove rear bearing in retainer using Installer 8128 and Handle C-4171.

(2) Install rear bearing in retainer with Tools C-4171 and 5064 (Fig. 87).

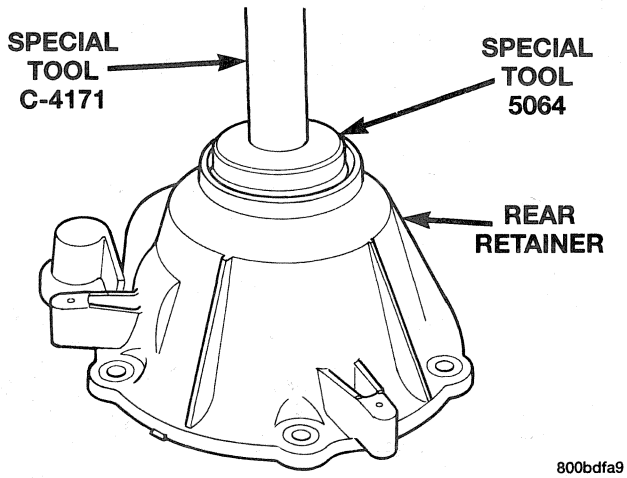


Fig. 87 Installing Rear Bearing In Retainer

(3) Install rear bearing O.D. retaining ring with snap-ring pliers (Fig. 88). Be sure retaining ring is fully seated in retainer groove.

(4) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

DISASSEMBLY AND ASSEMBLY (Continued)

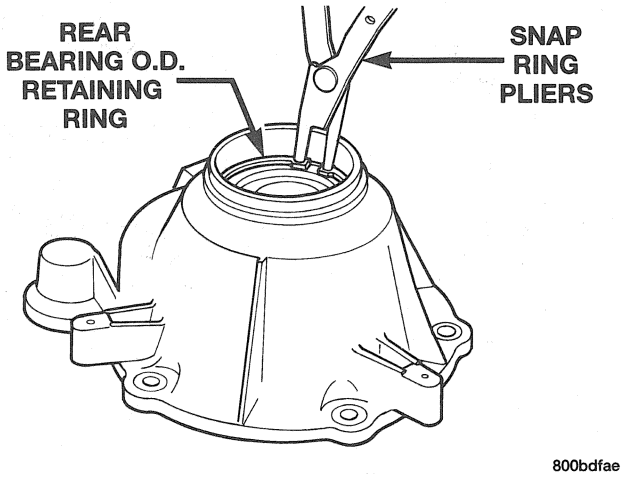


Fig. 88 Rear Bearing Retaining Ring Installation

(5) Install rear retainer on rear case. Tighten retainer bolts to 20–27 N·m (15–20 ft. lbs.) torque.

(6) Install rear bearing I.D. retaining ring and spacer on output shaft.

(7) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(8) Slide seal onto Seal Protector 6992 (Fig. 89). Slide seal protector and seal onto output shaft.

(9) Slide Installer C-4076-B onto seal protector with the recessed side of the tool toward the seal. Drive seal into rear bearing retainer with installer C-4076-B and handle MD-998323 (Fig. 90).

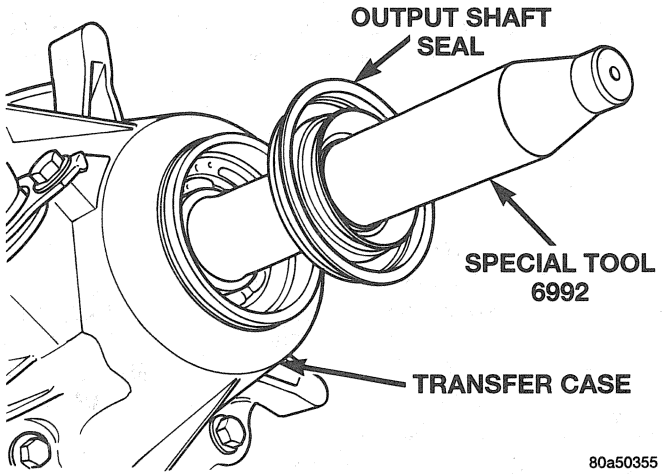


Fig. 89 Output Shaft Seal and Protector

(10) Install rear slinger with installer C-4076-A and handle MD-998323 (Fig. 90).

(11) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 91).

FRONT YOKE AND SWITCH INSTALLATION

(1) Install indicator switch in front case. Tighten switch to 20–34 N·m (15–25 ft. lbs.) torque.

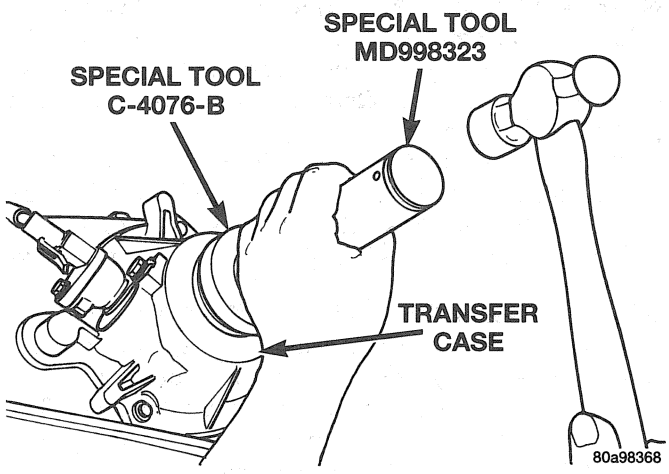


Fig. 90 Rear Seal Installation

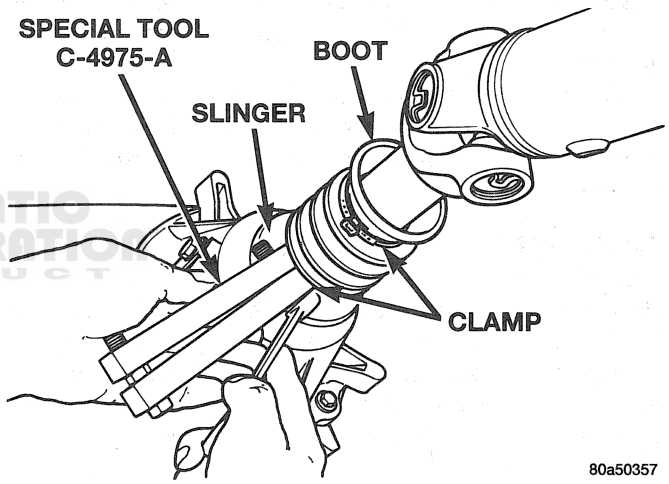


Fig. 91 Slinger Boot Installation

(2) Lubricate yoke hub with transmission fluid and install yoke on front shaft.

(3) Install new seal washer on front shaft.

(4) Install yoke on front shaft. Secure yoke with new nut.

CLEANING AND INSPECTION

NV242 TRANSFER CASE

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

CLEANING AND INSPECTION (Continued)

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320–400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 92). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300–400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 93). Minor nicks on the shift rail can be smoothed with 320–400 grit emery cloth.

Inspect the shift fork wear pads. The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are also serviceable.

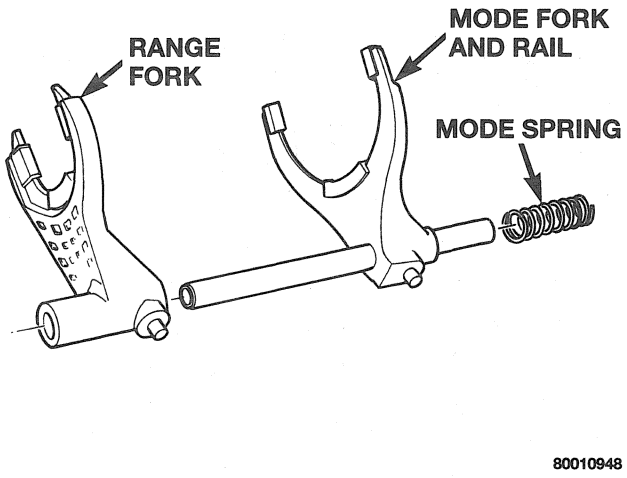


Fig. 93 Shift forks

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/ BOOT

Inspect the retainer components (Fig. 94). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Inspect the retaining rings and washers. Replace any part if distorted, bent, or broken. Reuse is not

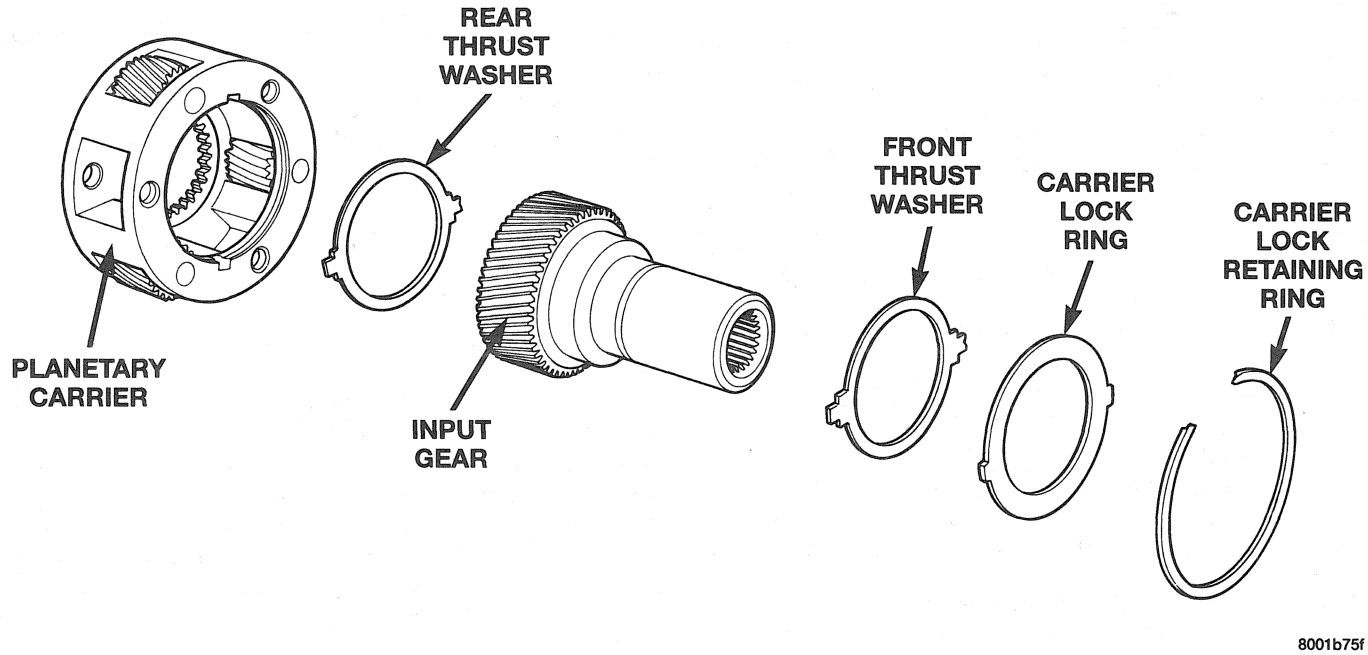


Fig. 92 Input Gear And Carrier Components

CLEANING AND INSPECTION (Continued)

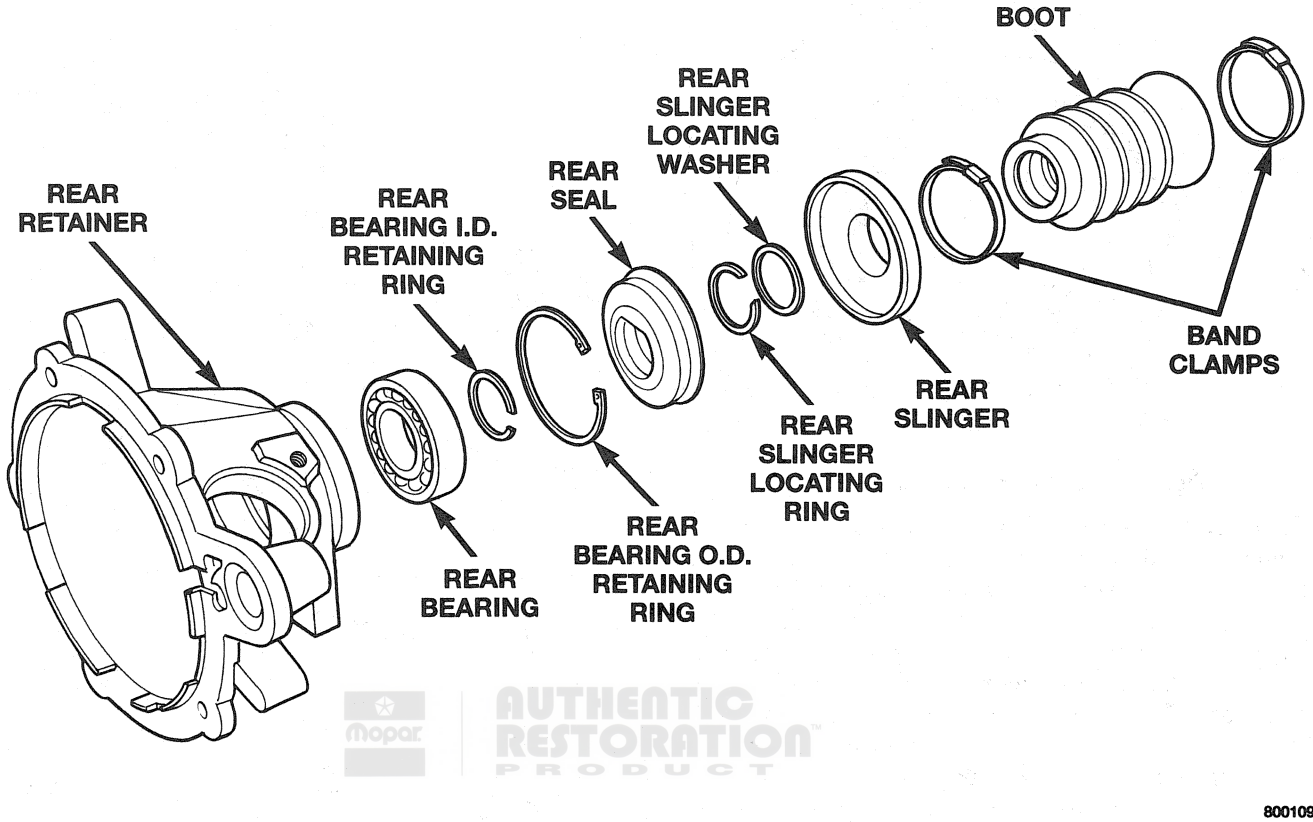


Fig. 94 Rear Retainer Components

recommended. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 95). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320–400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. replace the chain if stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 96).

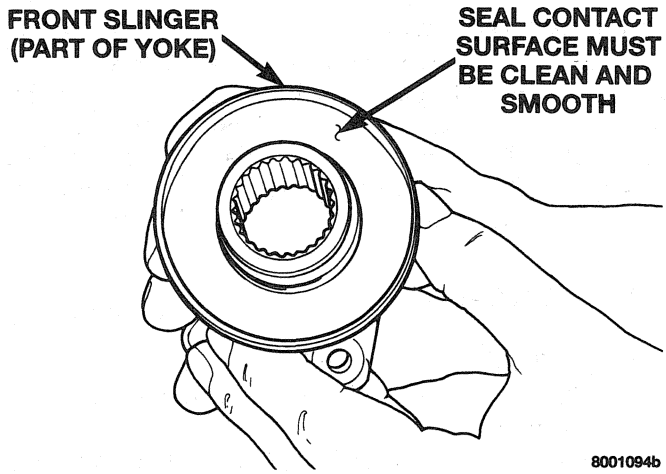


Fig. 95 Seal Contact Surface Of Yoke Slinger

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

CLEANING AND INSPECTION (Continued)

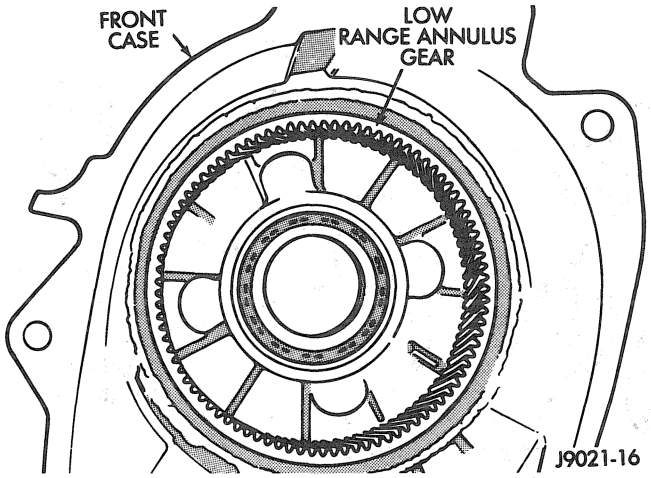


Fig. 96 Low Range Annulus Gear

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT

(1) Shift transfer case into 4L position.
(2) Raise vehicle.
(3) Loosen lock bolt on adjusting trunnion (Fig. 97).
(4) Be sure linkage rod slides freely in trunnion. Clean rod and apply spray lube if necessary.
(5) Verify that transfer case range lever is fully engaged in 4L position.
(6) Tighten adjusting trunnion lock bolt.
(7) Lower vehicle.

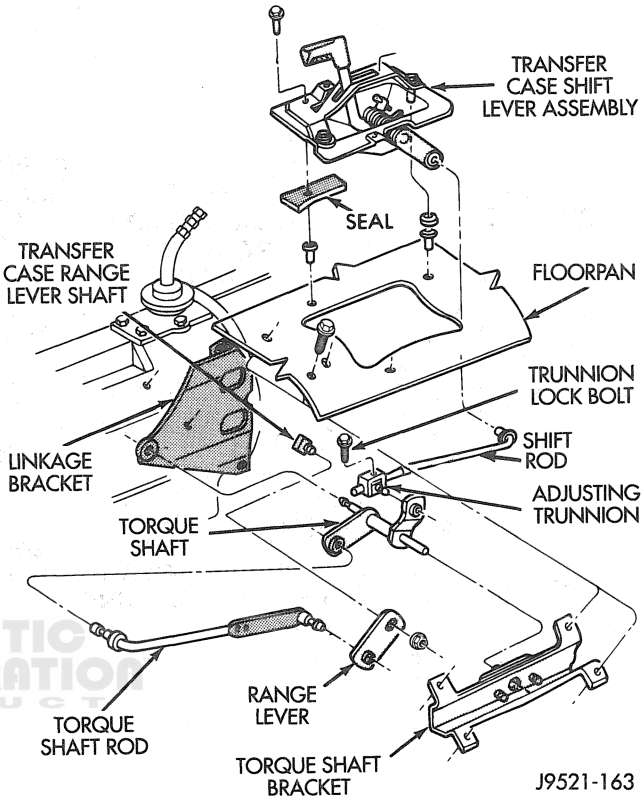


Fig. 97 Shift Linkage

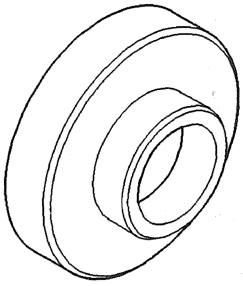
SPECIFICATIONS

TORQUE

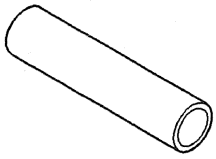
DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Bolt, Diff. Case	17–27 N·m (15–24 ft. lbs.)
Plug, Drain/Fill	40–45 N·m (30–40 ft. lbs.)
Bolt, Front Brg. Retainer	16–27 N·m (12–20 ft. lbs.)
Bolt, Case Half	35–46 N·m (26–34 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Screw, Oil Pump	1.2–1.8 N·m (12–15 in. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35–47 N·m (26–35 ft. lbs.)
Bolts, U-Joint	19 N·m (17 ft. lbs.)

SPECIAL TOOLS

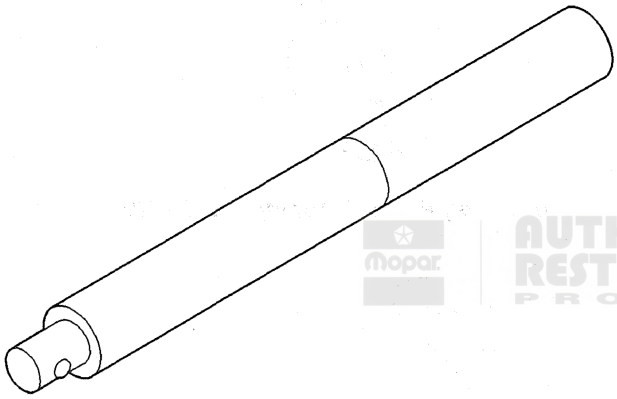
NV242



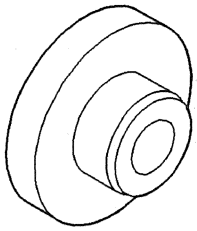
Installer—C-4076-B



Installer—MD-998323

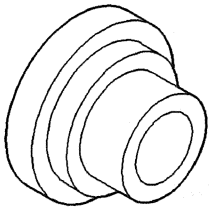


Handle, Universal—C-4171

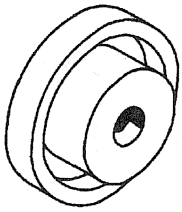


Installer, Bearing—5064

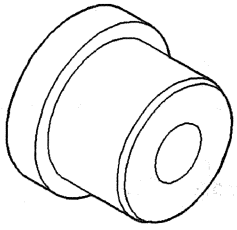
Mopar AUTHENTIC RESTORATION PRODUCT



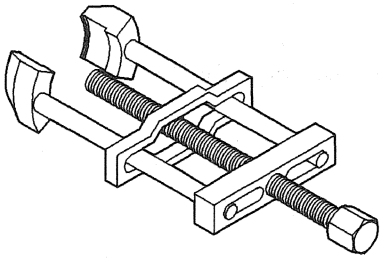
Installer—8128



Remover—C-4210

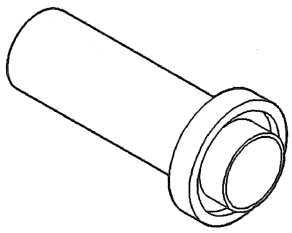


Installer—5066

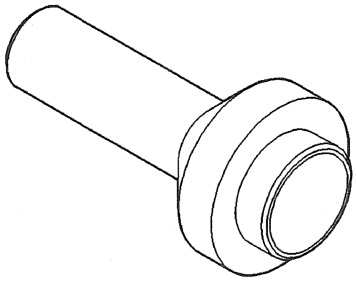


Puller, Slinger—MD-998056–A

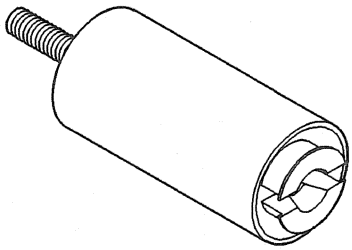
SPECIAL TOOLS (Continued)



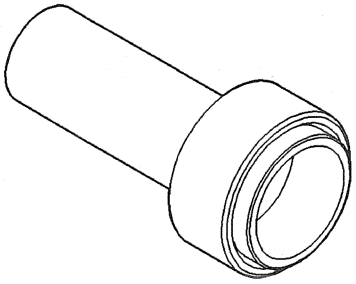
Installer—6952-A



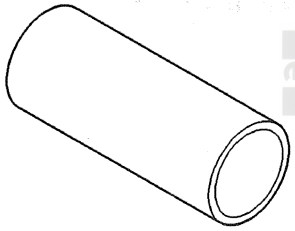
Installer, Seal—7884



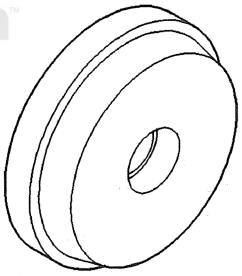
Remover—L-4454



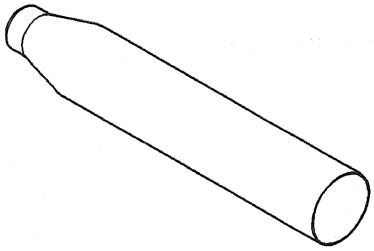
Installer, Pump Housing Seal—7888



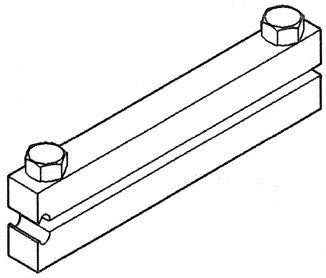
Cup—8148



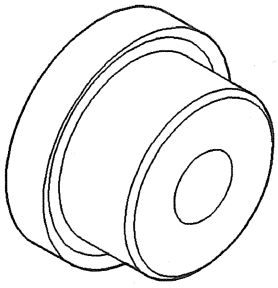
Installer, Bearing—8033-A



Seal Protector—6992



Installer, Boot Clamp—C-4975-A



Installer, Input Gear Bearing—7829-A

Description	Group-Page
ADJUSTMENT, SHIFT LINKAGE	21-25,21-56
ANALYSIS, GEAR CONTACT PATTERN	3-27,3-62,3-92
ASSEMBLY, DRIVE AXLE	3-6
ASSEMBLY, FINAL	3-21,3-52
ASSEMBLY, TUBE AXLE	3-7
AXLE, 8 1/4 INCH	3-94
AXLE, 8 1/4 REAR	3-68
AXLE ASSEMBLY, DRIVE	3-6
AXLE ASSEMBLY, TUBE	3-7
AXLE BUSHING REPLACEMENT	3-12
AXLE COMPONENTS	3-21,3-57
AXLE, DANA 30	3-29
AXLE, DANA 30 FRONT	3-1
AXLE, DANA 35	3-33,3-64
AXLE IDENTIFICATION	3-68
AXLE PINION GEAR DEPTH, 8 1/4	3-89
AXLE, REAR	3-39,3-74
AXLE SEAL AND BEARING	3-76
AXLE SHAFT	3-44,3-75
AXLE SHAFT, HUB BEARING	3-9
AXLE SHAFT OIL SEAL	3-15
AXLE SHAFT SEAL AND BEARING	3-45
AXLE SHAFT—CARDAN U-JOINT	3-7
AXLE, TUBE AND DANA 30 FRONT	3-1
AXLES, 8 1/4	3-68,3-88,3-95
AXLES, FRONT	3-4
BACKLASH, DIFFERENTIAL BEARING PRELOAD AND GEAR	3-24,3-60,3-91
BALL STUDS, STEERING KNUCKLE	3-11
BEARING AND AXLE SHAFT, HUB	3-9
BEARING, AXLE SEAL	3-76
BEARING, AXLE SHAFT SEAL	3-45
BEARING NOISE	3-35,3-71,3-3
BEARING PRELOAD AND GEAR BACKLASH, DIFFERENTIAL	3-24,3-60,3-91
BEARINGS, DIFFERENTIAL SIDE	3-14,3-47,3-79
BUSHING REPLACEMENT, AXLE	3-12
CARDAN U-JOINT	3-21
CASE IDENTIFICATION, TRANSFER	21-29,21-2
CASE, NV231 TRANSFER	21-22,21-1,21-6
CASE, NV242 TRANSFER	21-28,21-34,21-53
CASE, TRANSFER	21-31,21-4
CHANGE, LUBRICANT	3-39,3-74,3-6
CLEARANCE, SIDE GEAR	3-94
COLLAPSIBLE SPACER	3-42
CONTACT PATTERN ANALYSIS, GEAR	3-27,3-62,3-92
CONTINUED	3-5
DANA 30 AXLE	3-29
DANA 30 FRONT AXLE	3-1
DANA 30 FRONT AXLE, TUBE	3-1
DANA 35 AXLE	3-33,3-64
DEPTH, 8 1/4 AXLE PINION GEAR	3-89
DEPTH, PINION GEAR	3-22,3-57
DEPTH VARIANCE, PINION GEAR	3-23,3-58,3-89
DIAGNOSIS	3-4
DIAGNOSIS, NV231	21-3
DIAGNOSIS, NV242	21-30
DIFFERENTIAL	3-12,3-45,3-78
DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH	3-24,3-60,3-91
DIFFERENTIAL NOISE, TRAC–LOK	3-36,3-71
DIFFERENTIAL SIDE BEARINGS	3-14,3-47,3-79
DIFFERENTIAL, STANDARD	3-20,3-34,3-52,3-69,3-83,3-2
DIFFERENTIAL, TRAC-LOK	3-53,3-84
DRIVE AXLE ASSEMBLY	3-6
DRIVELINE SNAP	3-36,3-71,3-3
FILL LEVEL, RECOMMENDED LUBRICANT	21-29,21-2
FINAL ASSEMBLY	3-21,3-52
FRONT AXLE, DANA 30	3-1
FRONT AXLE, TUBE AND DANA 30	3-1
FRONT AXLES	3-4
FRONT OUTPUT SHAFT SEAL	21-33,21-6
GEAR BACKLASH, DIFFERENTIAL BEARING PRELOAD	3-24,3-60,3-91
GEAR CLEARANCE, SIDE	3-94
GEAR CONTACT PATTERN ANALYSIS	3-27,3-62,3-92
GEAR DEPTH, 8 1/4 AXLE PINION	3-89
GEAR DEPTH, PINION	3-22,3-57
GEAR DEPTH VARIANCE, PINION	3-23,3-58,3-89
GEAR NOISE	3-35,3-71,3-3
GEAR, PINION	3-16,3-48,3-80
GEAR, RING	3-15,3-48,3-80
GENERAL INFORMATION	3-35,3-70,3-2
HUB BEARING AND AXLE SHAFT	3-9
IDENTIFICATION, AXLE	3-68
IDENTIFICATION, TRANSFER CASE	21-29,21-2
INCH AXLE, 8 1/4	3-94
INTRODUCTION	8W-01-1
KNOCK, LOW SPEED	3-36,3-71,3-3
KNUCKLE AND BALL STUDS, STEERING	3-11
LEVEL, RECOMMENDED LUBRICANT AND FILL	21-29,21-2
LEVER, SHIFT	21-31,21-4
LINKAGE ADJUSTMENT, SHIFT	21-25,21-56
LOW SPEED KNOCK	3-36,3-71,3-3
LUBRICANT AND FILL LEVEL, RECOMMENDED	21-29,21-2
LUBRICANT CHANGE	3-39,3-74,3-6
LUBRICANT SPECIFICATIONS	3-33,3-68,3-2
NOISE, BEARING	3-35,3-71,3-3
NOISE, GEAR	3-35,3-71,3-3
NOISE, TRAC–LOK DIFFERENTIAL	3-36,3-71
NV231	21-26
NV231 DIAGNOSIS	21-3
NV231 TRANSFER CASE	21-22,21-1,21-6
NV242	21-57
NV242 DIAGNOSIS	21-30
NV242 TRANSFER CASE	21-28,21-34,21-53
OIL SEAL, AXLE SHAFT	3-15
OPERATION, TRAC-LOK	3-34,3-70
OUTPUT SHAFT SEAL, FRONT	21-33,21-6
PATTERN ANALYSIS, GEAR CONTACT	3-27,3-62,3-92
PINION GEAR	3-16,3-48,3-80
PINION GEAR DEPTH	3-22,3-57
PINION GEAR DEPTH, 8 1/4 AXLE	3-89
PINION GEAR DEPTH VARIANCE	3-23,3-58,3-89
PINION SEAL	3-76
PINION SHAFT SEAL	3-40,3-8
PRELOAD AND GEAR BACKLASH, DIFFERENTIAL BEARING	3-24,3-60,3-91
REAR AXLE	3-39,3-74
REAR AXLE, 8 1/4	3-68
RECOMMENDED LUBRICANT AND FILL LEVEL	21-29,21-2
RING GEAR	3-15,3-48,3-80
SEAL AND BEARING, AXLE	3-76
SEAL AND BEARING, AXLE SHAFT	3-45
SEAL, AXLE SHAFT OIL	3-15
SEAL, FRONT OUTPUT SHAFT	21-33,21-6
SEAL, PINION	3-76
SEAL, PINION SHAFT	3-40,3-8
SHAFT, AXLE	3-44,3-75
SHAFT, HUB BEARING AND AXLE	3-9
SHAFT OIL SEAL, AXLE	3-15
SHAFT SEAL AND BEARING, AXLE	3-45
SHAFT SEAL, FRONT OUTPUT	21-33,21-6
SHAFT SEAL, PINION	3-40,3-8
SHAFT—CARDAN U-JOINT, AXLE	3-7
SHIFT LEVER	21-31,21-4
SHIFT LINKAGE ADJUSTMENT	21-25,21-56
SIDE BEARINGS, DIFFERENTIAL	3-14,3-47,3-79
SIDE GEAR CLEARANCE	3-94
SNAP, DRIVELINE	3-36,3-71,3-3
SPACER, COLLAPSIBLE	3-42
SPECIFICATIONS, LUBRICANT	3-33,3-68,3-2
SPEED KNOCK, LOW	3-36,3-71,3-3
SPEEDOMETER	21-31,21-4
STANDARD DIFFERENTIAL	3-20,3-34,3-52,3-69, 3-83,3-2
STEERING KNUCKLE AND BALL STUDS	3-11
STUDS, STEERING KNUCKLE AND BALL	3-11
TEST, TRAC–LOK	3-39,3-74
TORQUE	21-25,21-56
TRAC-LOK	3-57,3-88
TRAC-LOK DIFFERENTIAL	3-53,3-84
TRAC-LOK OPERATION	3-34,3-70
TRAC–LOK DIFFERENTIAL NOISE	3-36,3-71
TRAC–LOK TEST	3-39,3-74
TRANSFER CASE	21-31,21-4
TRANSFER CASE IDENTIFICATION	21-29,21-2
TRANSFER CASE, NV231	21-22,21-1,21-6
TRANSFER CASE, NV242	21-28,21-34,21-53
TUBE AND DANA 30 FRONT AXLE	3-1
TUBE AXLE ASSEMBLY	3-7
U-JOINT, AXLE SHAFT—CARDAN	3-7
U-JOINT, CARDAN	3-21
VARIANCE, PINION GEAR DEPTH	3-23,3-58,3-89
VIBRATION	3-36,3-71,3-3

1996 SERVICE MANUAL COMMENTS

What features do you find most useful?_____

_____

_____

_____

_____

What errors have you found? Please include page number. _____

_____

_____

_____

_____

What topics are hard to locate, confusing, or not covered completely?_____

_____

_____

_____

_____

What comments or suggestions do you have?_____

_____

_____

_____

_____

Your Name: _____ Dealership: _____

Address: _____

_____

Manual Name and Model Year: _____

Note: All comments become the property of Chrysler Corporation.

CustomerOne™

Fold Here

Place
Stamp
Here

Chrysler Corporation
CIMS 424-81-55
25999 Lawrence Ave.
Center Line, MI 48015

Fold Here

CHRYSLER CORPORATION

SERVICE MANUAL

1996 CHEROKEE

To order the special service tools used and illustrated, please refer to the instructions on inside back cover.

CHRYSLER CORPORATION

Mopar AUTHENTIC RESTORATION PRODUCT

NO PART OF THIS PUBLICATION MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED, IN ANY FORM OR BY ANY MEANS, ELECTRONIC, MECHANICAL, PHOTOCOPYING, RECORDING, OR OTHERWISE, WITHOUT THE PRIOR WRITTEN PERMISSION OF CHRYSLER CORPORATION.

Chrysler Corporation reserves the right to make changes in design or to make additions to or improvements in its products without imposing any obligations upon itself to install them on its products previously manufactured.

Litho in U.S.A. Copyright © 1995 Chrysler Corporation 20M0796

Paper Content
50% Recycled

FOREWORD

The information contained in this service manual has been prepared for the professional automotive technician involved in daily repair operations. This manual does not cover theory of operation, which is addressed in service training material. Information describing the operation and use of standard and optional equipment is included in the Owner's Manual provided with the vehicle.

Information in this manual is divided into groups. These groups contain general information, diagnosis, testing, adjustments, removal, installation, disassembly, and assembly procedures for the components. To assist in locating a group title page, use the Group Tab Locator on the following page. The solid bar after the group title is aligned to a solid tab on the first page of each group. The first page of the group has a contents section that lists major topics within the group. If you are not sure which Group contains the information you need, look up the Component/System in the alphabetical index located in the rear of this manual.

A Service Manual Comment form is included at the rear of this manual. Use the form to provide Chrysler Corporation with your comments and suggestions.

Tightening torques are provided as a specific value throughout this manual. This value represents the midpoint of the acceptable engineering torque range for a given fastener application. These torque values are intended for use in service assembly and installation procedures using the correct OEM fasteners. When replacing fasteners, always use the same type (part number) fastener as removed.

Chrysler Corporation reserves the right to change testing procedures, specifications, diagnosis, repair methods, or vehicle wiring at any time without prior notice or incurring obligation.

NOTE: The acronyms, terminology and nomenclature used to identify emissions related components in this manual may have changed from prior publications. These new terms are in compliance with S.A.E. recommended practice J1930.

Navigation Tools: Click on the "Table of Contents" below, or use the Bookmarks to the left.

GROUP TAB LOCATOR

	Introduction
0	Lubrication and Maintenance
2	Suspension
3	Differential and Driveline
5	Brakes
6	Clutch
7	Cooling System
8A	Battery
8B	Starting System
8C	Charging System
8D	Ignition System
8E	Instrument Panel Systems
8F	Audio Systems
8G	Horn Systems
8H	Vehicle Speed Control System
8J	Turn Signal and Hazard Warning Systems
8K	Wiper and Washer Systems
8L	Lamps
8M	Passive Restraint Systems
8N	Electrically Heated Systems
8P	Power Lock Systems
8R	Power Seat Systems
8S	Power Window Systems
8T	Power Mirror Systems
8U	Chime/Buzzer Warning Systems
8V	Overhead Console Systems
8W	Wiring Diagrams
9	Engine
11	Exhaust System and Intake Manifold
13	Frame and Bumpers
14	Fuel System
19	Steering
21	Transmission and Transfer Case
22	Tires and Wheels
23	Body
24	Heating and Air Conditioning
25	Emission Control Systems
	Component and System Index

Service Manual Comment Forms (Rear of Manual)

INTRODUCTION

CONTENTS

	page		page
GENERAL INFORMATION		METRIC SYSTEM	7
BODY CODE PLATE	2	TORQUE REFERENCES	7
FASTENER IDENTIFICATION	4	VEHICLE DIMENSIONS	2
INTERNATIONAL VEHICLE CONTROL AND DISPLAY SYMBOLS	3	VEHICLE IDENTIFICATION NUMBER	1
		VEHICLE SAFETY CERTIFICATION LABEL	1

GENERAL INFORMATION

VEHICLE IDENTIFICATION NUMBER

The Vehicle Identification Number (VIN) plate is located on the lower windshield fence near the left A-pillar. The VIN contains 17 characters that provide data concerning the vehicle. Refer to the VIN decoding chart to determine the identification of a vehicle.

The Vehicle Identification Number is also imprinted on the:

- Body Code Plate.
- Vehicle Safety Certification Label.
- Frame rail.

To protect the consumer from theft and possible fraud the manufacturer is required to include a Check Digit at the ninth position of the Vehicle Identification Number. The check digit is used by the manufacturer and government agencies to verify the authenticity of the vehicle and official documentation. The formula to use the check digit is not released to the general public.

VEHICLE SAFETY CERTIFICATION LABEL

A vehicle safety certification label (Fig. 1) is attached to every Chrysler Corporation vehicle. The label certifies that the vehicle conforms to all appli-

VEHICLE IDENTIFICATION NUMBER DECODING CHART

POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of Origin	1 = United States
2	Make	J = Jeep
3	Vehicle Type	4 = MPV
4	Gross Vehicle Weight Rating	F = 4001-5000 lbs.
5	Vehicle Line	J = Cherokee 4X4 (LHD) J = Cherokee 4X4 (RHD) EXPORT N = Cherokee 4X4 (RHD) B = Cherokee 4X2 (RHD) T = Cherokee 4X2 (LHD)
6	Series	2 = SE 6 = Sport 7 = Country
7	Body Style	7 = 2dr Sport Utility 8 = 4dr Sport Utility
8	Engine	M = 2.5L Diesel P = 2.5L Gasoline S = 4.0L Gasoline
9	Check Digit	
10	Model Year	T = 1996
11	Assembly Plant	L = Toledo #1
12 thru 17	Vehicle Build Sequence	

GENERAL INFORMATION (Continued)

cable Federal Motor Vehicle Safety Standards. The label also lists:

- Month and year of vehicle manufacture.
- Gross Vehicle Weight Rating (GVWR). The gross front and rear axle weight ratings (GAWR's) are based on a minimum rim size and maximum cold tire inflation pressure.
- Vehicle Identification Number (VIN).
- Type of vehicle.
- Type of rear wheels.
- Bar code.
- Month, Day and Hour (MDH) of final assembly.
- Paint and Trim codes.
- Country of origin.

The label is located on the driver-side door shutface.

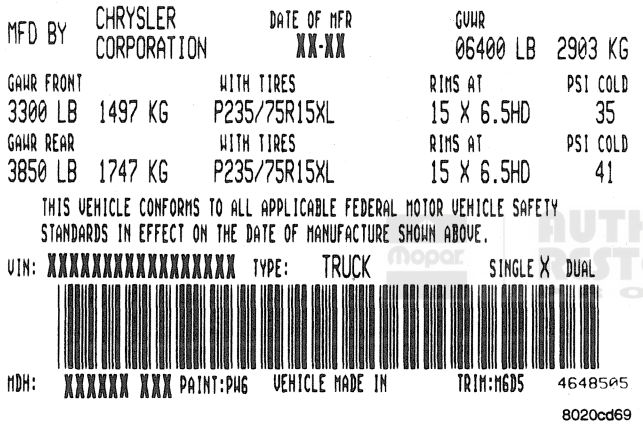


Fig. 1 Vehicle Safety Certification Label—Typical

BODY CODE PLATE

A metal body code plate is attached to the left (driver) side of the dash panel in the engine compartment (Fig. 2). There can be a maximum of seven rows of vehicle information imprinted on the plate. The information should be read from left to right, starting with line 1 at the bottom of the plate up through line 7 (as applicable) at the top of the code plate.

Refer to the decoding chart to decode lines 1 up through 3.

Lines 4 through 7 (if used) on the vehicle code plate are imprinted on the plate (in sequence) according to the following:

- 3-character sales code.
- 3-digit numerical code.
- 6-digit SEC code.

If there is not enough space left in the row for all of the 6-digit SEC code (if used):

- The unused space will remain blank.
- The code will be listed in the next row.

The last nine positions of row 7 will contain a 2-digit code, when applicable, and a 6-digit gateline

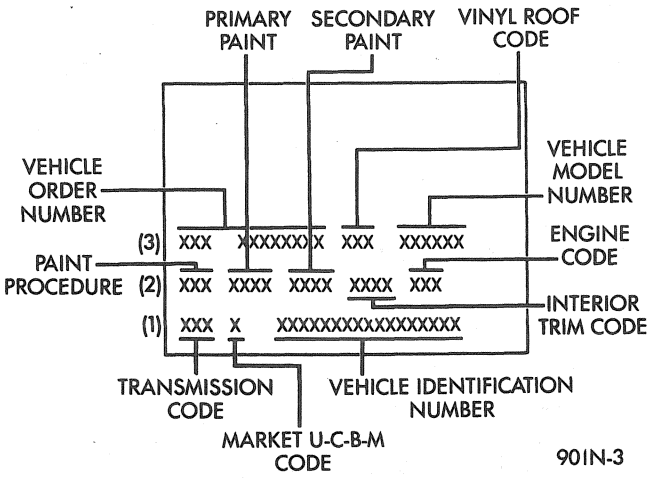


Fig. 2 Body Code Plate

BODY CODE DECODING

Line #1	Digit 1-3	Transmission Sales Code
	Digit 4	Open Space
	Digit 5	Market Code - U-C-B-M
	Digit 6	Open Space
	Digit 7-23	Vehicle Identification No.
Line #2	Digit 1-3	Paint Procedure
	Digit 4	Open Space
	Digit 5-8	Primary Paint
	Digit 9	Open Space
	Digit 10-13	Secondary Paint
	Digit 14	Open Space
	Digit 15-18	Trim Code
	Digit 19	Open Space
	Digit 20-22	Engine Sales Code
	Digit 23	Open Space
Line #3	Digit 1-12	Vehicle Order Number
	Digit 13	Open Space
	Digit 14-16	Vinyl Roof Code (Door Combo Code - Pillette)
	Digit 17	Open Space
	Digit 18-23	Model

J901N-20

serial number (same as the last 6 numbers of the VIN).

The last code imprinted on a vehicle code plate will be followed by the imprinted word END. When two vehicle code plates are required, the last available spaces on the first plate will be imprinted with the letters CTD (for continued).

When a second vehicle code plate is necessary, the first four spaces on each row will not be used because of the plate overlap.

VEHICLE DIMENSIONS

The vehicle dimension data charts list the exterior and interior dimensions. All dimensions are listed in centimeters and inches.

GENERAL INFORMATION (Continued)

VEHICLE EXTERIOR DIMENSIONS

MODEL NAME	WHEEL BASE	TRACK FRONT	TRACK REAR	LENGTH	OVERALL WIDTH	HEIGHT
Cherokee 2WD/4WD	257.6 101.4	147.3 58.0	147.3 58.0	419.8 165.3	179.0 70.5	161.0 63.2

VEHICLE INTERIOR DIMENSIONS

MODEL NAME	HEAD FRONT/ REAR	LEG FRONT / REAR	SHOULDER FRONT / REAR	HIP FRONT / REAR
Cherokee 2WD / 4WD	97.3 / 96.5 38.3 / 38.0	104.1 / 89.7 41.0 / 35.3	140.4 / 140.4 55.3 / 55.3	140.5 / 113.0 55.3 / 44.5

INTERNATIONAL VEHICLE CONTROL AND DISPLAY SYMBOLS

The graphic symbols illustrated in the following chart are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

Mopar AUTHENTIC RESTORATION PRODUCT

INTERNATIONAL CONTROL AND DISPLAY SYMBOLS

 HIGH BEAM	 FOG LIGHTS	 HEADLIGHTS, PARKING LIGHTS, PANEL LIGHTS	 TURN SIGNAL	 HAZARD WARNING	 WINDSHIELD WASHER
 WINDSHIELD WIPER	 WINDSHIELD WIPER AND WASHER	 WINDSCREEN DEMISTING AND DEFROSTING	 VENTILATING FAN	 REAR WINDOW DEFOGGER	 REAR WINDOW WIPER
 REAR WINDOW WASHER	 FUEL	 ENGINE COOLANT TEMPERATURE	 BATTERY CHARGING CONDITION	 ENGINE OIL	 SEAT BELT
 BRAKE FAILURE	 PARKING BRAKE	 FRONT HOOD	 REAR HOOD (TRUNK)	 HORN	 LIGHTER

GENERAL INFORMATION (Continued)

FASTENER IDENTIFICATION

THREAD IDENTIFICATION

SAE and metric bolt/nut threads are not the same. The difference is described in the Thread Notation chart (Fig. 3).

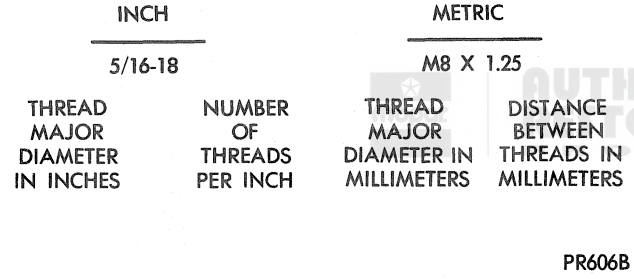


Fig. 3 Thread Notation—SAE and Metric

GRADE/CLASS IDENTIFICATION

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 12.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts.

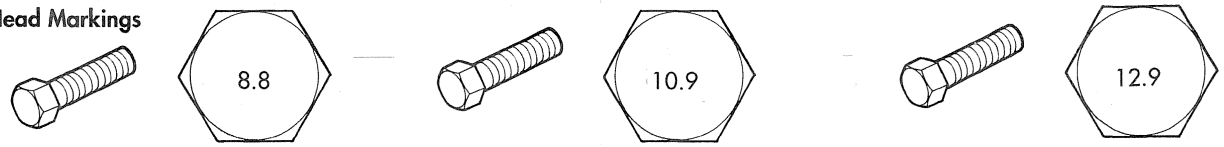
GENERAL INFORMATION (Continued)

FASTENER IDENTIFICATION

Bolt Markings and Torque - Metric

Commercial Steel Class

Bolt Head Markings



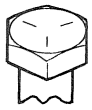
Body Size	Torque				Torque				Torque			
Diam.	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	14	9	11	7	14	9	11	7
7	14	9	11	7	18	14	14	11	23	18	18	14
8	25	18	18	14	32	23	25	18	36	27	28	21
10	40	30	30	25	60	45	45	35	70	50	55	40
12	70	55	55	40	105	75	80	60	125	95	100	75
14	115	85	90	65	160	120	125	95	195	145	150	110
16	180	130	140	100	240	175	190	135	290	210	220	165
18	230	170	180	135	320	240	250	185	400	290	310	230

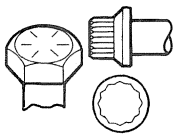
Bolt Markings and Torque Values - U.S. Customary

SAE Grade Number 5 8

Bolt Head Markings
These are all SAE Grade 5 (3) line





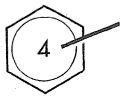
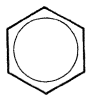
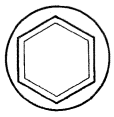


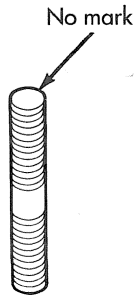
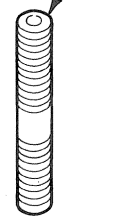
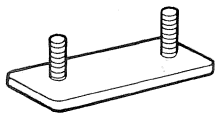
Body Size	Bolt Torque - Grade 5 Bolt				Bolt Torque - Grade 8 Bolt			
	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4 - 20	9	7	8	6	15	11	12	9
- 28	12	9	9	7	18	13	14	10
5/16 - 18	20	15	16	12	30	22	24	18
- 24	23	17	19	14	33	24	25	19
3/8 - 16	40	30	25	20	55	40	40	30
- 24	40	30	35	25	60	45	45	35
7/16 - 14	60	45	45	35	90	65	65	50
- 20	65	50	55	40	95	70	75	55
1/2 - 13	95	70	75	55	130	95	100	75
- 20	100	75	80	60	150	110	120	90
9/16 - 12	135	100	110	80	190	140	150	110
- 18	150	110	115	85	210	155	170	125
5/8 - 11	180	135	150	110	255	190	205	150
- 18	210	155	160	120	290	215	230	170
3/4 - 10	325	240	255	190	460	340	365	270
- 16	365	270	285	210	515	380	410	300
7/8 - 9	490	360	380	280	745	550	600	440
- 14	530	390	420	310	825	610	660	490
1 - 8	720	530	570	420	1100	820	890	660
- 14	800	590	650	480	1200	890	960	710

GENERAL INFORMATION (Continued)

FASTENER STRENGTH

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 Bolt head No. 4 — 4T; 5 — 5T; 6 — 6T; 7 — 7T; 8 — 8T; 9 — 9T; 10 — 10T; 11 — 11T	
	 No mark	4T
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt	 No mark	4T
	 Grooved	6T
Welded bolt		4T

mopar AUTHENTIC RESTORATION PRODUCT

GENERAL INFORMATION (Continued)

METRIC SYSTEM

WARNING: USE OF AN INCORRECT FASTENER MAY RESULT IN COMPONENT DAMAGE OR PERSONAL INJURY.

Figure art, specifications and torque references in this Service Manual are identified in metric and SAE format.

During any maintenance or repair procedures, it is important to salvage metric fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification should be used.

The metric system is based on quantities of one, ten, one hundred, one thousand and one million (Fig. 4).

Mega	-	(M) Million	Deci	-	(D) Tenth
Kilo	-	(K) Thousand	Centi	-	(C) Hundreth
			Milli	-	(m) Thousandth

J901N-2

Fig. 4 Metric Prefixes

The following chart will assist in converting metric units to equivalent English and SAE units, or vise versa.

Refer to the Conversion Chart to convert torque values listed in metric Newton- meters (N·m). Also, use the chart to convert between millimeters (mm) and inches (in.)

TORQUE REFERENCES

Individual Torque Charts appear at the end of many Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts.

Mopar AUTHENTIC RESTORATION PRODUCTS

CONVERSION FORMULAS AND EQUIVALENT VALUES

Multiply	By	To Get	Multiply	By	To Get
in-lbs	x 0.11298	= Newton-Meters (N•m)	N•m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton-Meters (N•m)	N•m	x 0.7376	= ft-lbs
Inches Hg (60°F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters (M)	M	x 1.0936	= Yards
Miles	x 1.6093	= Kilometers (Km)	Km	x 0.6214	= Miles
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec.	x 0.3048	= Meters/Sec. (M/S)	M/S	x 3.281	= Feet/Sec.
Kilometers/Hr.	x 0.27778	= Meters/Sec. (M/S)	M/S	x 3.600	= Kilometers/Hr.
mph	x 0.4470	= Meters/Sec. (M/S)	M/S	x 2.237	= mph

COMMON METRIC EQUIVALENTS

1 Inch	= 25 Millimeters	1 Cubic Inch	= 16 Cubic Centimeters
1 Foot	= 0.3 Meter	1 Cubic Foot	= 0.03 Cubic Meter
1 Yard	= 0.9 Meter	1 Cubic Yard	= 0.8 Cubic Meter
1 Mile	= 1.6 Kilometers		

J91IN-1

GENERAL INFORMATION (Continued)

METRIC CONVERSION

in-lbs to N•m

in- lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966

N•m to in-lbs

N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb
.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882
.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584
.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287
.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989
1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691
1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393
1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096
1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798
1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500
2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202
2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458
2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714
2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970
2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225
3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480
3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736
3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247
3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759
3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270
4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781

ft-lbs to N•m

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820

N•m to ft-lbs

N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425
2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801
3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177
4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552
5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928
6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303
7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679
8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545
9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430
10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806
11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181
12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557
13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933
14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308
15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684
16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060
17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435
18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811
19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187
20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562

in. to mm

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384
.17	3.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400

mm to in.

mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465
.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504
.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

GENERAL INFORMATION (Continued)

TORQUE SPECIFICATIONS

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

mopar AUTHENTIC RESTORATION PRODUCT

LUBRICATION AND MAINTENANCE

CONTENTS

	page		page
GENERAL INFORMATION	1	MAINTENANCE SCHEDULES	3
JUMP STARTING, TOWING AND HOISTING	8		

GENERAL INFORMATION

INDEX

	page		page
GENERAL INFORMATION		INTERNATIONAL SYMBOLS	1
CLASSIFICATION OF LUBRICANTS	1	INTRODUCTION	1
FLUID CAPACITIES	2	PARTS AND LUBRICANT RECOMMENDATIONS	1

Mopar AUTHENTIC RESTORATION PRODUCTS

GENERAL INFORMATION

INTRODUCTION

Service and maintenance procedures for components and systems listed in Schedule—A or B can be found by using the Group Tab Locator index at the front of this manual. If it is not clear which group contains the information needed, refer to the index at the back of this manual.

There are two maintenance schedules that show proper service based on the conditions that the vehicle is subjected to.

Schedule—**A**, lists scheduled maintenance to be performed when the vehicle is used for general transportation.

Schedule—**B**, lists maintenance intervals for vehicles that are operated under the conditions listed at the beginning of the Maintenance Schedule section.

Use the schedule that best describes your driving conditions.

Where time and mileage are listed, follow the interval that occurs first.

PARTS AND LUBRICANT RECOMMENDATIONS

When service is required, Chrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar provides the best engineered products for servicing Chrysler Corporation vehicles.

INTERNATIONAL SYMBOLS

Chrysler Corporation uses international symbols to identify engine compartment lubricant and fluid inspection and fill locations (Fig. 1).

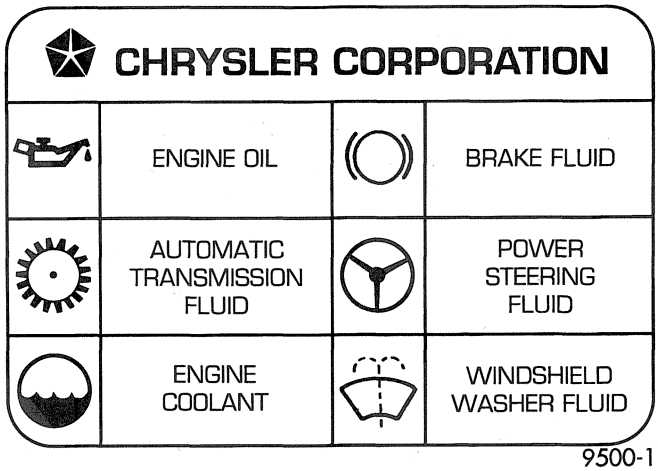


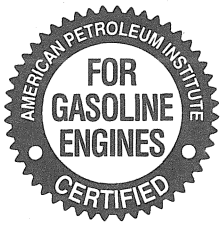
Fig. 1 International Symbols

CLASSIFICATION OF LUBRICANTS

Only lubricants that are endorsed by the following organization should be used to service a Chrysler Corporation vehicle.

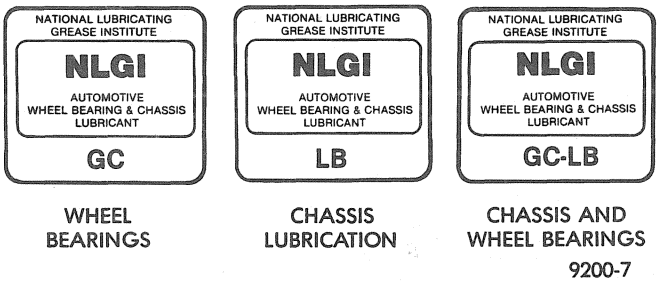
- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API) (Fig. 2)
- National Lubricating Grease Institute (NLGI) (Fig. 3)

GENERAL INFORMATION (Continued)



9400-9

Fig. 2 API Symbol



9200-7

Fig. 3 NLGI Symbol

ENGINE OIL

SAE GRADE RATING INDICATES ENGINE OIL VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 30 specifies a single viscosity engine oil. Engine oils also have multiple viscosities. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range.

- SAE 30 = single grade engine oil.
- SAE 10W-30 = multiple grade engine oil.

API QUALITY CLASSIFICATION

The API Service Grade specifies the type of performance the engine oil is intended to provide. The API Service Grade specifications also apply to energy conserving engine oils.

Use engine oil that is API Service Grade Certified or an oil that conforms to the API Service Grade SH or SH/CD. MOPAR engine oils conform to all of these service grades.

Refer to Group 9, Engine for engine oil specification.

GEAR LUBRICANTS

SAE ratings also apply to multiple grade gear lubricants. In addition, API classification defines the lubricants usage.

LUBRICANTS AND GREASES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol (Fig. 3) on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter "G". Chassis lubricant is identified by the latter "L". The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.

FLUID CAPACITIES

FUEL TANK

All . . . . . .76.4 L (20.2 gal.)

ENGINE OIL

2.5L . . . . . .3.8 L (4.0 qts.)
4.0L . . . . . .5.7 L (6.0 qts.)

COOLING SYSTEM

2.5L . . . . . .9.5 L (10 qts.)*
4.0L . . . . . .11.4 L (12 qts.)**

*Includes 2.2 L (2.3 qts) for coolant recovery reservoir.

**Includes 0.9 L (1.0 qt) for coolant recovery reservoir.

AUTOMATIC TRANSMISSION

Dry fill capacity*

AW4 . . . . . .8.0 L (16.9 pts.)
30RH . . . . . .8.2 L (17.5 pts.)

*Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. Refer to Group 21, Transmission for proper fluid fill procedure.

MANUAL TRANSMISSION

AX5 (4X2) . . . . . .3.3 L (3.5 qts.)
AX5 (4X4) . . . . . .3.2 L (3.3 qts.)
AX15 (4X2) . . . . . .3.1 L (3.2 qts.)
AX15 (4X4) . . . . . .3.15 L (3.32 qts.)

TRANSFER CASE

SELEC-TRAC 242 . . . . . .1.4 L (3.0 pts.)
COMMAND-TRAC 231 . . . . . .1.0 L (2.2 pts.)

FRONT AXLE

MODEL 30. . . . . .1.48 L (3.13 pts.)

REAR AXLE

MODEL 35. . . . . .1.6 L (3.38 pts.*)
8-1/4. . . . . .2.08 L (4.4 pts.*)

* When equipped with TRAC-LOK, include 2 ounces of Friction Modifier Additive.

MAINTENANCE SCHEDULES

INDEX

page

GENERAL INFORMATION
INTRODUCTION 3
SCHEDULE—A 3
SCHEDULE—B 5
UNSCHEDULED INSPECTION 3

GENERAL INFORMATION

INTRODUCTION

Service and maintenance procedures for components and systems listed in Schedule—A or B can be found by using the Group Tab Locator index at the front of this manual. If it is not clear which group contains the information needed, refer to the index at the back of this manual.

There are two maintenance schedules that show proper service based on the conditions that the vehicle is subjected to. Use the schedule that best describes these conditions.

Schedule—**A**, lists maintenance recommended for vehicles used for general transportation.

Schedule—**B**, lists maintenance recommended for vehicles used under the following conditions:

- Frequent short trip driving less than 5 miles (8 km)
- Frequent driving in dusty conditions
- Frequent trailer towing
- Extensive idling
- More than 50% of your driving is at sustained high speeds during hot weather, above 90°F (32°C)

Where time and mileage are listed, follow the interval that occurs first.

EMISSION CONTROL SYSTEM MAINTENANCE

The scheduled emission maintenance listed in **bold type** on the Maintenance Schedules, must be done at the mileage specified to assure the continued proper functioning of the emission control system. These, and all other maintenance services included in this manual, should be done to provide the best vehicle performance and reliability. More frequent maintenance may be needed for vehicles in severe operating conditions such as dusty areas and very short trip driving.

UNSCHEDULED INSPECTION

At Each Stop For Fuel

- Check engine oil level, add as required.
- Check windshield washer solvent and add if required.

Once A Month

- Check tire pressure and look for unusual wear or damage.
- Inspect battery and clean and tighten terminals as required. Check electrolyte level and add water as needed.
- Check fluid levels of coolant reservoir, power steering, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Inspect exhaust system.
- Inspect brake hoses.
- Rotate the tires at each oil change interval shown on Schedule—A (7,500 miles) or every other interval shown on Schedule—B (6,000 miles).
- Check coolant level, hoses, and clamps.
- Lubricate propeller shaft universal joints and slip splines (if equipped).
- Lubricate suspension ball joints.
- After completion of off-road (4WD) operation, the underside of the vehicle should be thoroughly inspected. Examine threaded fasteners for looseness.

SCHEDULE—A

7,500 Miles (12 000 km) or at 6 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

15,000 Miles (24 000 km) or at 12 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

22,500 Miles (36 000 km) or at 18 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Inspect brake linings.

GENERAL INFORMATION (Continued)

30,000 Miles (48 000 km) or at 24 months

- Change engine oil.
- Replace engine oil filter.
- **Replace air cleaner element.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.

37,500 Miles (60 000 km) or at 30 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.

45,000 Miles (72 000 km) or at 36 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Inspect brake linings.
- Flush and replace engine coolant at 36 months, regardless of mileage.

52,500 Miles (84 000 km) or at 42 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Flush and replace engine coolant if not done at 36 months.

60,000 Miles (96 000 km) or at 48 months

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Replace fuel filter. Federal only.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.

67,500 Miles (108 000 km) or at 54 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Inspect brake linings.

75,000 Miles (120 000 km) or at 60 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill manual transmission fluid.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

82,500 Miles (133 000 km) or at 66 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

90,000 Miles (144 000 km) or at 72 months

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Inspect brake linings.

97,500 Miles (156 000 km) or at 78 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

105,000 Miles (168 000 km) or at 84 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

112,500 Miles (180 000 km) or at 90 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.
- Inspect brake linings.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

120,000 Miles (192 000 km) or at 96 months

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Replace fuel filter. Federal only.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.

Important: Inspection and service should also be performed any time a malfunction is observed or suspected.

GENERAL INFORMATION (Continued)

SCHEDULE—B

3,000 Miles (5 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

6,000 Miles (10 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

9,000 Miles (14 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

12,000 Miles (19 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

15,000 Miles (24 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

18,000 Miles (29 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.

21,000 Miles (34 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

24,000 Miles (38 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

27,000 Miles (43 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

30,000 Miles (48 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Lubricate steering linkage.
- Drain and refill transfer case fluid.

33,000 Miles (53 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

36,000 Miles (58 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

39,000 Miles (62 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

42,000 Miles (67 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

45,000 Miles (72 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

48,000 Miles (77 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

51,000 Miles (82 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Flush and replace engine coolant.

54,000 Miles (86 000 km)
- Change engine oil.
- Replace engine oil filter.

GENERAL INFORMATION (Continued)

- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.

57,000 Miles (91 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

60,000 Miles (96 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Replace fuel filter. Federal only.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

63,000 Miles (101 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

66,000 Miles (106 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

69,000 Miles (110 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

72,000 Miles (115 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

75,000 Miles (120 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

78,000 Miles (125 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

81,000 Miles (134 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Flush and replace engine coolant.

84,000 Miles (134 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

87,000 Miles (139 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

90,000 Miles (144 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Lubricate steering linkage.
- Drain and refill manual transmission fluid.
- Drain and refill transfer case fluid.

93,000 Miles (149 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

96,000 Miles (154 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

99,000 Miles (158 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

102,000 Miles (163 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

105,000 Miles (168 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**

GENERAL INFORMATION (Continued)

- Lubricate steering linkage.

108,000 Miles (173 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

111,000 Miles (178 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Flush and replace engine coolant.

114,000 Miles (182 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

117,000 Miles (187 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

120,000 Miles (192 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect and adjust drive belts.
- Replace fuel filter. Federal only.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Drain and refill front and rear axles.*
- Inspect brake linings.

*Off-highway operation, trailer towing, taxi, limousine, bus, snow plowing, or other types of commercial service or prolonged operation with heavy loading, especially in hot weather, require front and rear axle service indicated with an * in Schedule—B. Perform these services if the vehicle is operated under these conditions.

Important: Inspection and service should also be performed any time a malfunction is observed or suspected.

JUMP STARTING, TOWING AND HOISTING

INDEX

	page
SERVICE PROCEDURES	
EMERGENCY TOW HOOKS	11
FLAT SURFACE TOWING	11
FOUR-WHEEL-DRIVE VEHICLE TOWING	10
HOISTING RECOMMENDATIONS	11
JUMP STARTING PROCEDURE	8
TOWING RECOMMENDATIONS	9
TWO-WHEEL-DRIVE VEHICLE TOWING	9

SERVICE PROCEDURES

JUMP STARTING PROCEDURE

WARNING: REVIEW ALL SAFETY PRECAUTIONS AND WARNINGS IN GROUP 8A, BATTERY/STARTING/CHARGING SYSTEMS DIAGNOSTICS. DO NOT JUMP START A FROZEN BATTERY, PERSONAL INJURY CAN RESULT. DO NOT JUMP START WHEN MAINTENANCE FREE BATTERY INDICATOR DOT IS YELLOW OR BRIGHT COLOR. DO NOT JUMP START A VEHICLE WHEN THE BATTERY FLUID IS BELOW THE TOP OF LEAD PLATES. DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE. DO NOT USE OPEN FLAME NEAR BATTERY. REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT. WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW BATTERY VOLTAGE TO EXCEED 16 VOLTS. REFER TO INSTRUCTIONS PROVIDED WITH DEVICE BEING USED.

CAUTION: When using another vehicle as a booster, do not allow vehicles to touch. Electrical systems can be damaged on either vehicle.

TO JUMP START A DISABLED VEHICLE:

(1) Raise hood on disabled vehicle and visually inspect engine compartment for:

- Battery cable clamp condition, clean if necessary.
- Frozen battery.
- Yellow or bright color test indicator, if equipped.
- Low battery fluid level.
- Generator drive belt condition and tension.
- Fuel fumes or leakage, correct if necessary.

CAUTION: If the cause of starting problem on disabled vehicle is severe, damage to booster vehicle charging system can result.

(2) When using another vehicle as a booster source, turn off all accessories, place gear selector in park or neutral, set park brake and operate engine at 1200 rpm.

(3) On disabled vehicle, place gear selector in park or neutral and set park brake. Turn off all accessories.

(4) Connect jumper cables to booster battery. RED clamp to positive terminal (+). BLACK clamp to negative terminal (-). DO NOT allow clamps at opposite end of cables to touch, electrical arc will result. Review all warnings in this procedure.

(5) On disabled vehicle, connect RED jumper cable clamp to positive (+) terminal. Connect BLACK jumper cable clamp to engine ground as close to the ground cable attaching point as possible (Fig. 1).

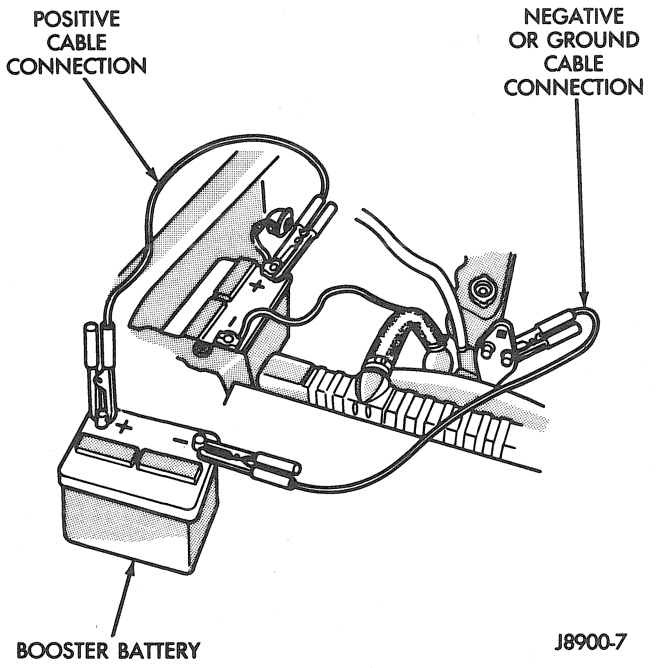


Fig. 1 Jumper Cable Connections—Typical

CAUTION: Do not crank starter motor on disabled vehicle for more than 15 seconds, starter will overheat and could fail.

SERVICE PROCEDURES (Continued)

(6) Allow battery in disabled vehicle to charge to at least 12.4 volts (75% charge) before attempting to start engine. If engine does not start within 15 seconds, stop cranking engine and allow starter to cool (15 min.), before cranking again.

DISCONNECT CABLE CLAMPS AS FOLLOWS:

- Disconnect BLACK cable clamp from engine ground on disabled vehicle.
- When using a Booster vehicle, disconnect BLACK cable clamp from battery negative terminal. Disconnect RED cable clamp from battery positive terminal.
- Disconnect RED cable clamp from battery positive terminal on disabled vehicle.

TOWING RECOMMENDATIONS

A vehicle equipped with SAE approved sling-type towing equipment can be used to tow all Jeep vehicles. When towing a 2WD vehicle, Chrysler Corporation recommends that the vehicle be towed with the rear end lifted, whenever possible.When towing a 4WD vehicle using a wheel-lift towing device, use a tow dolly under the opposite end of the vehicle. A vehicle with flat-bed device can also be used to transport a disabled vehicle (Fig. 2).

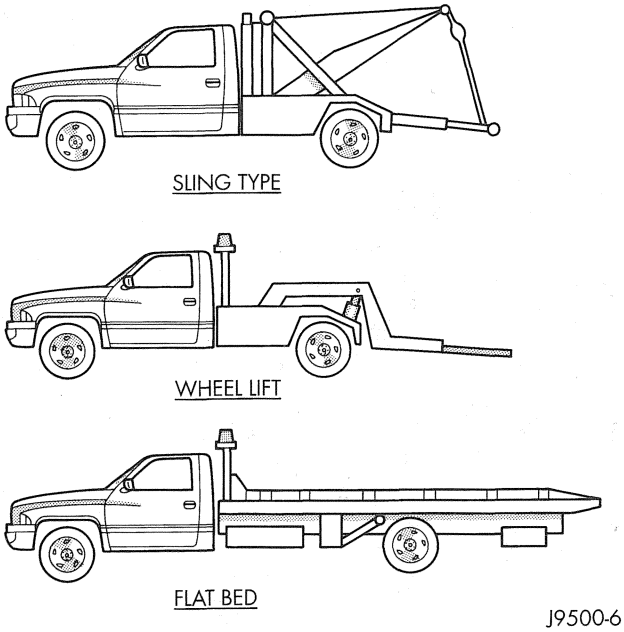


Fig. 2 Tow Vehicles With Approved Equipment

A wooden crossbeam may be required for proper connection when using the sling-type, front-end towing method.

SAFETY PRECAUTIONS

- Secure loose and protruding parts.
- Always use a safety chain system that is independent of the lifting and towing equipment.
- Do not allow towing equipment to contact the disabled vehicle's fuel tank.
- Do not allow anyone under the disabled vehicle while it is lifted by the towing device.
- Do not allow passengers to ride in a vehicle being towed.
- Always observe state and local laws regarding towing regulations.
- Do not tow a vehicle in a manner that could jeopardize the safety of the operator, pedestrians or other motorists.
- Do not attach tow chains, T-hooks, J-hooks, or a tow sling to a bumper, steering linkage, drive shafts or a non-reinforced frame hole.

GROUND CLEARANCE

CAUTION: If vehicle is towed with wheels removed, install lug nuts to retain brake drums.

A towed vehicle should be raised until lifted wheels are a minimum 100 mm (4 in) from the ground. Be sure there is adequate ground clearance at the opposite end of the vehicle, especially when towing over rough terrain or steep rises in the road. If necessary, remove the wheels from the lifted end of the vehicle and lower the vehicle closer to the ground, to increase the ground clearance at the opposite end of the vehicle. Install lug nuts on wheel attaching studs to retain brake drums.

FLAT-BED TOWING RAMP ANGLE

If a vehicle with flat-bed towing equipment is used, the approach ramp angle should not exceed 15 degrees.

TWO-WHEEL-DRIVE VEHICLE TOWING

TOWING-REAR END LIFTED (SLING-TYPE)

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

2WD XJ vehicles can be towed with the front wheels on the surface for extended distances at speeds not exceeding 48 km/h (30 mph).

(1) Attach J-hooks around the axle shaft tube outboard of the shock absorber.

(2) Place the sling crossbar under and forward of the bumper.

(3) Attach safety chains around the frame rails.

(4) Turn the ignition switch to the OFF position to unlock the steering wheel.

(5) Secure steering wheel in the straight ahead position with a clamp device designed for towing.

SERVICE PROCEDURES (Continued)

(6) Verify that steering components are in good condition.

(7) Shift the transmission to NEUTRAL.

TOWING-FRONT END LIFTED (SLING-TYPE)

CAUTION: Many vehicles are equipped with air dams, spoilers, and/or ground effect panels. To avoid component damage, a wheel-lift towing vehicle or a flat-bed hauling vehicle is recommended.

If a 2WD XJ vehicle cannot be towed with the rear wheels lifted, it can be towed with the front wheels lifted.

(1) Attach a J-hook to the disabled vehicle at the left side of the axle.

(2) Position the sling crossbar close to the J-hook and below the front bumper.

(3) Secure a chain to the right side of vehicle by placing it over the axle shaft tube and attaching it to a structural member (Fig. 3).

(4) Attach the safety chains to the vehicle.

(5) Turn the ignition switch to the OFF position to unlock the steering wheel.

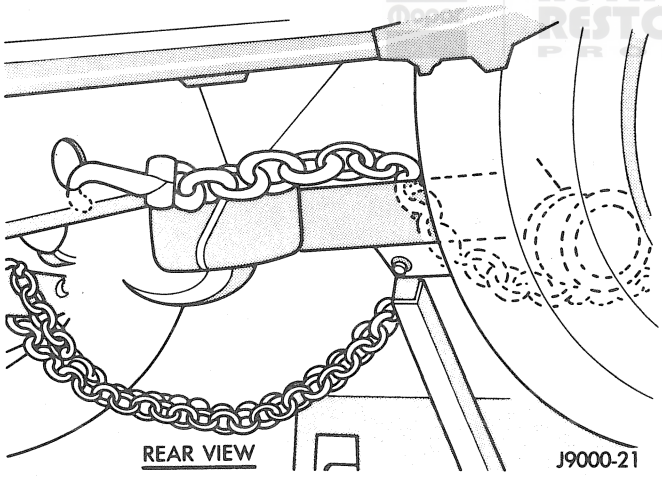


Fig. 3 Sling-Type, Front-End Towing (Rear View)

2WD-AUTOMATIC TRANSMISSION

Provided the transmission is operable, tow only in **NEUTRAL** at speeds not to exceed 30 mph (50 km/h) and distances less than 15 miles (25km/h).

If the vehicle is to be towed more than 15 miles, the propeller shaft should be disconnected or place tow dollies under rear wheels.

2WD-MANUAL TRANSMISSION

To reduce the possible damage of transmission components, the propeller shaft must be removed or place tow dollies under the rear wheels before towing. Refer to Propeller Shafts, Group 16 for proper removal procedure.

FOUR-WHEEL-DRIVE VEHICLE TOWING

Chrysler Corporation recommends that a 4WD vehicle be transported on a flat-bed device. A Wheel-lift or Sling-type device can be used provided all the wheels are lifted off the ground using tow dollies.

TOWING-REAR END LIFTED (SLING-TYPE)

(1) Raise the front of the vehicle off the ground and install tow dollies under front wheels.

(2) Attach J-hooks around the rear axle shaft tube outboard of the shock absorber.

(3) Place the sling crossbar under and forward of the bumper.

(4) Attach safety chains around the frame rails.

(5) Turn the ignition switch to the OFF position to unlock the steering wheel.

(6) Secure steering wheel in the straight ahead position with a clamp device designed for towing.

(7) Shift the transfer case to NEUTRAL.

TOWING-FRONT END LIFTED (SLING-TYPE)

(1) Raise the rear of the vehicle off the ground and install tow dollies under rear wheels.

(2) Attach a J-hook to the disabled vehicle at the left side of front the axle.

(3) Position the sling crossbar close to the J-hook and below the front bumper (Fig. 4).

(4) Secure a chain to the right side of vehicle by placing it over the axle shaft tube and attaching it to a structural member

(5) Attach the safety chains to the vehicle.

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.

(7) Shift transfer case to NEUTRAL.

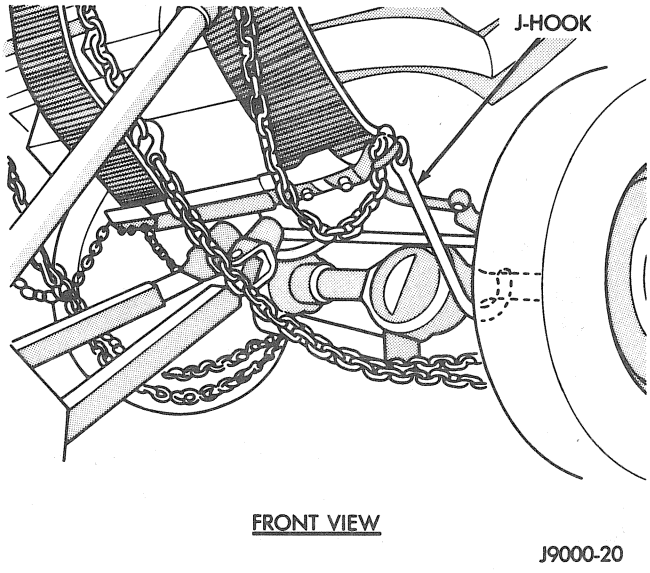


Fig. 4 Sling-Type, Front-End Towing (Front View)

SERVICE PROCEDURES (Continued)

FLAT SURFACE TOWING

Tow a vehicle in this manner only when all four wheels will freely rotate.

2WD VEHICLES

(1) Mark the drive shaft and the axle drive pinion gear shaft yoke for installation alignment reference.
(2) Remove the drive shaft. Install a protective covering over the drive shaft U-joints to retain them assembled and protected.
(3) Cover the open end of the transmission extension housing.

4WD VEHICLES

(1) Shift transfer case lever to NEUTRAL.
(2) Place ignition switch in the unlocked position.

EMERGENCY TOW HOOKS

WARNING: REMAIN AT A SAFE DISTANCE FROM A VEHICLE THAT IS BEING TOWED VIA ITS TOW HOOKS. THE TOW STRAPS/CHAINS COULD BREAK AND CAUSE SERIOUS INJURY.

Some Jeep vehicles are equipped with front and rear emergency tow hooks. The tow hooks should be used for **EMERGENCY** purposes only.

CAUTION: DO NOT use emergency tow hooks for tow truck hook-up or highway towing.

HOISTING RECOMMENDATIONS

Refer to the Owner's Manual for emergency vehicle lifting procedures.

FLOOR JACK

When properly positioned, a floor jack can be used to lift a Jeep vehicle (Fig. 5) and (Fig. 6). Support the vehicle in the raised position with jack stands at the front and rear ends of the frame rails.

CAUTION: Do not attempt to lift a Jeep vehicle with a floor jack positioned under:

- An axle tube.
- A body side sill.
- A steering linkage component.
- A drive shaft.
- The engine or transmission oil pan.
- The fuel tank.
- A front suspension arm.

NOTE: Use the correct sub-frame rail or frame rail lifting locations only.

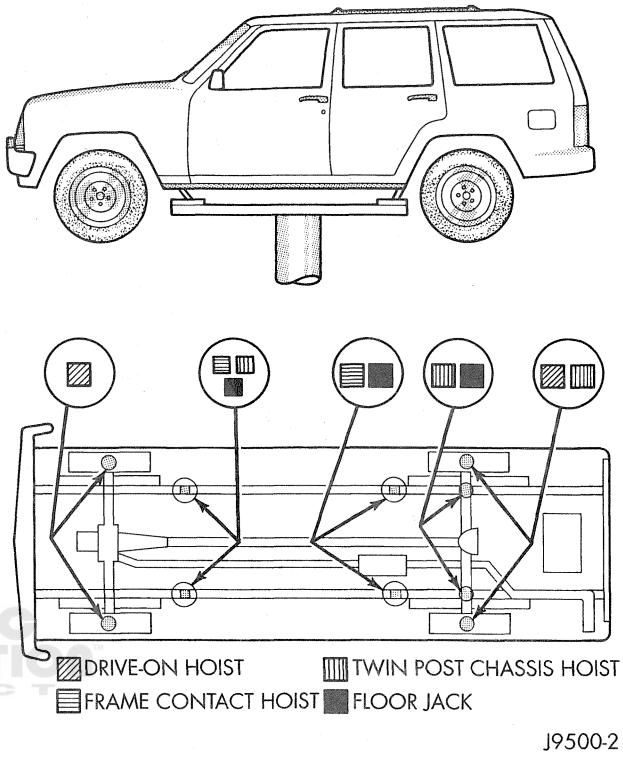


Fig. 5 Vehicle Lifting Locations

HOIST

A vehicle can be lifted with:
- A single-post, frame-contact hoist.
- A twin-post, chassis hoist.
- A ramp-type, drive-on hoist.

NOTE: When a frame-contact type hoist is used, verify that the lifting pads are positioned properly.

SERVICE PROCEDURES (Continued)

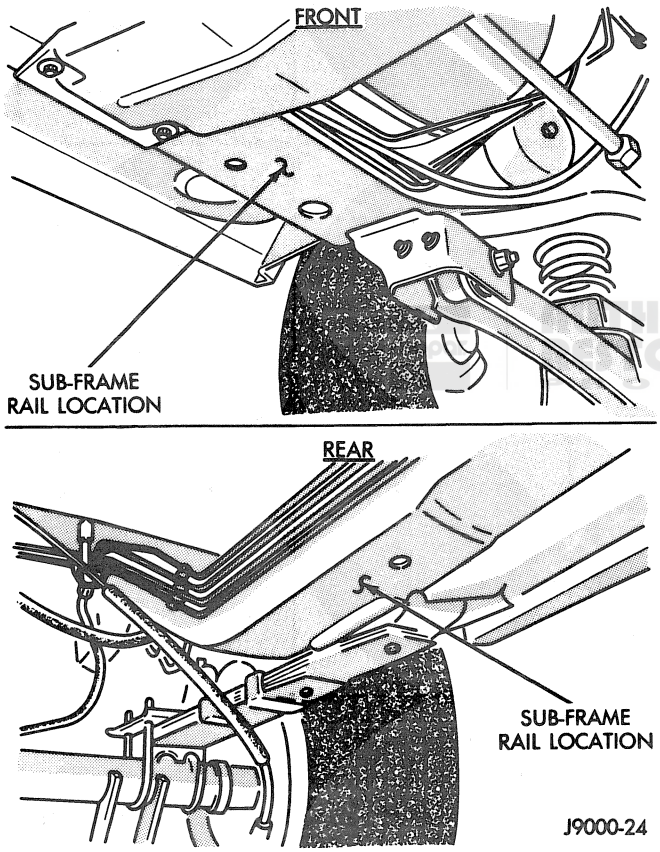


Fig. 6 Correct Vehicle Lifting Locations

WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN A CHASSIS OR DRIVETRAIN COMPONENT IS REMOVED FROM A VEHICLE, THE CENTER OF GRAVITY IS ALTERED MAKING SOME HOISTING CONDITIONS UNSTABLE. PROPERLY SUPPORT OR SECURE VEHICLE TO HOISTING DEVICE WHEN THESE CONDITIONS EXIST.

SUSPENSION

CONTENTS

	page		page
ALIGNMENT	1	REAR SUSPENSION	13
FRONT SUSPENSION	6		

ALIGNMENT

INDEX

	page		page
GENERAL INFORMATION		WHEEL ALIGNMENT	4
WHEEL ALIGNMENT	1	SPECIFICATIONS	
SERVICE PROCEDURES		ALIGNMENT	5
PRE-ALIGNMENT INSPECTION	1		

Mopar AUTHENTIC RESTORATION PRODUCTS

GENERAL INFORMATION

WHEEL ALIGNMENT

Wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to maximize tire wear. The most important measurements of front end alignment are caster, camber and toe position.

NOTE: Routine inspection of the front suspension and steering components is a good preventative maintenance practice. Inspection also helps to ensure safe operation of the vehicle.

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle rearward provides positive caster. Tilting the top of the knuckle forward provides negative caster. Caster is a directional stability angle. This angle enables the front wheels to return to a straight ahead position after turns.
- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire. The angle is not adjustable, the damaged component(s) must be replaced to correct mis-alignment.
- **WHEEL TOE POSITION** is the difference between the leading inside edges and trailing inside edges of the front tires. Incorrect wheel toe position is the most common cause of unstable steering and uneven tire wear. The wheel toe position is the **final** front wheel alignment adjustment.
- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted. The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable, the damaged component(s) must be replaced to correct misalignment.

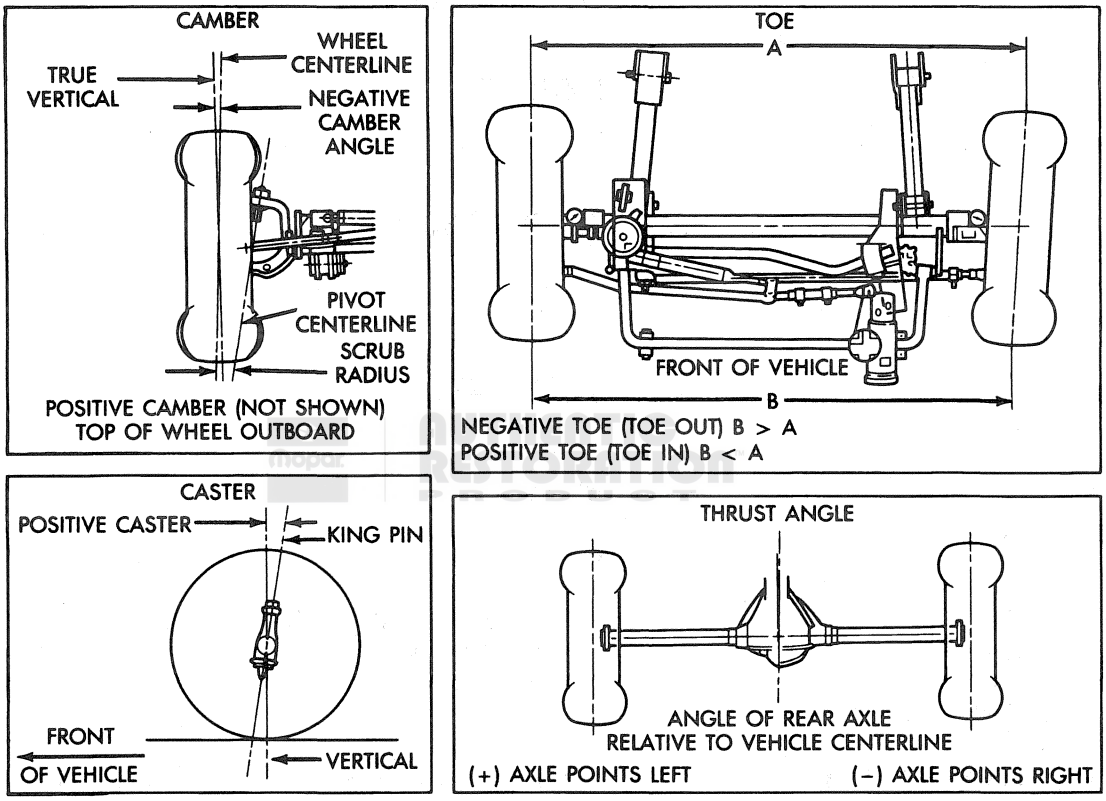
WARNING: Do not attempt to modify any suspension or steering component by heating and bending.

SERVICE PROCEDURES

PRE-ALIGNMENT INSPECTION

Before starting wheel alignment, the following inspection and necessary corrections must be completed. Refer to Suspension and Steering System Diagnosis Chart for additional information.

SERVICE PROCEDURES (Continued)



J9402-57

Wheel Alignment Measurements

(1) Tires with the same recommended air pressure, size, and tread wear. Refer to Group 22, Wheels and Tires for diagnosis information.

(2) Inspect front wheel bearings for wear or adjustment.

(3) Inspect front wheels for excessive radial, lateral runout and unbalance. Refer to Group 22, Wheels and Tires for diagnosis information.

(4) Inspect ball studs, linkage pivot points and steering gear for looseness, roughness, binding or a sticking condition. Refer to Group 19, Steering for additional information.

(5) Inspect suspension components for wear and noise. Check components for correct torque.

SERVICE PROCEDURES (Continued)

SUSPENSION AND STEERING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn front wheel bearings. 2. Loose or worn suspension bushings or components.	1. Adjust or replace wheel bearings. 2. Replace worn bushings or suspension components.
EXCESSIVE PLAY IN STEERING	1. Loose or worn front wheel bearings. 2. Loose or worn steering components. 3. Loose or worn steering gear.	1. Adjust or replace wheel bearings. 2. Replace loose or worn steering components. 3. Adjust or replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn front wheel bearings. 2. Loose or worn suspension bushings or components. 3. Tires worn or out of balance. 4. Alignment.	1. Adjust or replace wheel bearings. 2. Replace worn bushings or suspension components. 3. Replace or balance tires as needed. 4. Align front end.
VEHICLE INSTABILITY	1. Loose or worn front wheel bearings. 2. Alignment. 3. Loose or worn suspension bushings or components. 4. Weak or broken spring. 5. Tire pressure.	1. Adjust or replace wheel bearings. 2. Align front end. 3. Replace worn bushings or suspension components. 4. Replace weak or broken spring. 5. Correct tire pressure.
DIFFICULT STEERING	1. Tire pressure. 2. Alignment. 3. Steering gear or pump.	1. Correct tire pressure. 2. Align front end. 3. Adjust or replace steering gear. Test and repair pump as needed.
VEHICLE PULLS TO ONE SIDE	1. Tire pressure. 2. Alignment. 3. Loose or worn suspension bushings or components. 4. Weak or broken spring. 5. Brake pull.	1. Correct tire pressure. 2. Align front end. 3. Replace worn bushings or suspension components. 4. Replace weak or broken spring. 5. Repair brakes.

SERVICE PROCEDURES (Continued)

WHEEL ALIGNMENT

Before each alignment reading, the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down several times. Always release the bumper in the down position. Set the front end alignment to specifications with the vehicle at its NORMAL RIDE HEIGHT.

CAMBER: The wheel camber angle is preset. This angle is not adjustable and cannot be altered.

CASTER: Before checking the caster of the front axle for correct angle, be sure the axle is not bent or twisted.

Road test the vehicle, make left and right turns. If the steering wheel returns to the center position unassisted, the caster angle is correct. If steering wheel does not return toward the center position unassisted, an incorrect caster angle is probable.

Caster can be adjusted by installing the appropriate size shims (Fig. 1). **Changing caster angle will also change the front propeller shaft angle. The propeller shaft angle has priority over caster. Refer to Group 3 Differential & Driveline for additional information.**

TOE POSITION: The wheel toe position adjustment should be the final adjustment.

(1) Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position. Turn off the engine.

(2) Loosen the adjustment sleeve clamp bolts (Fig. 2) and (Fig. 3).

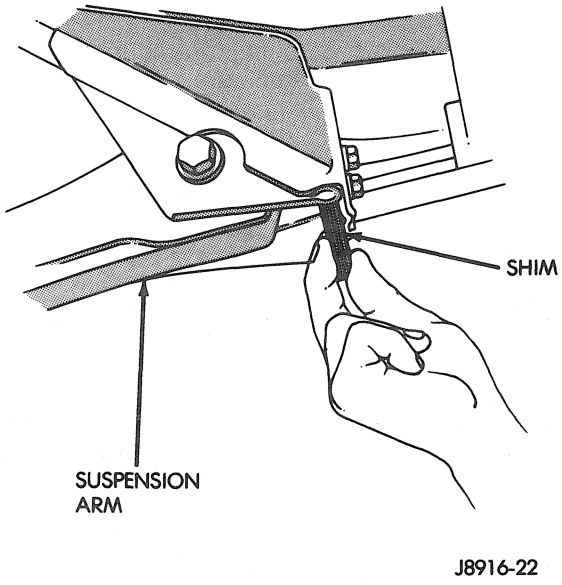


Fig. 1 Caster Adjustment

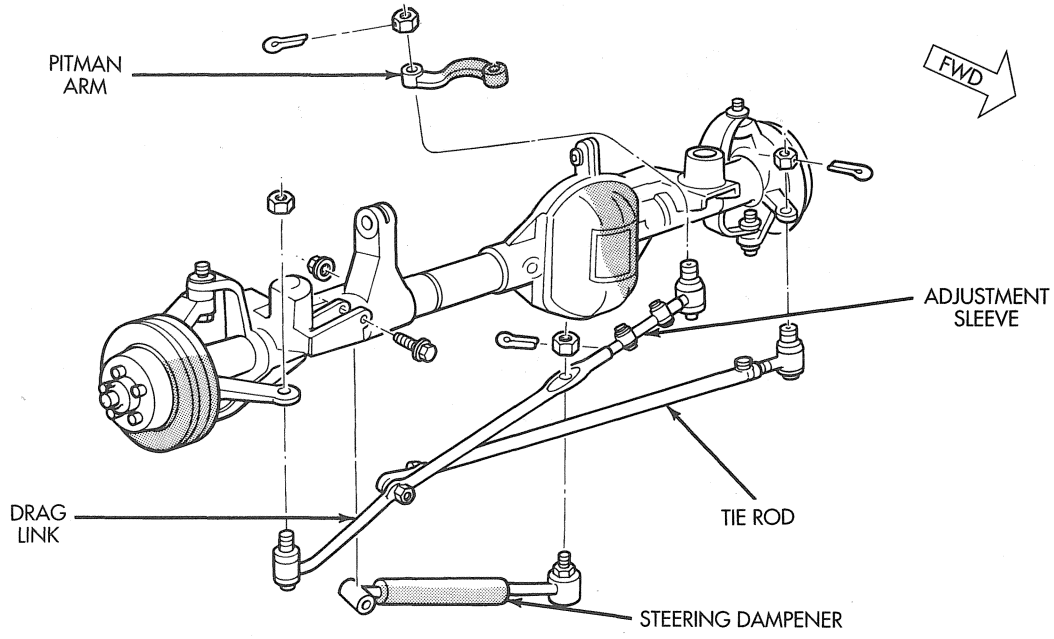


Fig. 2 Steering Linkage (LHD)

SERVICE PROCEDURES (Continued)

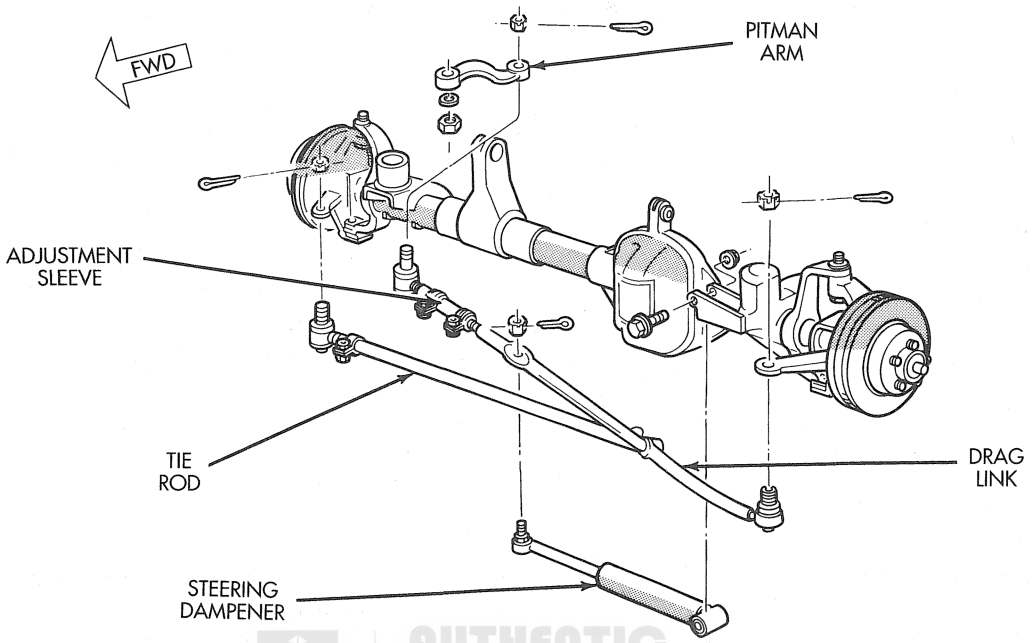


Fig. 3 Steering Linkage (RHD)

(3) Adjust the right wheel toe position with the drag link. Turn the sleeve until the right wheel is at specifications. Position the clamp bolts as shown (Fig. 4) and tighten to 49 N·m (36 ft. lbs.). **Make sure the toe setting does not change during clamp tightening.**

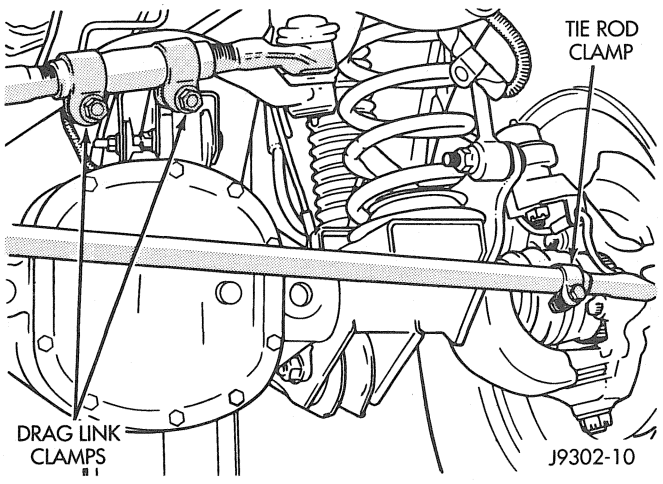


Fig. 4 Drag Link and Tie Rod Clamp (LHD)

(4) Adjust the left wheel toe position with the tie rod. Turn the sleeve until the left wheel is at specifications. Position the clamp bolts as shown (Fig. 4) and tighten to 27 N·m (20 ft. lbs.). **Make sure the toe setting does not change during clamp tightening.**

(5) Verify the right toe setting.

SPECIFICATIONS

ALIGNMENT

ADJUSTMENT	SET TO	OK RANGE
CASTER	7.07°	5.25° to 8.0°
CAMBER (not adjustable)	-0.25°	-0.75° to 0.5°
WHEEL TOE-IN (each side)	0°	-0.107° to +0.125°

J9502-9

FRONT SUSPENSION

INDEX

	page
DESCRIPTION AND OPERATION	
SUSPENSION COMPONENTS	6
DIAGNOSIS AND TESTING	
SHOCK DIAGNOSIS	6
REMOVAL AND INSTALLATION	
AXLE BUSHING	9
COIL SPRING	7
HUB BEARING	10
LOWER SUSPENSION ARM	8
SHOCK ABSORBER	7
STABILIZER BAR	9
STEERING KNUCKLE	8
TRACK BAR	10
UPPER SUSPENSION ARM	8
WHEEL MOUNTING STUDS	10
SPECIFICATIONS	
TORQUE CHART	11
SPECIAL TOOLS	
FRONT SUSPENSION	12

DESCRIPTION AND OPERATION

SUSPENSION COMPONENTS

The XJ front suspension is a link/coil design (Fig. 1). This suspension is use on Left Hand Drive (LHD) and Right Hand Drive (RHD) vehicles. The suspension is comprised of:

- Drive axle (4WD), tube axle (2WD)
- Dual-action shock absorbers
- Coil springs
- Upper and lower suspension arms
- Stabilizer bar
- Track bar
- Jounce bumpers

Link/Coil Suspension: This suspension allows each wheel to adapt to different road surfaces without greatly affecting the opposite wheel. Wheels are attached to a hub/bearings which bolts to the knuckles. The hub/bearing is not serviceable and is replaced as a unit. Steering knuckles pivot on replaceable ball studs attached to the axle tube yokes.

Shock Absorbers: The shock dampen jounce and rebound of the vehicle over various road conditions. The top of the shock absorbers are bolted to the body. The bottom of the shocks are bolted to the axle spring bracket.

Coil Springs: The springs control ride quality and maintain proper ride height. The coil springs mount up in the fender shield to abracket which is part of the unitized body. A rubber isolator is located between the top of the spring and the body. The bottom of the spring seats on a axle pad and is retained with a clip.

Upper & Lower Suspension Arms: The suspension arms are different lengths, with bushings at both ends. They bolt the axle assembly to the body. The lower arms uses shims at the body mount to allow for adjustment of caster and drive shaft pinion angle. The suspension arm travel is limited through the use of jounce bumpers in compression and shocks absorbers in rebound.

Stabilizer Bar: The stabilizer bar is used to minimize vehicle body roll during turns. The spring steel bar helps to control the vehicle body in relationship to the suspension. The bar extends across the front underside of the chassis and connects to the body rails. Links are connected from the bar to the axle brackets. Stabilizer bar mounts are isolated by rubber bushings.

Track Bar: The track bar is used to minimize front axle side-to-side movement. The bar is attached to a body rail bracket with a ball stud and isolated with a bushing at the axle bracket.

NOTE: Suspension components which use rubber bushings should be tightened at vehicle ride height. This will prevent premature failure of the bushing and maintain ride comfort. Bushings must never be lubricated.

DIAGNOSIS AND TESTING

SHOCK DIAGNOSIS

A noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. This noise can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in

DIAGNOSIS AND TESTING (Continued)

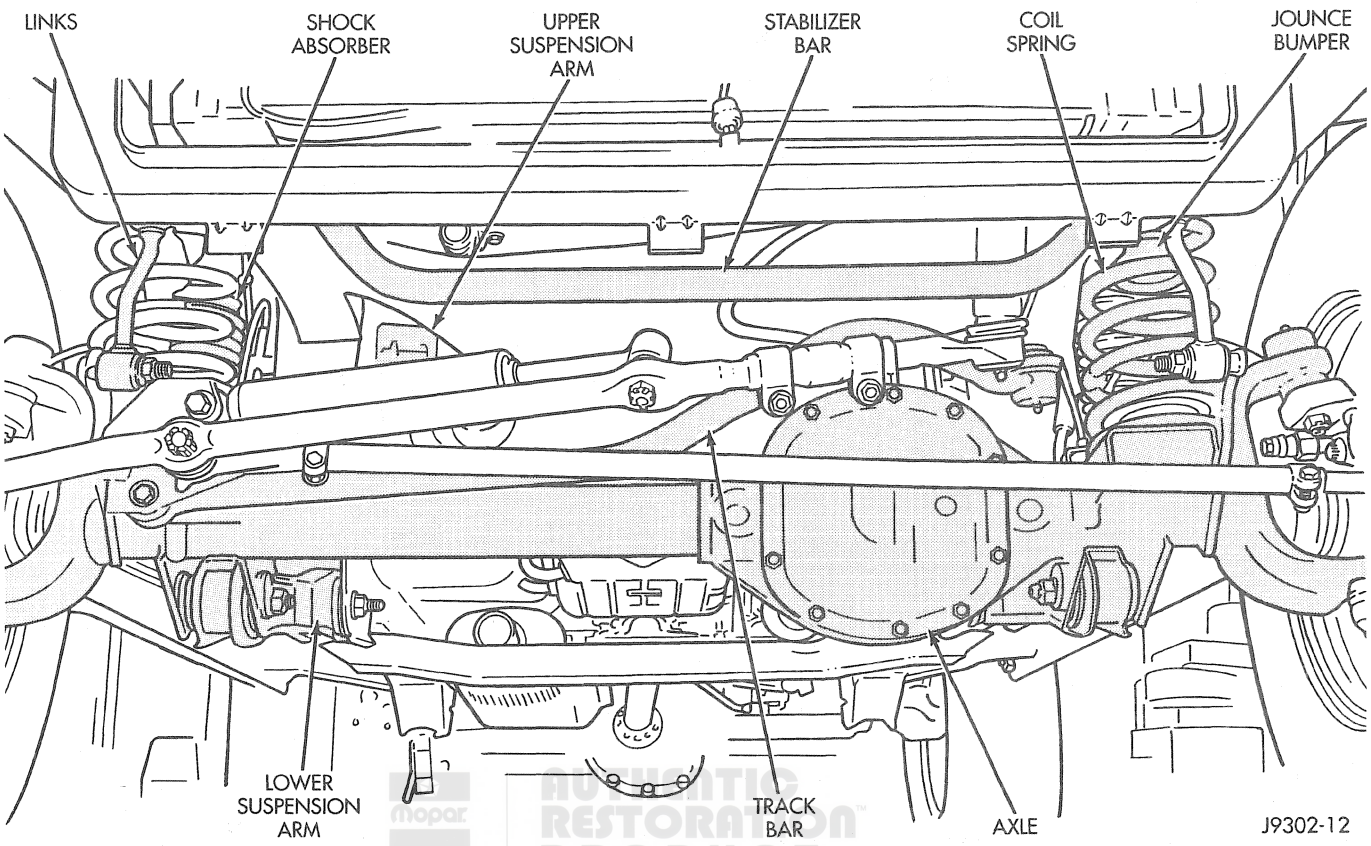


Fig. 1 Suspension Components (LHD)

an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

The shock absorber bushings do not require any type of lubrication. Do not attempt to stop bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing rubber.

REMOVAL AND INSTALLATION

SHOCK ABSORBER

REMOVAL

(1) Remove the nut, retainer and grommet from the upper stud in the engine compartment (Fig. 2).

(2) Remove the lower nuts and bolts from the axle bracket. Remove the shock absorber.

INSTALLATION

(1) Position the lower retainer and grommet on the upper stud. Insert the shock absorber through the shock tower hole.

(2) Install the lower bolts and nuts. Tighten nuts to 23 N·m (17 ft. lbs.).

(3) Install the upper grommet and retainer on the stud in the engine compartment. Install the nut and tighten to 10 N·m (8 ft. lbs.).

COIL SPRING

REMOVAL

(1) Raise and support the vehicle. Position a hydraulic jack under the axle to support it.

(2) Remove the wheel if necessary.

(3) Mark and disconnect the front propeller shaft from the axle.

(4) Disconnect the lower suspension arms from the axle (Fig. 2).

(5) Disconnect the stabilizer bar link and shock absorber from the axle.

(6) Disconnect the track bar from the body rail bracket.

(7) Disconnect the drag link from the pitman arm.

(8) Lower the axle until the spring is free from the upper mount. Remove the coil spring clip and remove the spring.

(9) Pull jounce bumper out of mount.

INSTALLATION

(1) Install jounce bumper into mount.

(2) Position the coil spring on the axle pad. Install the spring clip and bolt. Tighten bolt to 21 N·m (16 ft. lbs.).

(3) Raise the axle into position until the spring seats in the upper mount.

REMOVAL AND INSTALLATION (Continued)

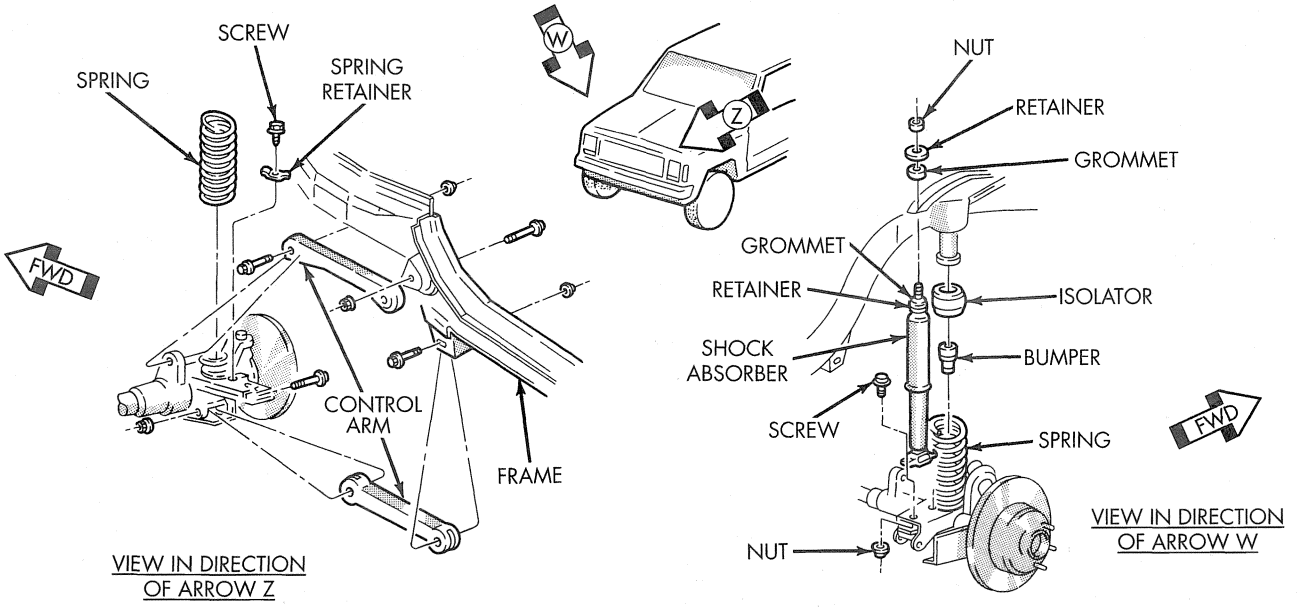


Fig. 2 Coil Spring & Shock Absorber

(4) Connect the stabilizer bar links and shock absorbers to the axle bracket. Connect the track bar to the body rail bracket.

(5) Install the lower suspension arms to the axle. DO NOT TIGHTEN AT THIS TIME.

(6) Install the front propeller shaft to the axle.

(7) Remove the supports and lower the vehicle.

(8) Tighten lower suspension arms nuts to 115 N·m (85 ft. lbs.).

STEERING KNUCKLE

For service procedures on the steering knuckle and ball studs refer to Group 3 Differentials And Driveline.

LOWER SUSPENSION ARM

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the lower suspension arm nut and bolt from the axle bracket.

(3) Remove the nut and bolt from the rear bracket and remove the lower suspension arm (Fig. 3).

INSTALLATION

(1) Position the lower suspension arm at the axle bracket and rear bracket.

(2) Install the bolts and finger tighten the nuts.

(3) Remove support and lower the vehicle.

(4) Tighten the front and rear nuts to 115 N·m (85 ft. lbs.).

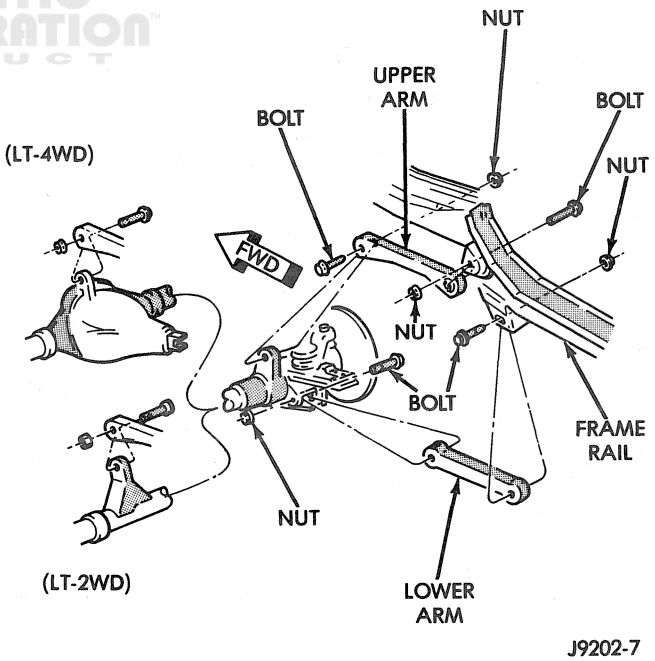


Fig. 3 Upper and Lower Suspension Arms

UPPER SUSPENSION ARM

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the upper suspension arm nut and bolt at the axle bracket.

(3) Remove the nut and bolt at the frame rail and remove the upper suspension arm (Fig. 3).

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Position the upper suspension arm at the axle and frame rail.
(2) Install the bolts and finger tighten the nuts.
(3) Remove the supports and lower the vehicle.
(4) Tighten the nut at the axle to 75 N·m (55 ft. lbs.). Tighten the nut at the frame bracket to 90 N·m (66 ft. lbs.).

AXLE BUSHING

REMOVAL

(1) Remove the upper suspension arm from axle
(2) Position Receiver 7932-1 (J-35581-1) over the bushing in the axle and install Bushing Removal/Installer (Fig. 4).
(3) Remove the bushing by tightening the Long Nut.

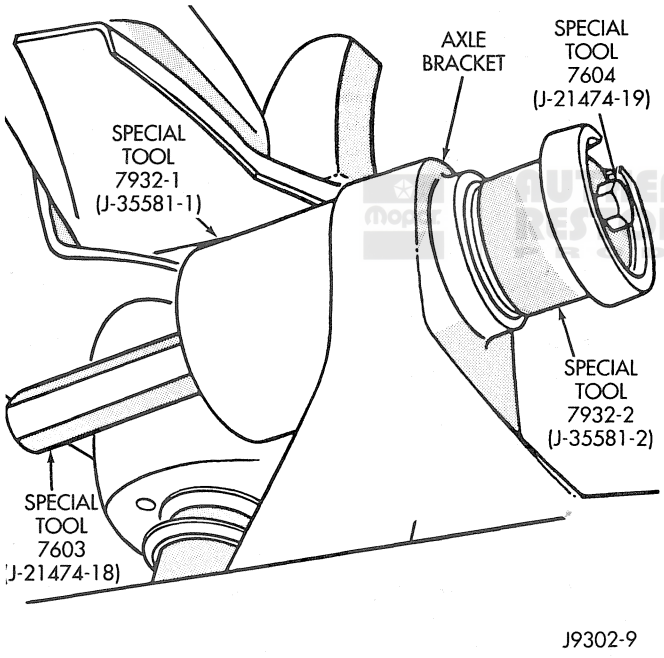


Fig. 4 Bushing Removal

NOTE: For two-wheel drive axles and right side on Model 30 axle, do not remove Receiver 7932-1 (J-35581-1) at this time.

INSTALLATION

(1) Position new bushing, Receiver and Installer on axle (Fig. 5).
(2) Install the bushing by tightening the Long Nut.
(3) Remove tools and install the upper suspension arm.

STABILIZER BAR

REMOVAL

(1) Raise and support the vehicle.

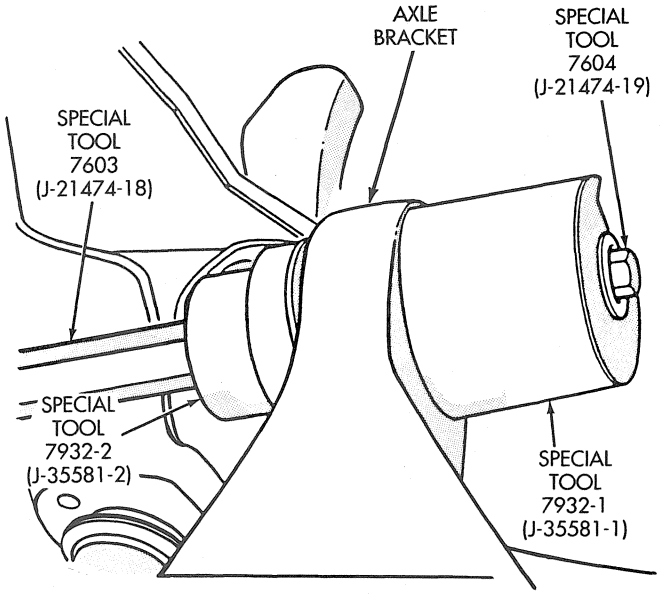


Fig. 5 Bushing Installation

(2) Disconnect the stabilizer bar links from the axle brackets (Fig. 6).

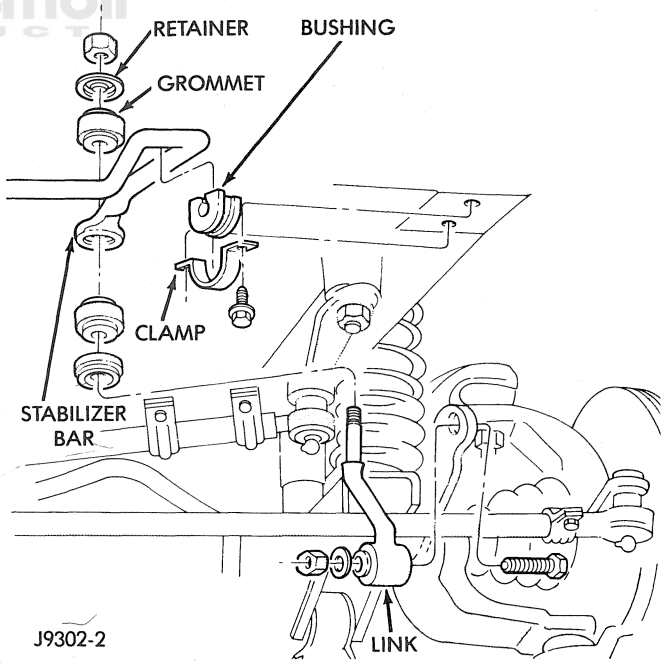


Fig. 6 Stabilizer Bar (LHD)

(3) Disconnect the stabilizer bar from the links.
(4) Disconnect the stabilizer bar clamps from the body rails. Remove the stabilizer bar.

INSTALLATION

(1) Inspect stabilizer bar bushings. Replace bushings if cracked, cut, distorted, or worn.

REMOVAL AND INSTALLATION (Continued)

(2) Position the stabilizer bar on the body rail and install the bushings and clamps. Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 75 N·m (40 ft. lbs.).

(3) Install the links and grommets onto the stabilizer bar and axle brackets. Tighten the nut at the connecting links at the axle bracket to 95 N·m (70 ft. lbs.).

(4) Tighten the stabilizer bar to connecting link nut to 36 N·m (27 ft. lbs.).

(5) Remove the supports and lower the vehicle.

TRACK BAR

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the cotter pin and nut from the ball stud end at the body rail bracket.

NOTE: A puller tool may be necessary to separate the ball stud from the frame rail bracket.

(3) Remove the bolt and flag nut from the axle shaft tube bracket (Fig. 7).

(4) Remove the track bar.

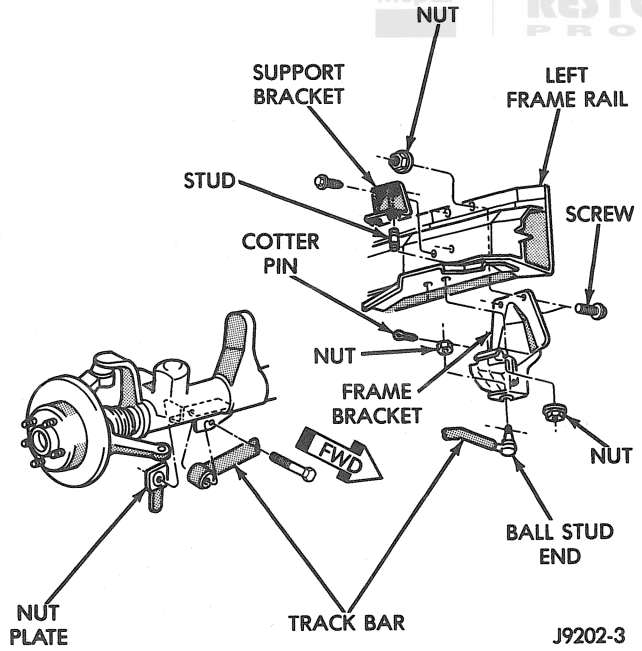


Fig. 7 Track Bar (LHD)

INSTALLATION

(1) Install the track bar at axle tube bracket. Loosely install the retaining bolt and flag nut.

(2) It may be necessary to pry the axle assembly over to install the track bar at the body rail. Install track bar at the body rail bracket. Install the retaining nut on the stud.

(3) Remove the supports and lower the vehicle.

(4) Tighten the retaining bolt at the axle shaft tube bracket to 100 N·m (74 ft. lbs.).

(5) Tighten the ball stud nut to 81 N·m (60 ft. lbs.). Install a new cotter pin.

HUB BEARING

The Hub Bearing is serviced as an assembly.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire assembly.

(3) Remove the brake components from the axle, refer to Group 5 Brakes.

(4) Remove the cotter pin, nut retainer and axle hub nut (Fig. 8).

(5) Remove the hub mounting bolts and remove hub bearing from the steering knuckle and axle shaft.

INSTALLATION

(1) Install the hub bearing and brake dust shield to the knuckle.

(2) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.).

(3) Install the hub washer and nut. Tighten the hub nut to 237 N·m (175 ft. lbs.). Install the nut retainer and a new cotter pin.

(4) Install the brake components, refer to Group 5 Brakes.

(5) Install the wheel and tire assembly.

(6) Remove support and lower the vehicle.

WHEEL MOUNTING STUDS

REMOVAL

(1) Raise and support vehicle.

(2) Remove wheel and tire assembly.

(3) Remove brake caliper and rotor, refer to Group 5 Brakes for procedure.

(4) Remove stud from hub with Remover C-4150A (Fig. 9).

INSTALLATION

(1) Install new stud into hub flange.

(2) Install three washer onto stud, then install lug nut with the flat side of the nut against the washers.

(3) Tighten lug nut until the stud is pulled into the hub flange. Verify that the stud is properly seated into the flange.

(4) Remove lug nut and washers.

(5) Install the brake rotor and caliper, refer to Group 5 Brakes for procedure.

(6) Install wheel and tire assembly, use new lug nut on stud or studs that were replaced.

(7) Remove support and lower vehicle.

REMOVAL AND INSTALLATION (Continued)

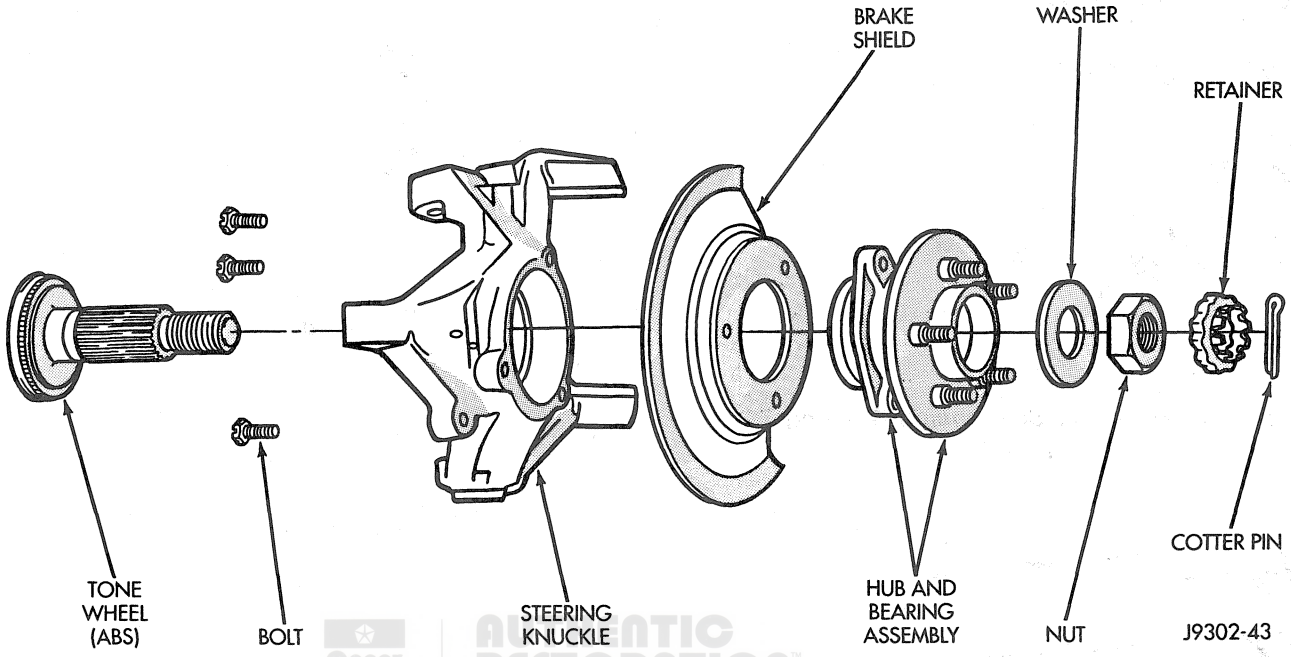


Fig. 8 Hub Bearing & Knuckle

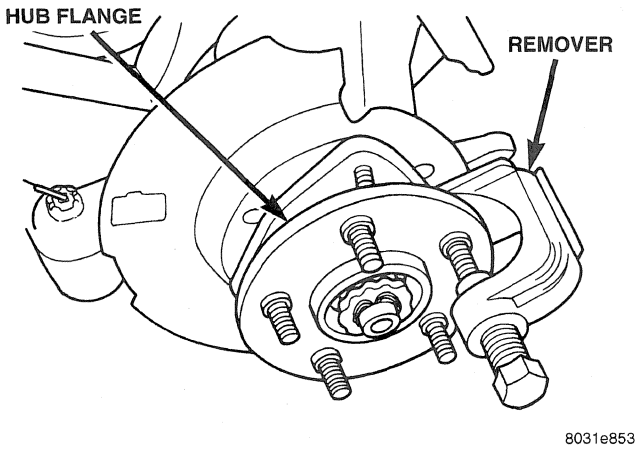


Fig. 9 Wheel Stud Removal

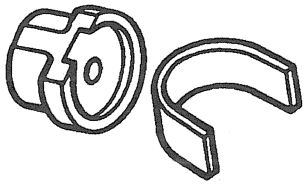
SPECIFICATIONS

TORQUE CHART

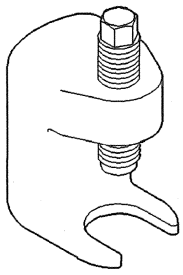
DESCRIPTION	TORQUE
Shock Absorber	
Upper Nut	11 N·m (8 ft. lbs.)
Lower Nut	23 N·m (17 ft. lbs.)
Suspension Arm Upper	
Front Nut	74 N·m (55 ft. lbs.)
Rear Nut	89 N·m (66 ft. lbs.)
Suspension Arm Lower	
Front Nut	115 N·m (85 ft. lbs.)
Rear Nut	115 N·m (85 ft. lbs.)
Stabilizer Bar	
Clamp Bolt	54 N·m (40 ft. lbs.)
Link Upper Nut	36 N·m (27 ft. lbs.)
Link Lower Nut	95 N·m (70 ft. lbs.)
Track Bar	
Ball Stud Nut	81 N·m (60 ft. lbs.)
Axle Bracket Bolt	100 N·m (74 ft. lbs.)
Track Bar Bracket	
Bolts	125 N·m (92 ft. lbs.)
Nut	100 N·m (74 ft. lbs.)
Support Bolts	42 N·m (31 ft. lbs.)

SPECIAL TOOLS

FRONT SUSPENSION

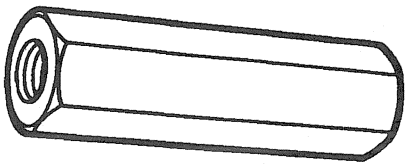


Remover/Installer Suspension Bushing 7932 (J-35581)



Remover C-4150A

AUTHENTIC RESTORATION PRODUCT



Nut, Long 7603 (J-21474–18)



Bolt, Special 7604 (J-21474–19)

REAR SUSPENSION

INDEX

page

DESCRIPTION AND OPERATION
SUSPENSION COMPONENT 13
DIAGNOSIS AND TESTING
SPRING AND SHOCK DIAGNOSIS 13
REMOVAL AND INSTALLATION
LEAF SPRING AND SHACKLE BUSHING 15
LEAF SPRING 14
SHOCK ABSORBER 14
STABILIZER BAR 14
SPECIFICATIONS
TORQUE CHART 16

DESCRIPTION AND OPERATION

SUSPENSION COMPONENT

The rear suspension is comprised of:

- Drive Axle
- Leaf Springs
- Dual-Action Shock Absorbers
- Stabilizer Bar
- Jounce Bumpers

Leaf Springs: The rear suspension system uses a multi-leaf springs and a solid drive axle. The forward end of the springs are mounted to the body rail hangers through rubber bushings. The rearward end of the springs are attached to the body by the use of shackles. The spring and shackles use rubber bushings. The bushing help to isolate road noise. The shackles allow the springs to change their length as the vehicle moves over various road conditions.

Shock Absorbers: Ride control is accomplished through the use of dual-action shock absorbers. The shocks dampen the jounce and rebound as the vehicle travels over various road conditions. The top of the shock absorbers are bolted to the body crossmember. The bottom of the shocks are bolted to the axle bracket.

Stabilizer Bar: The stabilizer bar is used to minimize vehicle body roll. The spring steel bar helps to control the vehicle body in relationship to the suspension. The bar extends across the underside of the body and is attached to the body rails with grommets. Links at the end of the bar are attached to the leaf spring brackets.

Jounce Bumpers: The jounce bumpers are used to limit the spring and axle travel. They are bolted to the body rail above the axle.

NOTE: Suspension components that use rubber bushings should be tightened with the vehicle at the normal height. Rubber bushings must never be lubricated.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING

SPRING AND SHOCK DIAGNOSIS

A noise from a shock absorber may be caused by movement between mounting bushings and metal bracket or attaching components. This noise can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

The spring eye and shock absorber bushings do not require any type of lubrication. Do not attempt to stop spring bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing rubber.

If the vehicle is used for severe, off-road operation, the springs should be examined periodically. Check for broken and shifted leafs, loose and missing clips, and broken center bolts. Refer to Spring and Shock Absorber Diagnosis chart for additional information.

REMOVAL AND INSTALLATION (Continued)

SPRING AND SHOCK ABSORBER DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
SPRING SAGS	1. Broken leaves 2. Spring fatigue	1. Replace broken leaves 2. Replace spring
SPRING NOISE	1. Loose U-bolts 2. Worn bushings 3. Worn or missing leaf liners	1. Tighten U-bolts to specified torque 2. Replace bushings 3. Replace leaf liners
SHOCK ABSORBERS NOISY	1. Loose mounting bolt or nut 2. Worn bushings 3. Leaking shock	1. Tighten bolt or nut to specified torque 2. Replace shock absorber 3. Replace shock

J9503-2

Mopar AUTHENTIC RESTORATION PRODUCT

REMOVAL AND INSTALLATION

SHOCK ABSORBER

REMOVAL

(1) Remove the shock absorber upper bolts from the body bracket (Fig. 1).

(2) Remove lower attaching nut and washer from the bracket stud. Remove the shock absorber.

INSTALLATION

(1) Install the shock absorber lower eye on the spring bracket stud. Install the shock absorber and upper bolts on the body bracket.

(2) Tighten the lower nut to 60 N·m (44 ft. lbs.).

(3) Tighten the upper bolts to 23 N·m (17 ft. lbs.).

STABILIZER BAR

REMOVAL

(1) Raise and support the vehicle.

(2) Disconnect stabilizer bar links from spring brackets (Fig. 2).

(3) Disconnect the stabilizer bar brackets from the body rails. Remove the stabilizer bar and links.

INSTALLATION

(1) Position the stabilizer bar links at the spring brackets. Install the attaching bolts and nuts and tighten to 74 N·m (55 ft. lbs.).

(2) Attach the stabilizer bar to the body rail brackets with the bolts. Tighten to 54 N·m (40 ft. lbs.).

(3) Remove the supports and lower the vehicle.

LEAF SPRING

REMOVAL

(1) Raise vehicle at body rails.

(2) Remove the wheel and tire assemblies.

(3) Support axle with hydraulic jack to relieve axle weight.

(4) Disconnect the shock absorber from the axle bracket or the spring bracket.

(5) Disconnect the stabilizer bar link from the spring bracket stud.

(6) Remove nuts, U-bolts and spring bracket from axle.

(7) Remove nut and bolt attaching spring front eye to shackle.

(8) Remove nut and bolt from spring rear eye.

(9) Remove spring from vehicle.

REMOVAL AND INSTALLATION (Continued)

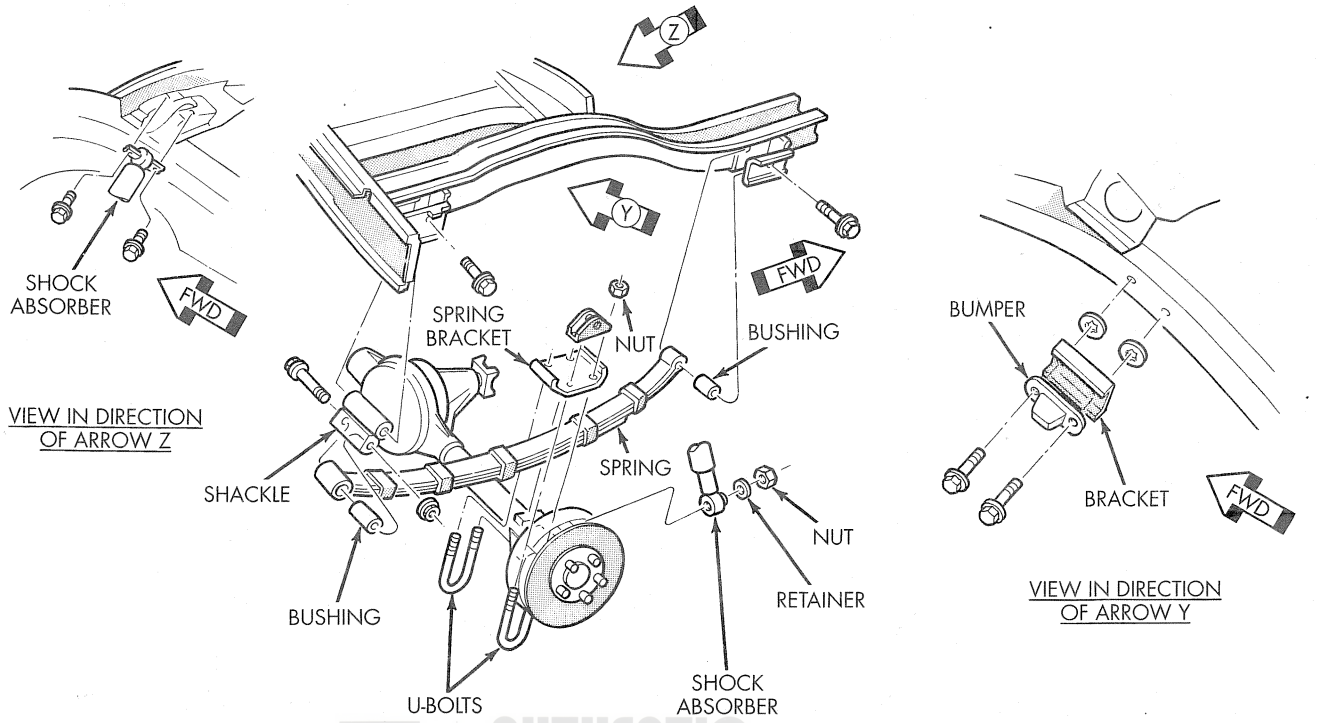


Fig. 1 Rear Suspension Components

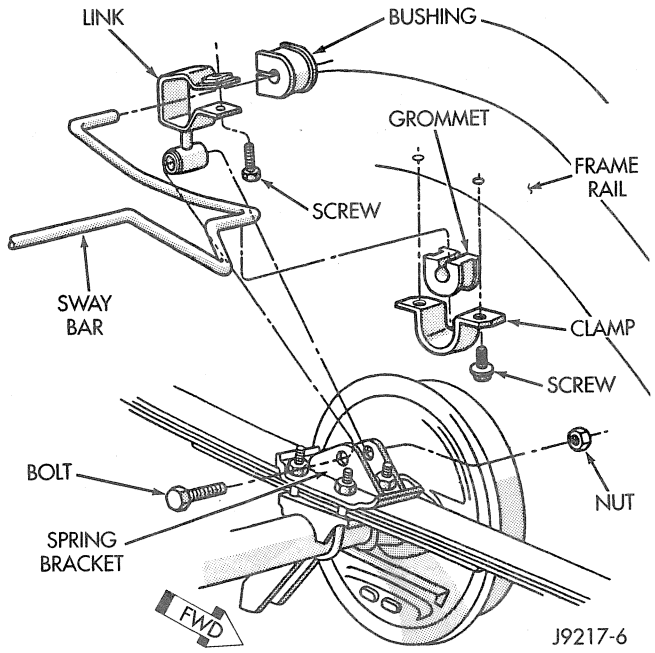


Fig. 2 Stabilizer Bar

INSTALLATION

(1) Position the spring front eye in the bracket. Loosely install the attaching bolt and nut. Do not tighten at this time.

(2) Position the rear eye in the shackle bracket. Loosely install the attaching bolt and nut. Do not tighten at this time.

(3) Position the axle. Install the spring bracket, U-bolts and nuts. Tighten the nuts to 70 N·m (52 ft. lbs.).

(4) Connect the stabilizer bar link to the spring bracket.

(5) Connect the shock absorber to the axle bracket or spring bracket.

(6) Remove the hydraulic jack.

(7) Lower the vehicle.

(8) Tighten the spring front eye attaching bolts to 148 N·m (109 ft. lbs.).

(9) Tighten the spring rear eye attaching bolts to 108 N·m (80 ft. lbs.).

LEAF SPRING AND SHACKLE BUSHING

For front oval bushings bend tabs DOWN before removal. Use an appropriate driver tool and force the original bushing out of the spring eye.

(1) Assemble tools shown (Fig. 3). Tighten nut at the socket wrench end of the threaded rod until the bushing is forced out.

(2) Assemble and align the bushing installation tools.

(3) Align the bushing with the spring eye or shackle eye and tighten the nut at the socket wrench

REMOVAL AND INSTALLATION (Continued)

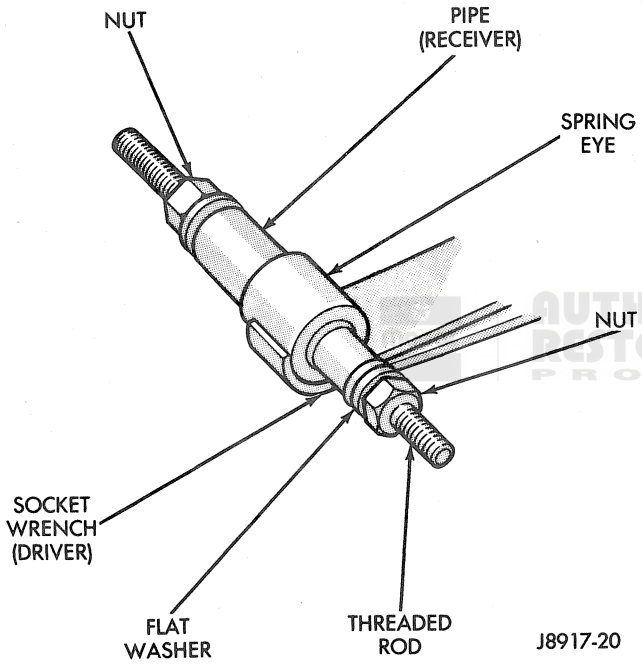


Fig. 3 Spring Eye Bushing Removal

end of the threaded rod. Tighten until the bushing is forced into the spring eye.

NOTE: The bushing must be centered in the spring eye. The ends of the bushing must be flush or slightly recessed within the end surfaces of the spring eye.

(4) For front oval bushings bend tabs up after installation.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Shock Absorber	
Upper Bolt	23 N·m (17 ft. lbs.)
Lower Nut	60 N·m (44 ft. lbs.)
Stabilizer Bar	
Clamp Bolt	54 N·m (40 ft. lbs.)
Link Upper Bolt	12 N·m (9 ft. lbs.)
Link Lower Nut	74 N·m (55 ft. lbs.)
Spring	
U-Bolt Nut	70 N·m (52 ft. lbs.)
Front Pivot Bolt	148 N·m (109 ft. lbs.)
Upper Shackle Bolt	148 N·m (109 ft. lbs.)
Lower Shackle Bolt	108 N·m (80 ft. lbs.)

DIFFERENTIAL AND DRIVELINE

CONTENTS

	page		page
8 1/4 AXLE	68	MODEL 35 AXLE	42
FRONT AXLE—TUBE AND MODEL 30	14	PROPELLER SHAFTS	1

PROPELLER SHAFTS

INDEX

	page		page
GENERAL INFORMATION		REAR PROPELLER SHAFT	7
LUBRICATION	2	DISASSEMBLY AND ASSEMBLY	
PRECAUTIONS	2	DOUBLE CARDAN (CV)	9
PROPELLER SHAFTS	1	SINGLE CARDAN	8
UNIVERSAL JOINTS	2	CLEANING AND INSPECTION	
DIAGNOSIS AND TESTING		SINGLE AND DOUBLE CARDAN JOINT	13
RUNOUT	4	ADJUSTMENTS	
UNBALANCE	3	ADJUSTMENT AT AXLE WITH LEAF SPRINGS	13
VIBRATION	3	SPECIFICATIONS	
SERVICE PROCEDURES		PROPELLER SHAFTS AND U–JOINTS	13
INSPECTION	5	SPECIAL TOOLS	
PROPELLER SHAFT ANGLE MEASUREMENT	5	PROPELLER SHAFT	13
UNIVERSAL JOINT ANGLE	5		
REMOVAL AND INSTALLATION			
FRONT PROPELLER SHAFT	7		

GENERAL INFORMATION

PROPELLER SHAFTS

The function of a propeller shaft is to transmit power from one point to another. The shaft is designed to send torque from the transmission (transfer case on 4WD vehicles) to the axle (Fig. 1).

The propeller shaft must operate through constantly changing relative angles between the transmission and axle. It must also be capable of changing length while transmitting torque. The axle rides suspended by springs in a floating motion. The propeller shaft must be able to change operating angles when going over various road surfaces. This is done through universal joints, which permit the propeller shaft to operate at different angles. The slip joints (or yokes) permit contraction or expansion (Fig. 1).

Tubular propeller shafts are balanced by the manufacturer with weights spot welded to the tube.

The propeller shaft is designed and built with the yoke lugs in line with each other which is called phasing. This design produces the smoothest running condition, an out of phase shaft can cause a vibration.

Before undercoating a vehicle, the propeller shaft and the U-joints should be covered. This will prevent the undercoating from causing an unbalanced condition and vibration.

CAUTION: Use exact replacement hardware for attaching the propeller shafts. The specified torque must always be applied when tightening the fasteners.

GENERAL INFORMATION (Continued)

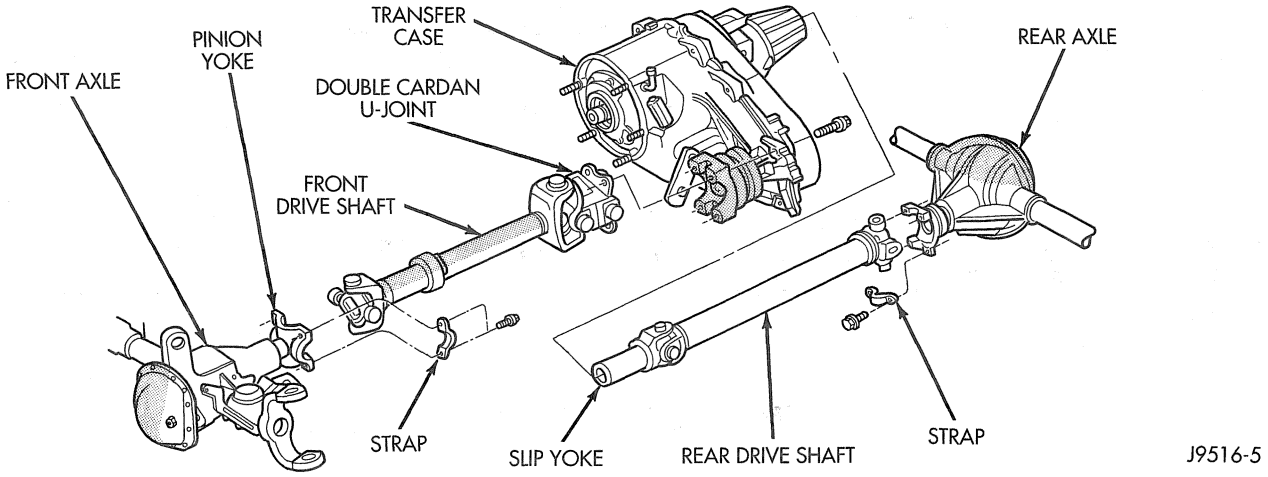


Fig. 1 Propeller Shafts

UNIVERSAL JOINTS

Two different types of U–joints are used with the propeller shafts:

- Single cardan U–joint (Fig. 2)
- Double cardan (CV) U–joint (Fig. 3)

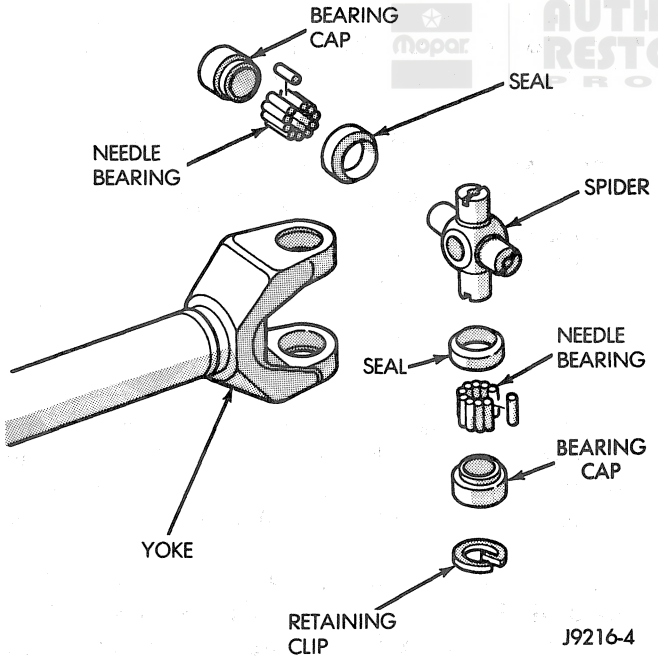


Fig. 2 Single Cardan Universal Joint

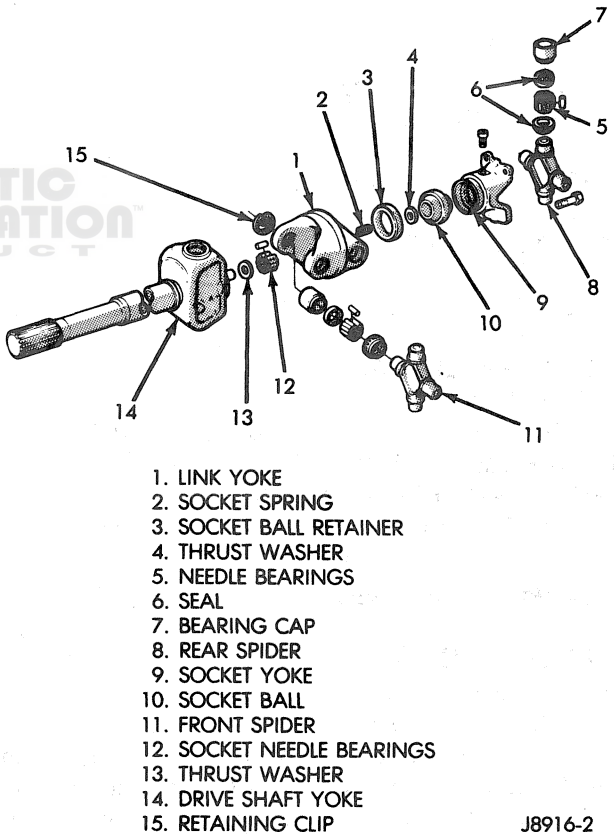


Fig. 3 Double Cardan (CV) Universal Joint

LUBRICATION

The factory installed U–joints are lubricated for the life of the vehicle and do not need re–lubrication. All U–joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the U–joint should be replaced.

PRECAUTIONS

Use exact replacement hardware for attaching the propeller shafts. Exact replacement will ensure safe operation. The specified torque must always be applied when tightening the fasteners.

Put reference marks on the propshaft yoke and axle or transmission yoke before service (Fig. 4). This will assure correct phasing and eliminate possible vibration.

GENERAL INFORMATION (Continued)

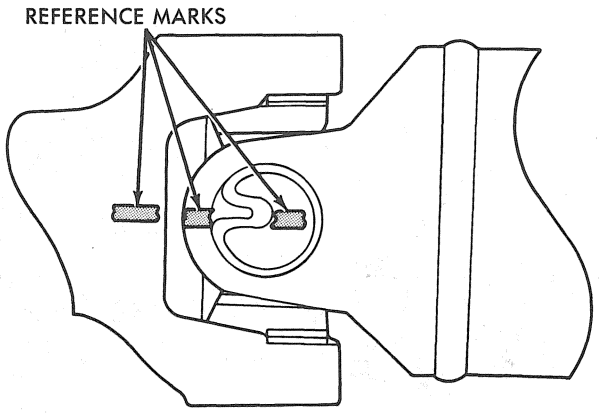


Fig. 4 Reference Marks on Yokes

CAUTION: Do not allow the propeller shaft to drop or hang from either universal joint during removal. Attach it to the vehicle underside with wire to prevent damage to the universal joints.

CAUTION: It is very important to protect the machined, external surface of the slip yoke from damage after propeller shaft removal. If damaged, the transmission extension seal could be damaged and cause a leak.

DIAGNOSIS AND TESTING

VIBRATION

Tires that are out–of–round or wheels that are unbalanced will cause a low frequency vibration. Refer to Group 22, Wheels and Tires for additional information.

Brake drums that are unbalanced will cause a harsh, low frequency vibration. Refer to Group 5, Brakes for additional information.

Driveline vibration can also result from loose or damaged engine mounts. Refer to Group 21, Transmissions for additional information.

Propeller shaft vibration will increase as the vehicle speed is increased. A vibration that occurs within a specific speed range is not caused by propeller shaft unbalance. Defective universal joints or an incorrect propeller shaft angle are usually the cause.

UNBALANCE

If propeller shaft unbalance is suspected, it can be verified with the following procedure.

Removing and re–indexing the propeller shaft 180° may eliminate some vibrations.

- Clean all the foreign material from the propeller shaft and the universal joints.
- Inspect the propeller shaft for missing balance weights, broken welds, and bent areas. **If the propeller shaft is bent, it must be replaced.**
- Ensure the universal joints are not worn, are properly installed, and are correctly aligned with the shaft.
- Check the universal joint clamp screws torque

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
PROPELLER SHAFT	a. Undercoating or other foreign material on shaft.	a. Clean exterior of shaft and wash with solvent.
	b. Loose U-joint clamp screws.	b. Tighten screws properly.
	c. Loose or bent U-joint yoke or excessive runout.	c. Install replacement yoke.
	d. Incorrect drive line angularity.	d. Correct angularity
	e. Rear spring center bolt not in seat.	e. Loosen spring U-bolts and seat center bolts.
	f. Worn U-joint bearings.	f. Replace U-joint.
	g. Propeller shaft damaged (bent tube) or out of balance.	g. Install replacement propeller shaft.
	h. Broken rear spring.	h. Replace rear spring.
	i. Excessive runout or unbalanced condition.	i. Reindex propeller shaft 180°, test and correct as necessary.
	j. Excessive drive pinion gear shaft yoke runout.	j. Reindex propeller shaft 180° and evaluate.
UNIVERSAL JOINT NOISE	a. U-joint clamp screws loose.	a. Tighten screws with specified torque.
	b. Lack of lubrication.	b. Replace U-joint.

J9216-7

DIAGNOSIS AND TESTING (Continued)

(1) Raise the vehicle.
(2) Remove the wheel and tires assembly. Install the wheel lug nuts to retain the brake drums.
(3) Mark and number the shaft six inches from the yoke end at four positions 90° apart.
(4) Run and accelerate the vehicle until vibration occurs. Note the intensity and speed the vibration occurred. Stop the engine.
(5) Install a screw clamp at position 1 (Fig. 5).

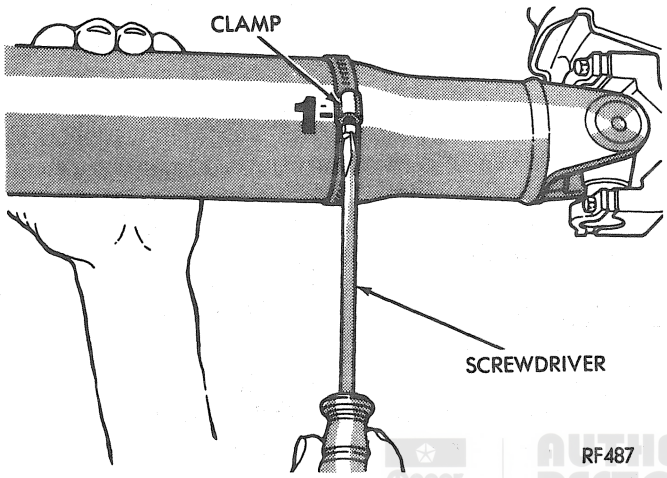


Fig. 5 Clamp Screw At Position 1

(6) Start the engine and re–check for vibration. If there is little or no change in vibration, move the clamp to one of the other three positions. Repeat the vibration test.
(7) If there is no difference in vibration at the other positions, the vibration may not be propeller shaft unbalance.
(8) If the vibration decreased, install a second clamp (Fig. 6) and repeat the test.

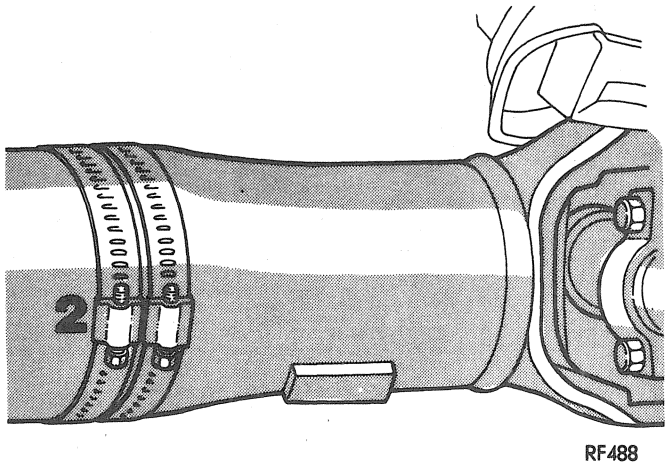


Fig. 6 Two Clamp Screws At The Same Position

(9) If the clamps cause an additional unbalance, separate the clamps (1/4 inch above and below the mark). Repeat the vibration test (Fig. 7).

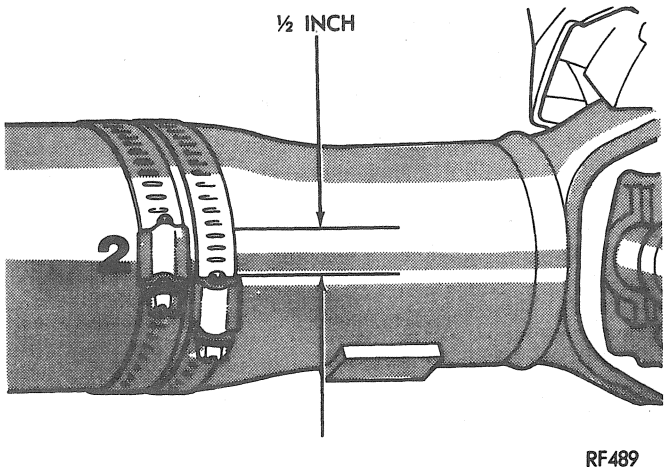


Fig. 7 Clamp Screws Separated

(10) Increase distance between the clamp screws and repeat the test until the amount of vibration is at the lowest level. Bend the slack end of the clamps so the screws will not loosen.
(11) Install the wheel and tires. Lower the vehicle.
(12) If the amount of vibration remains unacceptable, apply procedures at the front end of the propeller shaft.

RUNOUT

(1) Remove dirt, rust, paint, and undercoating from the propeller shaft surface. Areas where the dial indicator will contact the shaft must be clean.
(2) The dial indicator must be installed perpendicular to the shaft surface.
(3) Measure runout at the center and ends away from welds.
(4) Refer to Runout Specifications chart.
(5) Replace the propeller shaft if the runout exceeds the limit.

RUNOUT SPECIFICATIONS

Front of shaft	0.010 in. (0.25 mm)
Center of shaft	0.015 in. (0.38 mm)
Rear of shaft	0.010 in. (0.25 mm)

NOTE: Measure front/rear runout approximately 3 inches (76 mm) from the weld seam at each end of the shaft tube for tube lengths over 30 inches. Under 30 inches the max. runout is 0.20 inch for full length of the tube.

J9116-15

SERVICE PROCEDURES

UNIVERSAL JOINT ANGLE

INFORMATION

When two shafts come together at any common joint, the bend that is formed is called the operating angle. The larger the angle, the larger the amount of acceleration and deceleration of the joint. This speeding up and slowing down of the joint must be cancelled to produce a smooth power flow. This is done through phasing and proper universal joint working angles.

A propeller shaft is properly phased when the yoke ends are on the same plane or in line. A twisted shaft will throw the yokes out of phase and cause a noticeable vibration.

When taking universal joint angle measurements or checking phasing with two piece shafts, consider each shaft separately. On 4WD vehicles, the front shaft input (pinion shaft) angle has priority over the caster angle.

Ideally the driveline system should have;

- Angles that are in equal or opposite within 1 degree of each other
- Have a 3 degree maximum operating angle
- Have at least a 1/2 degree continuous operating (propeller shaft) angle

Engine speed (rpm) is the main factor though in determining maximum allowable operating angles. As a guide to maximum normal operating angles refer to the chart listed (Fig. 8).

PROPELLER SHAFT R.P.M.	MAX. NORMAL OPERATING ANGLES
5000	3°
4500	3°
4000	4°
3500	5°
3000	5°
2500	7°
2000	8°
1500	11°

J9316-4

Fig. 8 Maximum Angles And Engine Speed

INSPECTION

Before measuring universal joint angles, the following must be done.

- Inflate all tires to correct pressure
- Check angles in the same loaded or unloaded condition as when the vibration occurred. Propeller shaft angles will change according to the amount of load in the vehicle. Always check angles in loaded and unloaded conditions.
- Check the condition of all suspension components and verify all fasteners are torqued to specifications.
- Check the condition of the engine and transmission mounts and verify all fasteners are torqued to specifications.

PROPELLER SHAFT ANGLE MEASUREMENT

To accurately check driveline alignment, raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn. Remove any external bearing snap rings (if equipped) from universal joint so protractor base sits flat.

(1) Rotate the shaft until transmission/transfer case output yoke bearing is facing downward.

Always make measurements from front to rear.

(2) Place Inclinometer on yoke bearing (A) parallel to the shaft (Fig. 9). Center bubble in sight glass and record measurement.

This measurement will give you the transmission or Output Yoke Angle (A).

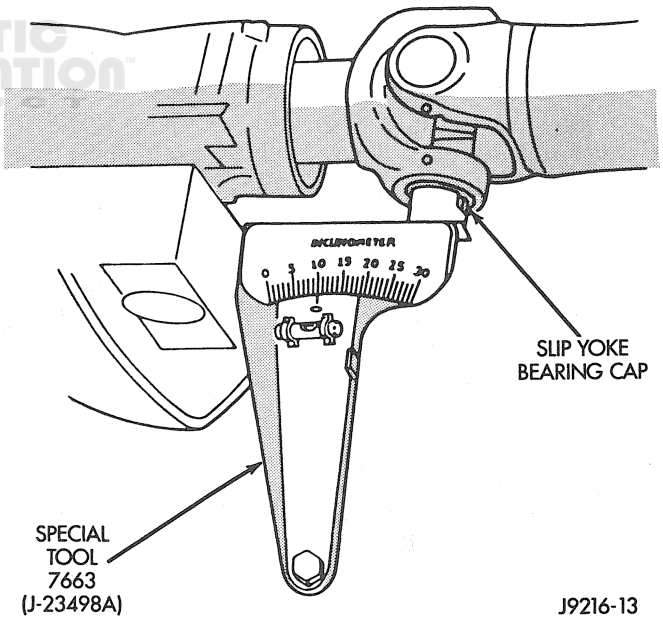


Fig. 9 Front (Output) Angle Measurement (A)

(3) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing parallel to the shaft (Fig. 10). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

This measurement will give you the Propeller Shaft Angle (C).

(4) Subtract smaller figure from larger (C minus A) to obtain Transmission Output Operating Angle.

(5) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing parallel to the

SERVICE PROCEDURES (Continued)

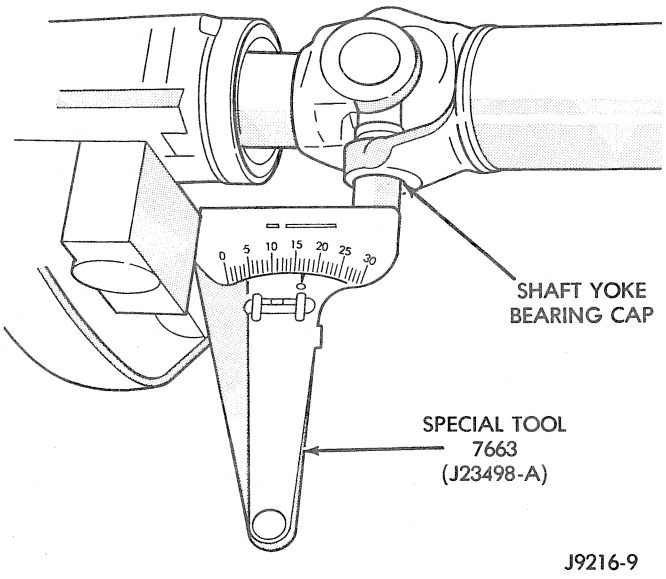


Fig. 10 Propeller Shaft Angle Measurement (C)

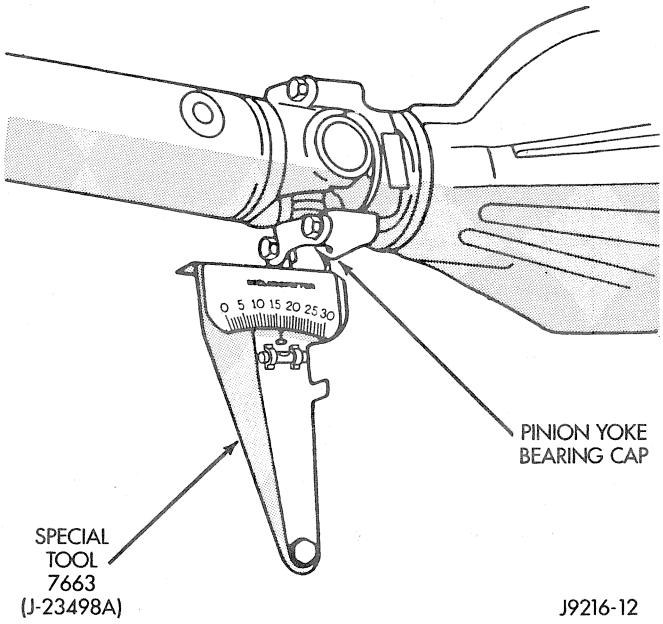


Fig. 11 Rear (Input) Angle Measurement (B)

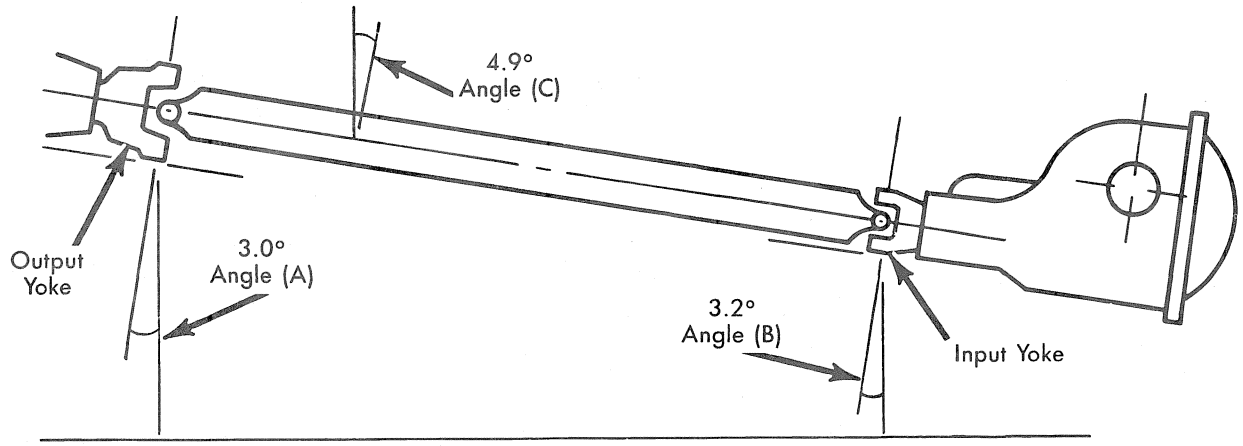
shaft (Fig. 11). Center bubble in sight glass and record measurement.

This measurement will give you the pinion shaft or Input Yoke Angle (B).

(6) Subtract smaller figure from larger (C minus B) to obtain axle Input Operating Angle.

Refer to rules given below and the example in (Fig. 12) for additional information.

- Good cancellation of U–joint operating angles (within 1°)
- Operating angles less than 3°
- At least 1/2 of one degree continuous operating (propeller shaft) angle



(A) Output Yoke	= 3.0°	or	4.9°
(C) Prop. Shaft	= 4.9°		-3.0°
Transmission Output Operating Angle			1.9°

(B) Axle Input Yoke	= 3.2°	or	4.9°
(C) Prop. Shaft	= 4.9°		-3.2°
Axle Input Operating Angle			1.7°

Trans. Output Operating Angle	1.9°
Axle Input Operating Angle	-1.7°
Amount of U-Joint Cancellation	0.2°

J9316-3

Fig. 12 Universal Joint Angle Example

REMOVAL AND INSTALLATION

FRONT PROPELLER SHAFT

REMOVAL

(1) Raise the vehicle.

(2) Scribe alignment marks on the yokes at the transfer case. Place marks at the pinion shaft and at each end of the propeller shaft. These marks will be used for installation reference (Fig. 13).

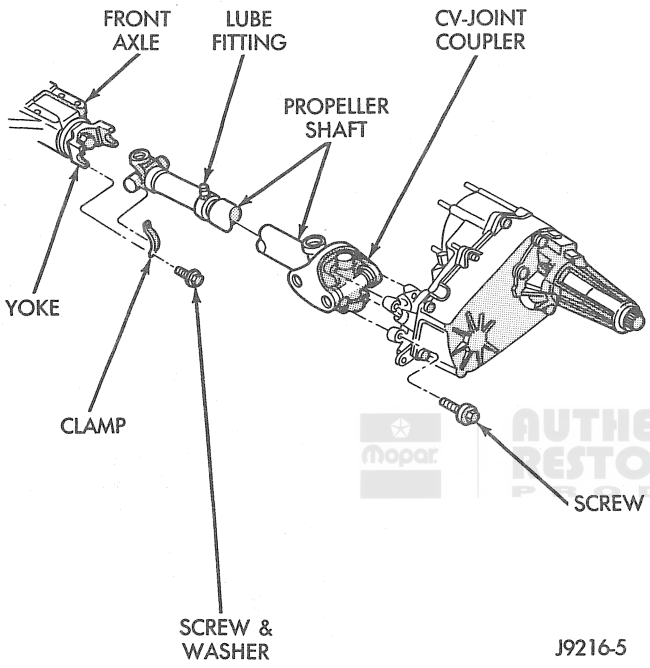


Fig. 13 Front Propeller Shaft

(3) Remove the U–joint strap bolts at the pinion shaft yoke.

(4) Disconnect the propeller shaft at the transfer case and remove the propeller shaft.

INSTALLATION

(1) Position the propeller shaft with the yoke reference marks aligned (Fig. 14). Install the propeller shaft.

Replacement U–joint straps and bolts must be installed.

(2) Tighten the U–joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.) torque.

(3) Tighten the flange to transfer case bolts to 27 N·m (20 ft. lbs.) torque.

(4) Lower the vehicle.

REAR PROPELLER SHAFT

REMOVAL

(1) Shift the transmission and transfer case (if applicable) to their Neutral positions. Raise the vehicle.

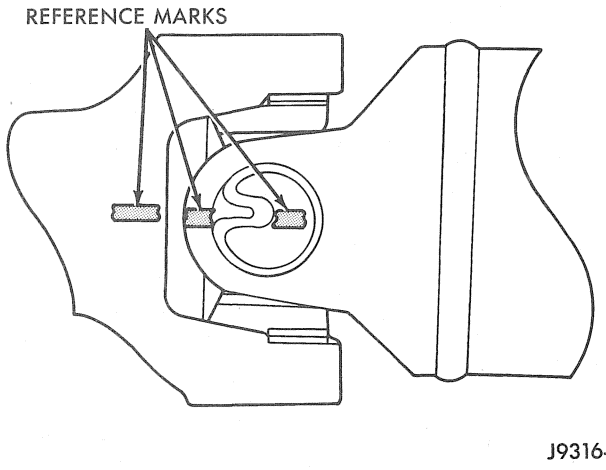


Fig. 14 Reference Marks on Yokes

(2) Scribe alignment marks at the pinion shaft and at each end of the propeller shaft. These marks will be used for installation reference.

(3) Remove the U–joint strap bolts at the pinion shaft yoke.

(4) Slide the slip yoke off of the transmission/transfer case output shaft and remove the propeller shaft (Fig. 15).

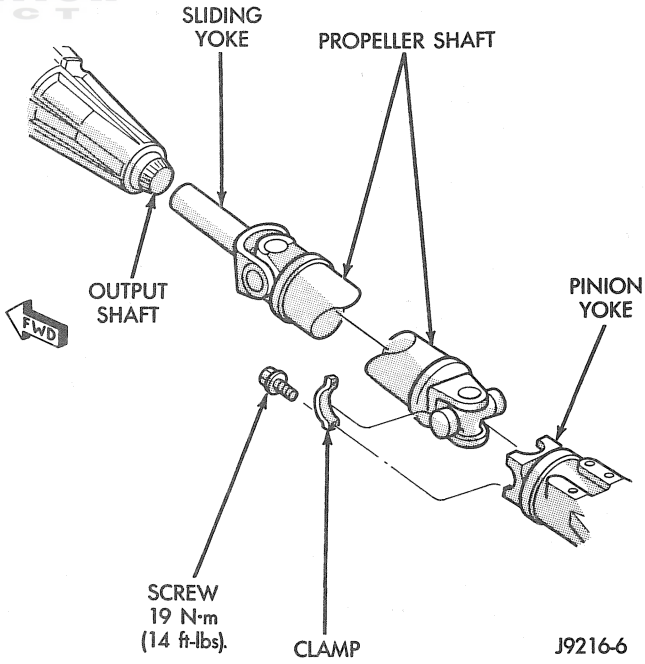


Fig. 15 Rear Propeller Shaft

INSTALLATION

(1) Slide the slip yoke on the transmission/transfer case output shaft. Align the installation reference marks at the axle yoke and install the propeller shaft (Fig. 15).

Replacement U–joint straps and bolts must be installed.

REMOVAL AND INSTALLATION (Continued)

(2) Tighten the U–joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.) torque.
(3) Lower the vehicle.

DISASSEMBLY AND ASSEMBLY

SINGLE CARDAN

REMOVAL

Single cardan universal joints are not serviceable. If worn or leaking, they must be replaced as a unit.
(1) Remove the propeller shaft. Refer to Propeller Shaft Replacement in this Group.
(2) **Paint or score alignment marks on the yokes and propeller shaft for installation reference.**
(3) Using a soft drift, tap the outside of the bearing assembly to loosen snap ring.
(4) Remove snap rings from both sides of yoke (Fig. 16).

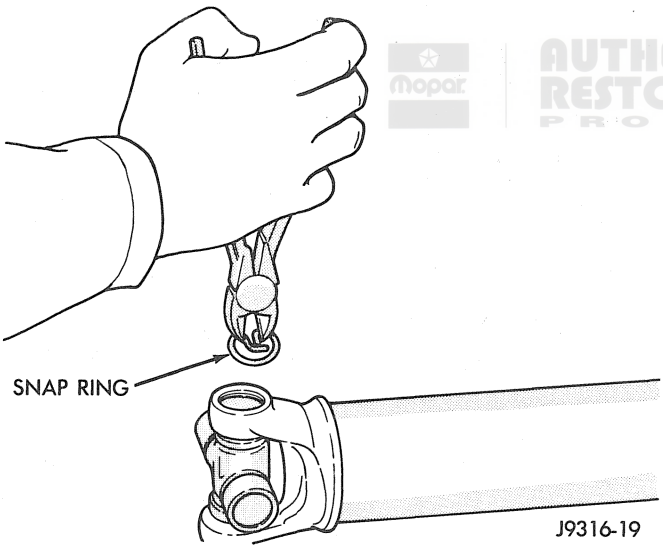


Fig. 16 Remove Snap Ring

(5) Set the yoke in an arbor press or vise with a large socket beneath it. Position the yoke with the grease fitting pointing up (if equipped). Place a smaller socket on the upper bearing assembly and press it through to release the lower bearing assembly (Fig. 17).
(6) If the bearing assembly will not pull out by hand after pressing, tap the base of the lug near it to dislodge.
(7) To remove the opposite bearing, turn the yoke over and straighten the cross in the open hole. Then carefully press the end of the cross until the remaining bearing can be removed (Fig. 18).

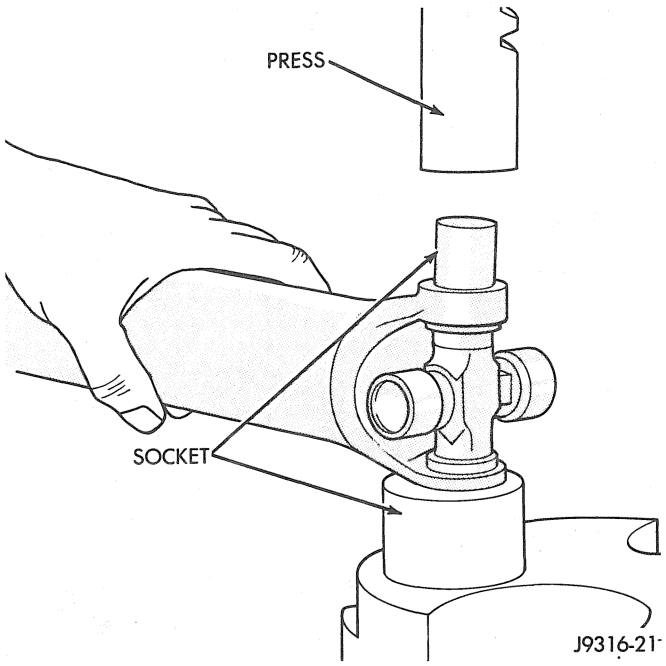


Fig. 17 Press Out Bearing

CAUTION: If the cross or bearing assembly are cocked when being pressed, the bearing assembly will score the walls of the yoke bore and ruin the yoke.

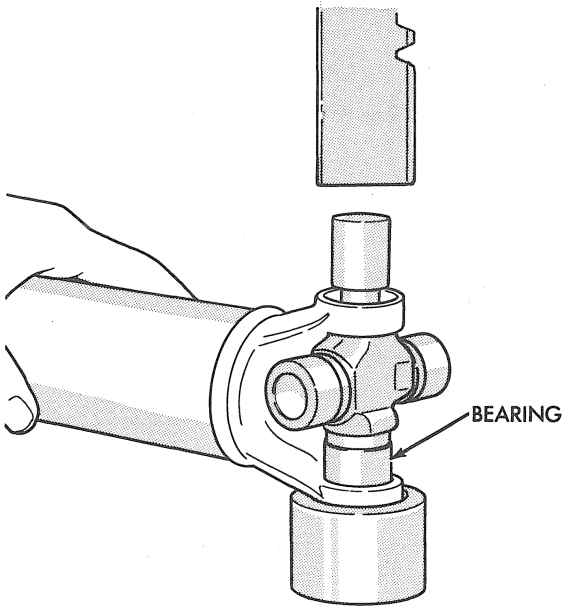


Fig. 18 Press Out Remaining Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

(1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to aid in installation.

(2) Position the cross in the yoke with its lube fitting (if equipped) pointing up (Fig. 19).

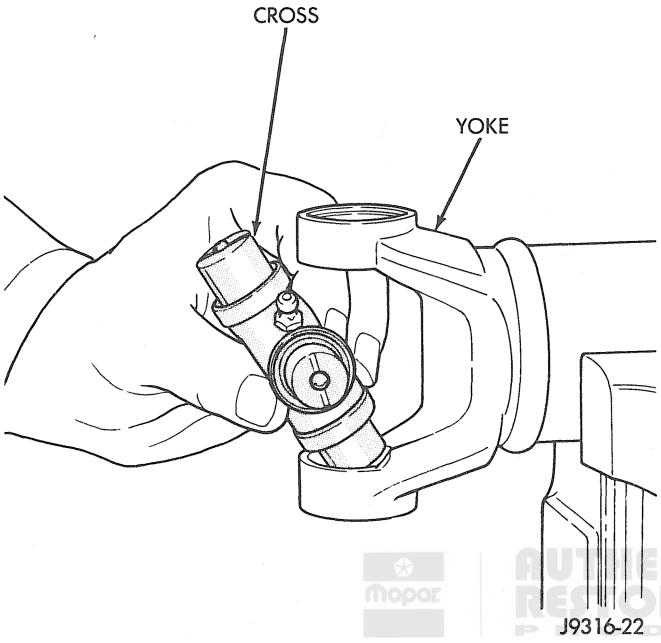


Fig. 19 Install Cross In Yoke

(3) Place a bearing assembly over the trunnion and align it with the cross hole (Fig. 20). Keep the needle bearings upright in the bearing assembly. A needle roller lying at the bottom will prevent proper assembly.

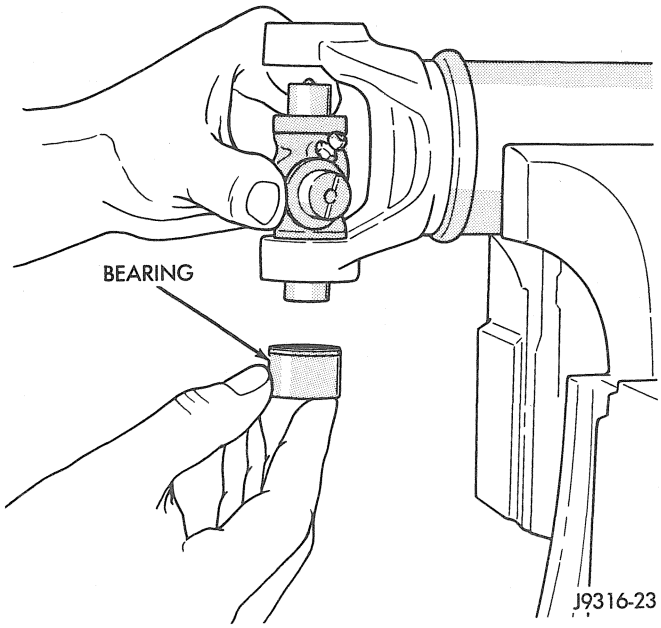


Fig. 20 Install Bearing On Trunnion

(4) Press the bearing assembly into the cross hole enough to install a snap ring. Install a snap ring.

(5) Repeat steps 3 and 4 to install the opposite bearing assembly. If the joint is stiff, strike the yoke with a soft hammer to seat the needle bearings. Install a snap ring.

(6) Add grease to lube fitting (if equipped).

(7) Install the propeller shaft.

DOUBLE CARDAN (CV)

REMOVAL

Cardan universal joints are not serviceable. If worn or leaking, they must be replaced as a unit.

(1) Remove the propeller shaft. Refer to Propeller Shaft Replacement in this Group.

(2) **Paint or score alignment marks on the yokes and propeller shaft for installation reference.**

(3) Remove all the bearing assembly snap rings (Fig. 21).

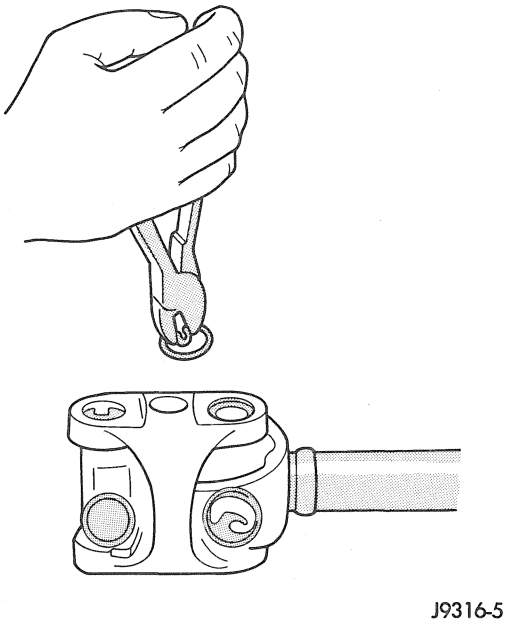


Fig. 21 Remove Snap Rings

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Press the bearing assembly partially from the outboard side of the center yoke, enough to grasp by vise jaws (Fig. 22). Be sure to remove grease fittings that interfere with removal.

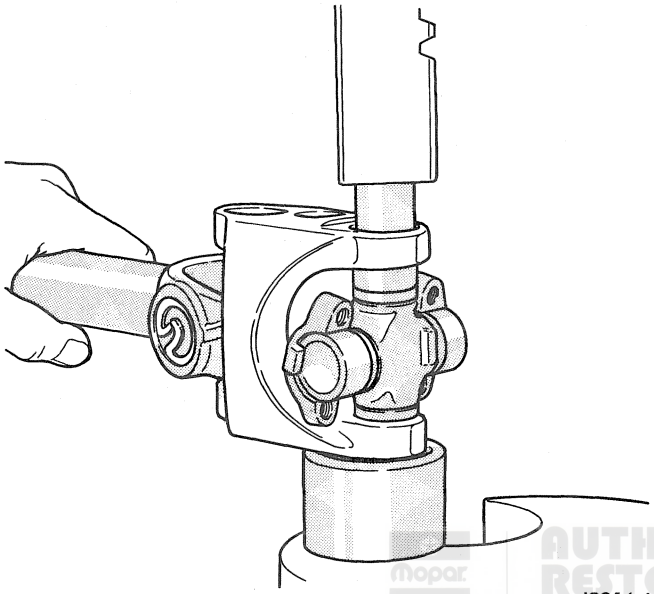


Fig. 22 Press Out Bearing

(5) Grasp the protruding bearing by vise jaws. Tap the tube yoke with a mallet and drift to dislodge from the yoke (Fig. 23).

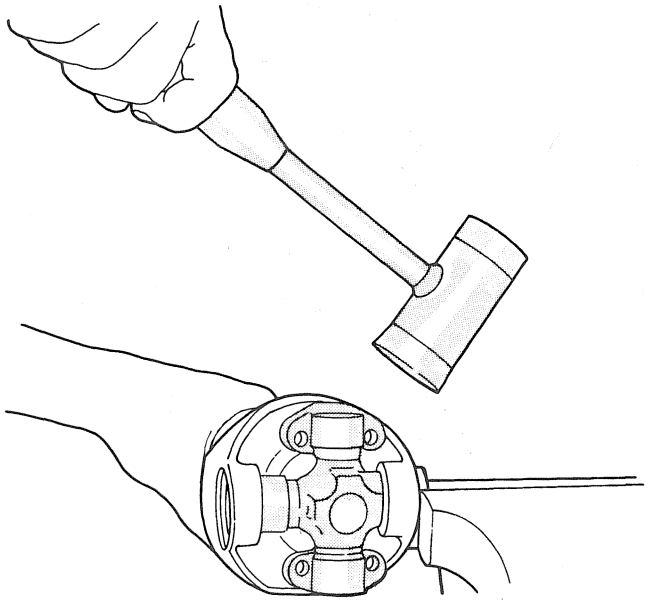


Fig. 23 Remove Bearing From Yoke

(6) Flip assembly and repeat steps 4 and 5 for removing the opposite side bearing. This will then allow removal of the cross centering kit assembly and spring (Fig. 24).

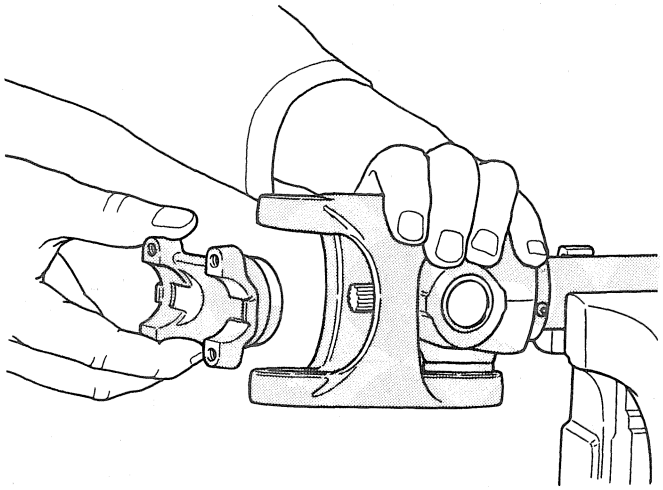


Fig. 24 Remove Centering Kit

(7) Press the remaining bearing assemblies out the other cross as described above to complete the disassembly.

INSTALLATION

During installation, ensure that the spiders and yokes are aligned to the reference marks.

(1) Fit a cross into the tube yoke (Fig. 25).

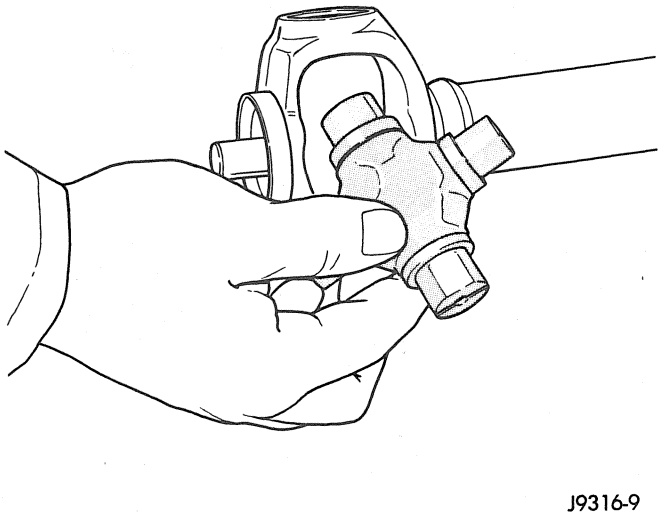


Fig. 25 Install Cross In Yoke

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Place a bearing assembly in a tube yoke hole and over a trunnion. Keep the needle bearings upright in the bearing assembly (Fig. 26). A needle roller lying at the bottom will prevent proper assembly. Be sure to remove any lube fittings that may interfere with removal.

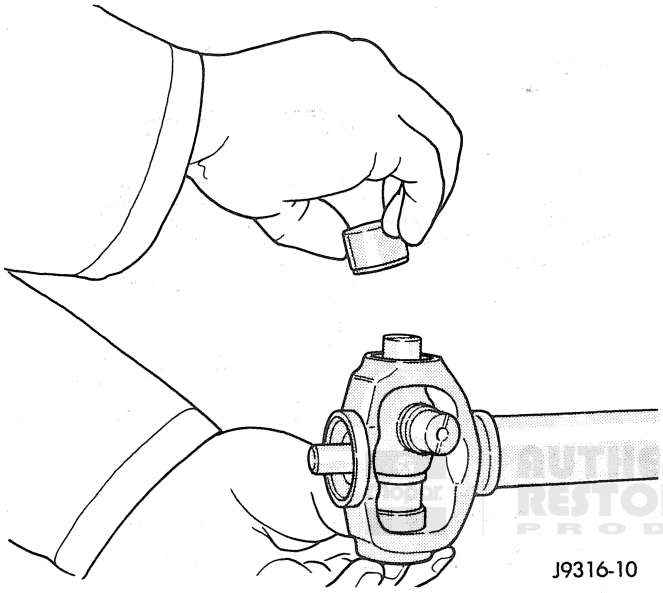


Fig. 26 Install Bearing Assembly

(3) Press the bearing assembly in place and install a snap ring (Fig. 27).

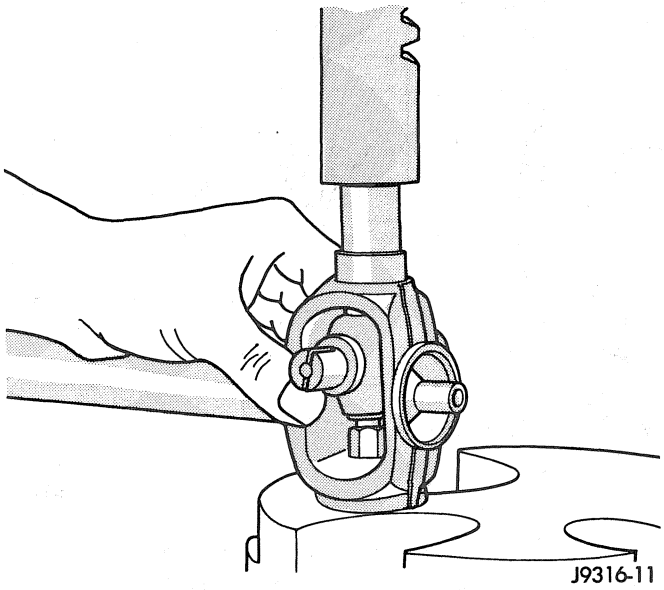


Fig. 27 Press In Bearing Assembly

(4) Flip the tube yoke and bearing assembly installation on the opposite trunnion. Install a snap ring (Fig. 28).

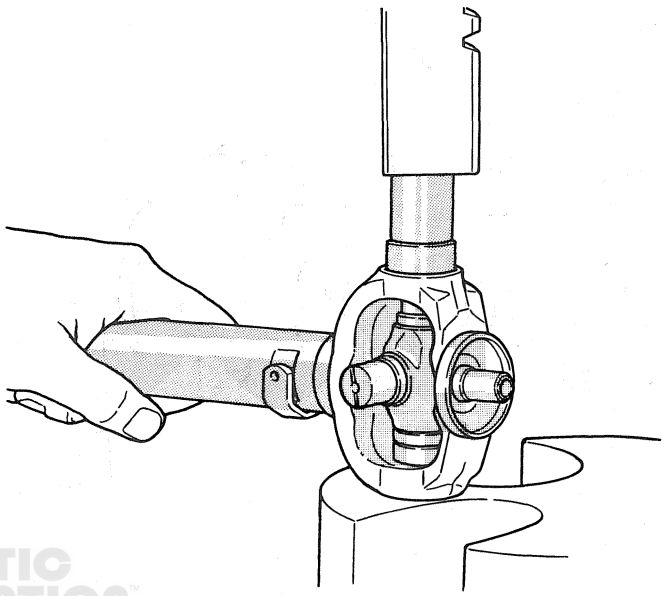


Fig. 28 Press In Bearing Assembly

(5) Fit the center yoke on the remaining two trunnions and press bearing assemblies in place, both sides (Fig. 29). Install a snap ring.

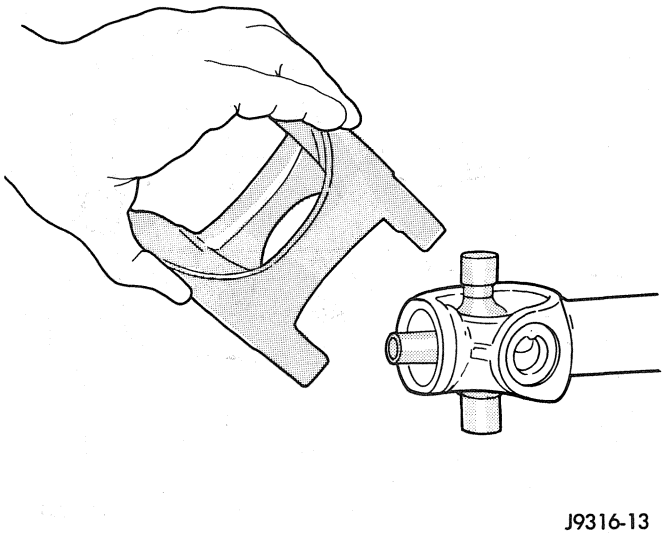


Fig. 29 Install Center Yoke

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install the centering kit assembly inside the center yoke making sure the spring is in place (Fig. 30).

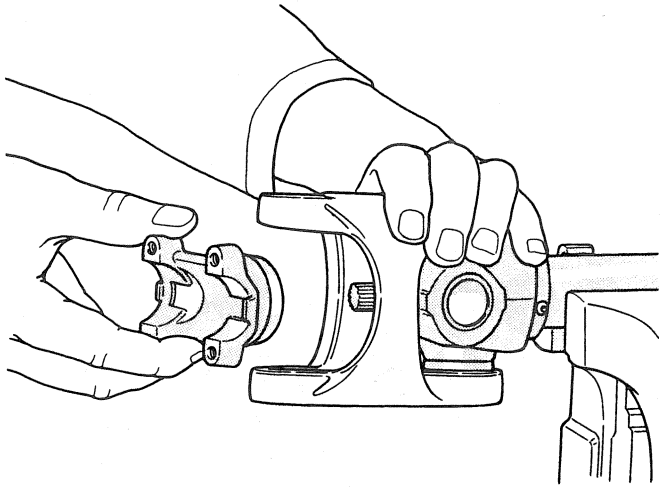


Fig. 30 Install Centering Kit

(7) Place two bearing assemblies on the remaining cross (opposite sides). Fit the open trunnions into the center yoke holes and the bearing assemblies into the centering kit (Fig. 31).

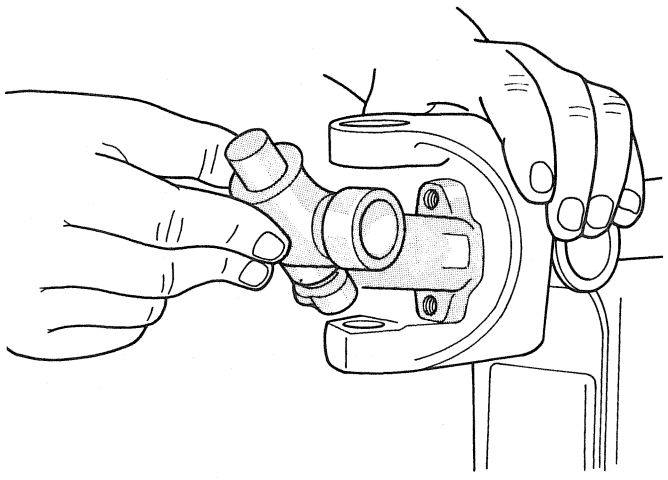


Fig. 31 Install Remaining Cross

(8) Press the remaining two bearing assemblies into place and install snap rings (Fig. 32).

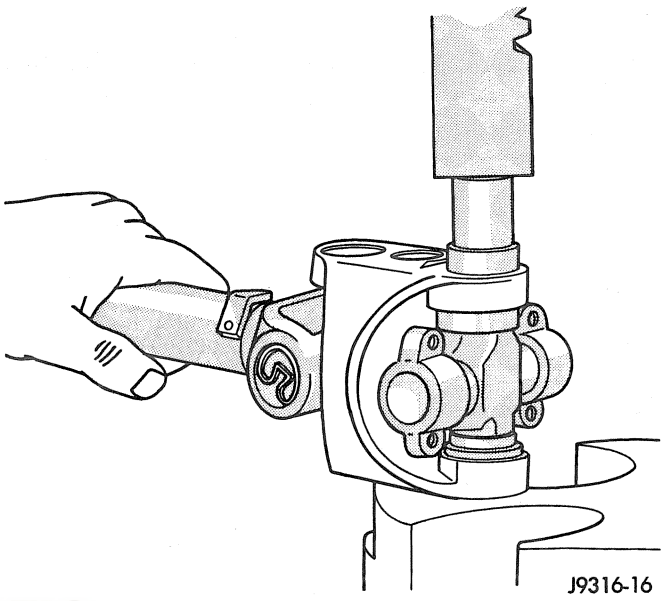


Fig. 32 Press In Bearing Assembly

(9) Tap the snap rings to allow them to seat into the grooves (Fig. 33).

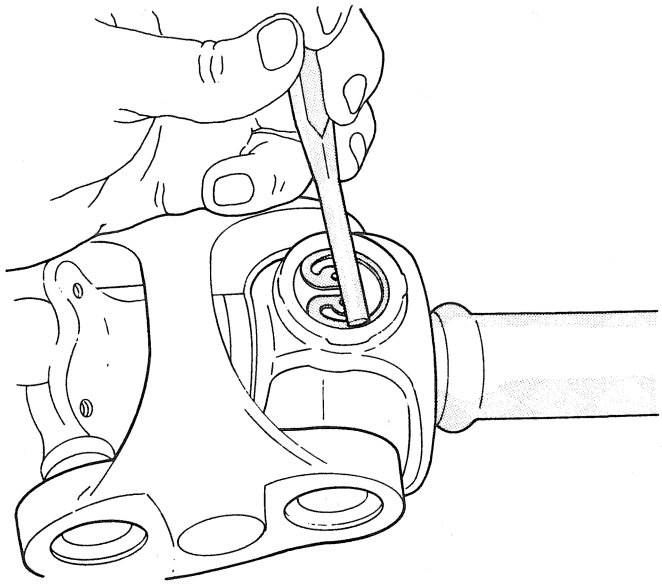


Fig. 33 Seat Snap Rings In Groove

(10) Check for proper assembly. Flex the CV joint beyond center, it should snap over–center in both directions when correctly assembled (Fig. 34).

(11) Install the propeller shaft.

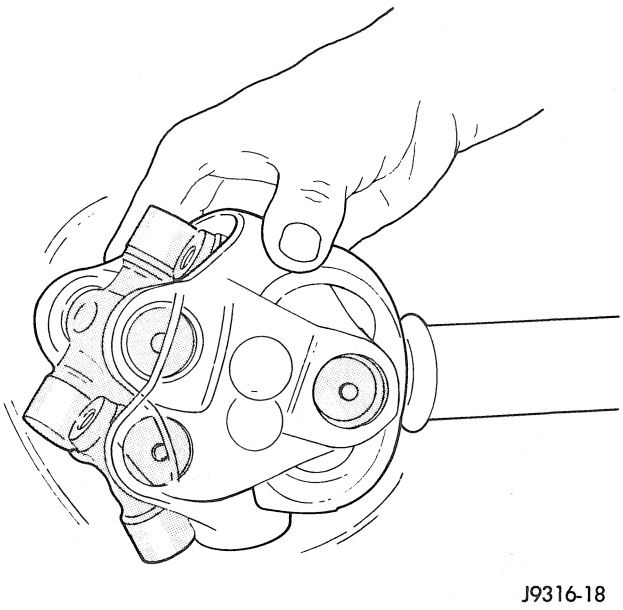


Fig. 34 Check Assembly

CLEANING AND INSPECTION

SINGLE AND DOUBLE CARDAN JOINT

(1) Clean all the universal joint yoke bores with cleaning solvent and a wire brush.

(2) Inspect the yokes for distortion, cracks and worn bearing assembly bores.

ADJUSTMENTS

ADJUSTMENT AT AXLE WITH LEAF SPRINGS

Adjust the pinion shaft angle at the springs with tapered shims (Fig. 35). Install tapered shims between the springs and axle pad to correct the angle.

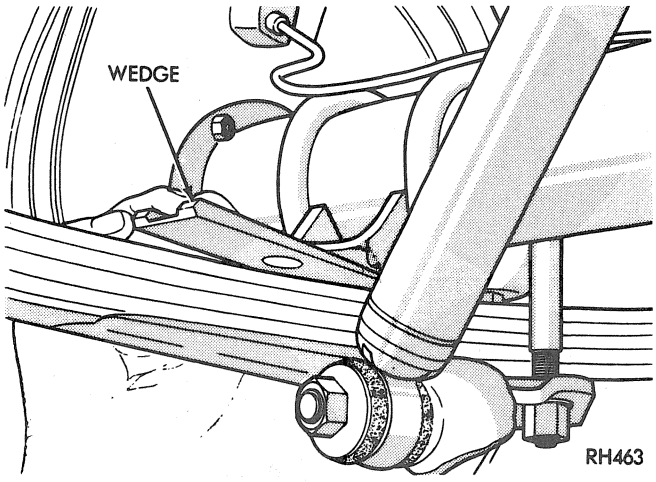


Fig. 35 Angle Adjustment at Leaf Springs

Adjust the pinion gear angle at the lower suspension arms with shims (Fig. 36). Adding shims will decrease the pinion gear shaft angle but will increase the caster angle. The pinion gear shaft angle has priority over the caster angle.

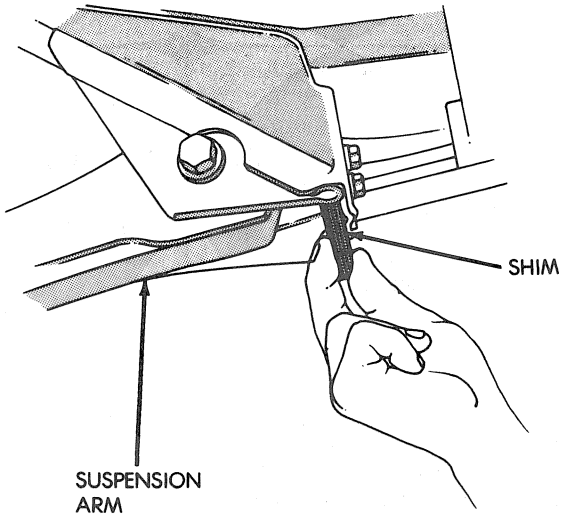


Fig. 36 Front Axle Angle Adjustment

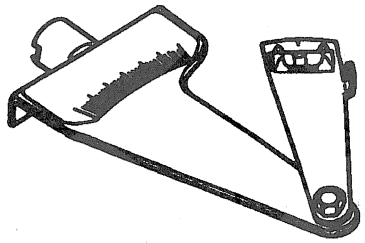
SPECIFICATIONS

PROPELLER SHAFTS AND U-JOINTS

DESCRIPTION	TORQUE
Front Shaft	
Transfer Case Yoke Bolts	27 N·m (20 ft. lbs.)
Axle Yoke Bolts	19 N·m (14 ft. lbs.)
Rear Shaft	
Axle Yoke Bolts	19 N·m (14 ft. lbs.)

SPECIAL TOOLS

PROPELLER SHAFT



Inclinometer—7663

FRONT AXLE—TUBE AND MODEL 30

INDEX

page

GENERAL INFORMATION
INFORMATION 14
LUBRICATION SPECIFICATIONS 14
PINION GEAR DEPTH INFORMATION 15
DIAGNOSIS AND TESTING
DRIVELINE SNAP 17
FRONT DRIVE AXLE 18
GEAR AND BEARING NOISE 16
GENERAL INFORMATION 16
LOW SPEED KNOCK 17
VIBRATION 17
SERVICE PROCEDURES
LUBRICANT CHANGE 20
REMOVAL AND INSTALLATION
AXLE BUSHING REPLACEMENT 24
DIFFERENTIAL 24
DRIVE AXLE ASSEMBLY REPLACEMENT 20
HUB BEARING AND AXLE SHAFT 21
INNER AXLE SHAFT OIL SEAL REPLACEMENT . 26
PINION GEAR 26

page

PINION SEAL REPLACEMENT 21
STEERING KNUCKLE AND BALL STUDS 22
DISASSEMBLY AND ASSEMBLY
AXLE SHAFT—CARDAN U-JOINT 29
BACKLASH AND CONTACT PATTERN ANALYSIS 34
DIFFERENTIAL AND PINION MEASUREMENT . . 31
DIFFERENTIAL SHIM PACK MEASUREMENT AND ADJUSTMENT 33
DIFFERENTIAL 29
FINAL ASSEMBLY 37
CLEANING AND INSPECTION
CARDAN U-JOINT 37
DIFFERENTIAL 37
SPECIFICATIONS
FRONT AXLE—MODEL 30 37
TORQUE—MODEL 30 AXLE 37
SPECIAL TOOLS
FRONT AXLE—MODEL 30 38

GENERAL INFORMATION

INFORMATION

The Model 30 front axles consists of a cast iron differential housing with axle shaft tubes extending from either side. The tubes are pressed into the differential housing and welded.

The integral type housing, hypoid gear design has the centerline of the pinion set above the centerline of the ring gear.

The axle has a fitting for a vent hose used to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the hub bearings. The axle shafts are retained by nuts at the hub bearings. The hub bearings are bolted to the steering knuckle at the outboard end of the axle tube yoke. The hub bearings are serviced as an assembly.

The axles are equipped with ABS brake sensors. The sensors are attached to the knuckle assemblies and tone rings are pressed on the axle shaft. **Do not damage ABS tone wheel or the sensor when removing axle shafts.**

The stamped steel cover provides a means for inspection and servicing the differential.

The Model 30 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover. Build date identification codes are stamped on the axle shaft tube cover side.

The differential case is a one–piece design. The differential pinion mate shaft is retained with a roll pin. Differential bearing preload and ring gear backlash is adjusted by the use of shims (select thickness). The shims are located between the differential bearing cones and case. Pinion bearing preload is set and maintained by the use of collapsible spacer.

SELEC–TRAC—XJ VEHICLES

The Selec–Trac system is a non–disconnect axle. Shifting from two– wheel to four–wheel drive is done at the transfer case.

For XJ vehicles equipped with **Selec–Trac** and ABS brake system, refer to Group 5—Brakes for additional service information.

LUBRICATION SPECIFICATIONS

Multi–purpose, hypoid gear lubricant should be used for Model 30 axles. The lubricant should have MIL–L–2105C and API GL 5 quality specifications. Mopar Hypoid Gear Lubricant conforms to both of these specifications.

- The factory fill for the Model 30 axle is SAE Thermally Stable 80W–90 gear lubricant. **Do not use heavier weight lubricant, this will cause axle engagement difficulties.**

GENERAL INFORMATION (Continued)

• The factory installed lubricant quantity for the non–disconnect type axle is 1.48 L (3.13 pts.).
• The factory installed lubricant quantity for the vacuum–disconnect type axle is 1.65 L (3.76 pts.).

Refer to Group 0, Lubrication and Maintenance for additional information regarding temperature range, viscosity and fluid level.

CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

PINION GEAR DEPTH INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 1). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the centerline of the ring gear to the back face of the pinion is 92.1 mm (3.625 inches) for Model 30 axles (Fig. 2). The standard depth provides the best teeth contact pattern.

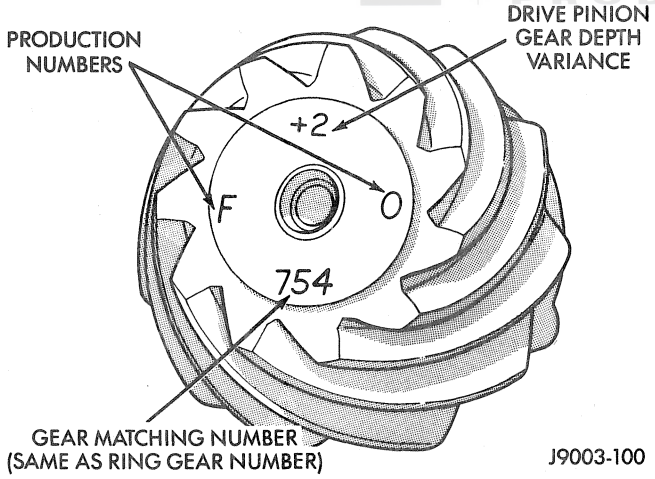


Fig. 1 Pinion Gear ID Numbers

THE BUTTON END ON THE PINION GEAR HEAD IS NO LONGER A MACHINED–TO– SPECIFICATIONS SURFACE. DO NOT USE THIS SURFACE FOR PINION DEPTH SET–UP OR CHECKING (Fig. 2).

Compensation for depth variance is achieved by a selected thickness oil slinger (production) or shims (service). The slinger is placed between the inner pinion bearing cone and gear head (Fig. 3). The shim pack is placed under the inner (rear) bearing cup for service. To change the pinion adjustment, shims are available in thicknesses of 0.003, 0.005, and 0.010 inch. **The oil slinger or baffle must be measured**

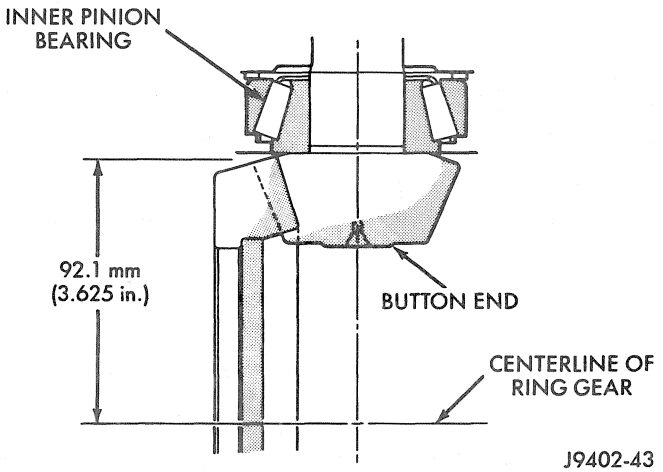


Fig. 2 Pinion Gear Head

and the thickness included with the total shim pack.

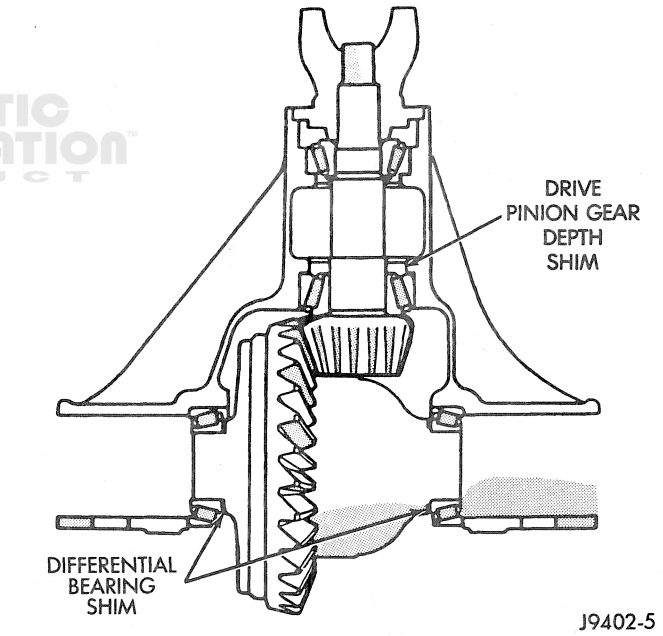


Fig. 3 Shim Locations

New gear set: note the depth variance etched into both the original and the replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance charts.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

For example, if old pinion is plus (+) 1 and the new pinion is minus (–) 3, intersecting figure is (+) 0.004 in. (0.10 mm). Add this amount to the original shim. Or if the old pinion is (–) 3 and the new pinion is (–)

GENERAL INFORMATION (Continued)

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

J8902-46

2, intersecting figure is (–) 0.001 in. (0.025 mm). Subtract this amount from original shim. **Refer to the Pinion Gear Depth Variance Chart.**

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant
- Foreign matter/water contamination
- Incorrect bearing preload torque adjustment
- Incorrect backlash (to tight)

When serviced, the bearings must be cleaned thoroughly. They should be dried with lint–free shop towels. **Never spin dry bearings with compressed air. This will overheat them and brinell the bearing surfaces. This will result in noisy operation after repair.**

Axle gear problem conditions are usually the result of:

- Insufficient lubrication
- Incorrect or contaminated lubricant
- Overloading (excessive engine torque) or exceeding vehicle weight capacity
- Incorrect clearance or backlash adjustment

Insufficient lubrication is usually the result of a housing cover leak. It can also be from worn axle shaft or pinion gear seals. Check for cracks or porous areas in the housing or tubes.

Using the wrong lubricant will cause overheating and gear failure. Gear tooth cracking and bearing spalling are indicators of this.

Axle component breakage is most often the result of:

- Severe overloading
- Insufficient lubricant
- Incorrect lubricant
- Improperly tightened components

Overloading occurs when towing heavier than recommended loads. Component breakage can occur when the wheels are spun excessively. Incorrect lubricant quantity contributes to breakage. Loose differential components can also cause breakage.

Incorrect bearing preload or gear backlash will not result in component breakage. Mis–adjustment will produce enough noise to cause service repair before a failure occurs. If a mis–adjustment condition is not corrected, component failure can result.

Excessive bearing preload may not be noisy. This condition will cause high temperature which can result in bearing failure.

GEAR AND BEARING NOISE

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant. Incorrect backlash, tooth contact, or worn/damaged gears can cause noise.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of

DIAGNOSIS AND TESTING (Continued)

driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, accelerate the vehicle to the speed range where the noise is the greatest. Shift out–of–gear and coast through the peak–noise range. If the noise stops or changes greatly, check for insufficient lubricant. Incorrect ring gear backlash, or gear damage can cause noise changes.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise in straight–ahead driving. These gears are loaded during vehicle turns. If noise does occur during vehicle turns, the side or pinion gears could be worn or damaged. A worn pinion gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion gear bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion gear bearings have a constant–pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs the pinion rear bearing is the source of the noise. If the bearing noise is heard during a coast, front bearing is the source.

Worn, damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U–joint or by worn side–gear thrust washers. A worn pinion gear shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged drive shaft
- Missing drive shaft balance weight
- Worn, out-of-balance wheels
- Loose wheel lug nuts
- Worn U-joint
- Loose spring U-bolts
- Loose/broken springs
- Damaged axle shaft bearings
- Loose pinion gear nut
- Excessive pinion yoke run out
- Bent axle shaft

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rear-end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Tires And Wheels for additional information involving vibration diagnosis.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed
- Loose engine/transmission/transfer case mounts
- Worn U–joints
- Loose spring mounts
- Loose pinion gear nut and yoke
- Excessive ring gear backlash
- Excessive differential side gear–to–case clearance

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSIS AND TESTING (Continued)

FRONT DRIVE AXLE

DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces.	1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONTINUED

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed.	2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts	1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

AUTHENTIC RESTORATION PRODUCT

SERVICE PROCEDURES

LUBRICANT CHANGE

The gear lubricant will drain quicker if the vehicle has been recently driven.

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**

(5) Remove the sealant from the housing and cover surfaces. Use solvent to clean the mating surfaces.

(6) Apply a bead of Mopar Silicone Rubber Sealant to the housing cover (Fig. 4). **Allow the sealant to cure for a few minutes.**

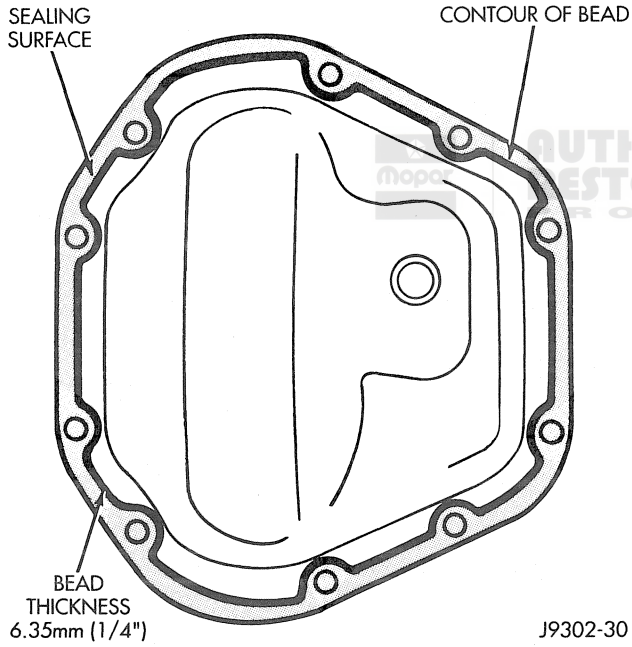


Fig. 4 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant. If not installed the sealant must be removed and another bead applied.

(7) Install the cover and any identification tag. Tighten the cover bolts in a criss–cross pattern to 41 N·m (30 ft. lbs.) torque.

(8) Refill the differential with Mopar Hypoid Gear Lubricant to bottom of the fill plug hole.

(9) Install the fill hole plug and lower the vehicle.

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY REPLACEMENT

REMOVAL

(1) Raise the vehicle and position support stands under the frame rails behind the lower suspension arm frame brackets.

(2) Remove the front wheels.

(3) Remove the brake components and ABS brake sensor (if equipped). Refer to Group 5—Brakes.

(4) On 4WD vehicles, disconnect the axle vent hose.

(5) On 4WD vehicles, mark the drive shaft yoke and axle pinion yoke for alignment reference. Disconnect the drive shaft from the axle.

(6) Disconnect the stabilizer bar link at the axle bracket.

(7) Disconnect the shock absorbers from axle bracket.

(8) Disconnect the track bar from the axle bracket.

(9) Disconnect the tie rod and drag link from the steering knuckle. Disconnect the steering damper from the axle bracket.

(10) Support the axle with a hydraulic jack under the differential.

(11) Disconnect the upper and lower suspension arms from the axle bracket.

(12) Lower the jack enough to remove the axle. The coil springs will drop with the axle.

(13) Remove the coil springs from the axle bracket.

INSTALLATION

CAUTION: Suspension components with rubber bushings should be tightened with the vehicle at normal height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur. Rubber bushings must never be lubricated.

(1) Install the springs and retainer clip. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.

(2) Support the axle on a hydraulic jack under the differential. Position the axle under the vehicle.

(3) Raise the axle with a floor jack and align it with the spring pads.

(4) Position the upper and lower suspension arm at the axle bracket. Install bolts and nuts finger tighten.

(5) Connect the track bar to the axle bracket and install the bolt. **Do not tighten at this time.**

It is important that the springs support the weight of the vehicle when the track bar is con-

REMOVAL AND INSTALLATION (Continued)

nected. If springs are not at their usual position, vehicle ride comfort could be affected.

(6) Install the shock absorber and tighten the bolt to 23 N·m (17 ft. lbs.) torque.

(7) Install the stabilizer bar link to the axle bracket. Tighten the nut to 95 N·m (70 ft. lbs.) torque.

(8) Install the drag link and tie rod to the steering knuckles and tighten the nuts to 47 N·m (35 ft. lbs.) torque. Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.

(9) Install the brake components and ABS brake sensor (if equipped). Refer to Group 5, Brakes.

(10) On 4WD vehicles, connect the vent hose to the tube fitting.

(11) On 4WD vehicles, align the reference marks and connect the drive shaft to the axle yoke. Tighten the U–joint clamp bolts to 19 N·m (14 ft. lbs.) torque.

(12) Check differential lubricant and add if necessary.

(13) Install the wheel and tire assemblies.

(14) Remove the supports and lower the vehicle.

(15) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.

(16) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.

(17) Check the front wheel alignment.

PINION SEAL REPLACEMENT

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Mark the propeller shaft yoke and pinion yoke for installation alignment reference.

(4) Remove the propeller shaft from the yoke.

(5) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 5).

(6) Mark the positions of the yoke and pinion gear for installation alignment reference.

(7) Use Remover 7794A and slide hammer to remove the pinion gear seal (Fig. 6).

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 7).

(2) Align the reference marks and install yoke on the pinion gear with Installer W–162–D.

(3) Install a new pinion nut on pinion shaft. **Tighten the nut to 217–352 N·m (160–260 ft. lbs.).**

(4) Align the installation reference marks and attach the propeller shaft to the yoke.

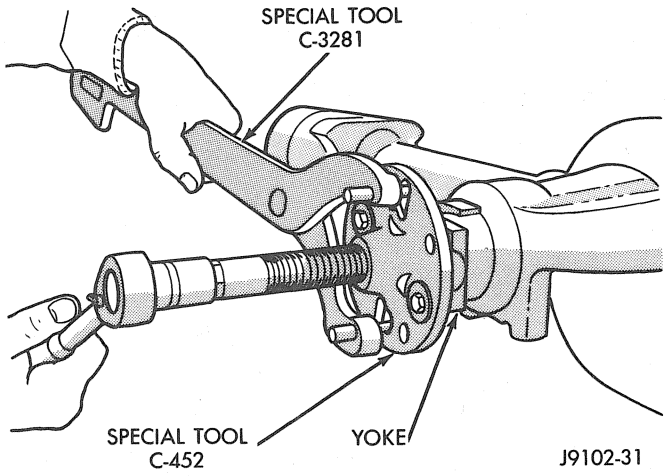


Fig. 5 Pinion Yoke Removal

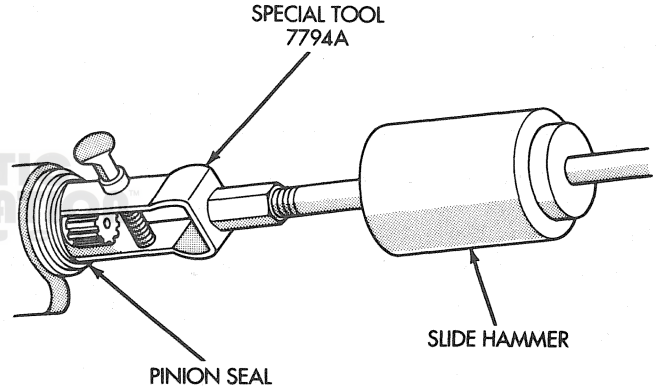


Fig. 6 Seal Removal

(5) Add API grade GL 5 hypoid gear lubricant to the differential housing, if necessary.

(6) Install wheel and tire assemblies.

(7) Remove support and lower the vehicle.

HUB BEARING AND AXLE SHAFT

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire assembly.

(3) Remove the brake components from the axle, refer to Group 5, Brakes.

(4) Remove the cotter pin, nut retainer and axle hub nut (Fig. 8).

(5) Remove the hub to knuckle bolts (Fig. 8). Remove the hub from the steering knuckle and axle shaft.

(6) Remove the disc brake rotor shield from the bearing carrier (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

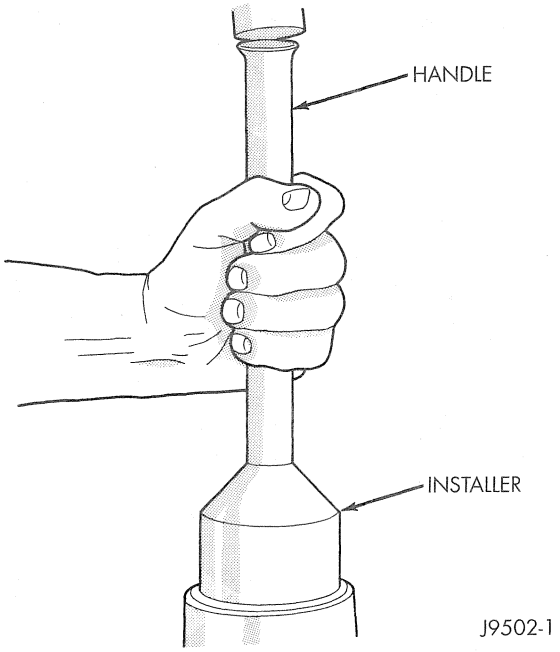


Fig. 7 Pinion Seal Installation

(7) On disconnect axles, remove vacuum shift motor housing. Refer to Vacuum Disconnect Axle in this section.

(8) Remove the axle shaft from the housing. **Avoid damaging the axle shaft oil seals in the differential.**

INSTALLATION

(1) Thoroughly clean the axle shaft (Fig. 8) and apply a thin film of Mopar Wheel Bearing Grease to the shaft splines, seal contact surface, hub bore.

(2) Install the axle shaft into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the differential.

(3) Install the hub bearing and brake dust shield to the knuckle.

(4) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.) torque.

(5) Install the hub washer and nut. Tighten the hub nut to 237 N·m (175 ft. lbs.) torque. Install the nut retainer and a new cotter pin (Fig. 8).

(6) Install the brake components, refer to Group 5, Brakes.

(7) Install the wheel and tire assembly.

(8) Remove support and lower the vehicle.

STEERING KNUCKLE AND BALL STUDS

Ball Stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball stud requires use of Tool Kit 6289 (J34503–A).

The lower ball stud has two different designs. For this reason Installer 6752 will also be needed. Check installers for proper fit.

KNUCKLE REMOVAL

(1) Remove hub bearing and axle shaft refer to the Removal procedure.

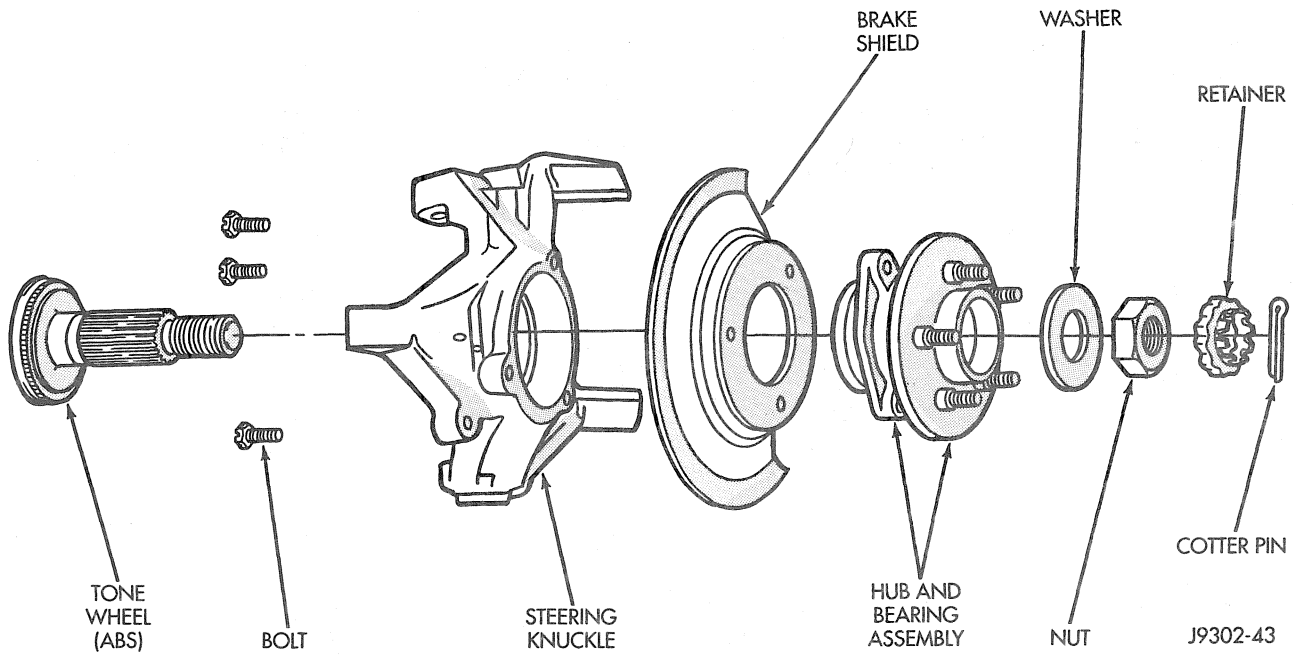


Fig. 8 Hub, Knuckle and Axle Shaft

REMOVAL AND INSTALLATION (Continued)

(2) Disconnect the tie–rod or drag link end from the steering knuckle arm. Remove the ABS sensor wire and bracket from knuckle.

(3) Remove the cotter pins from the upper and lower ball studs. Remove the upper and lower ball stud nuts.

(4) Strike the steering knuckle with a brass hammer to loosen. Remove knuckle from axle tube yokes (Fig. 9).

UPPER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 10).

LOWER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 11). Because there are two different designs for the lower ball studs try both installers for proper fit.

KNUCKLE INSTALLATION

(1) Position the steering knuckle on the ball studs.

(2) Install and tighten the bottom retaining nut to 109 N·m (80 ft. lbs.) torque. Install new cotter pin.

(3) Install and tighten the top retaining nut to 101 N·m (75 ft. lbs.) torque. Install new cotter pin.

(4) Install the Hub Bearing and Axle Shaft according to the installation procedure.

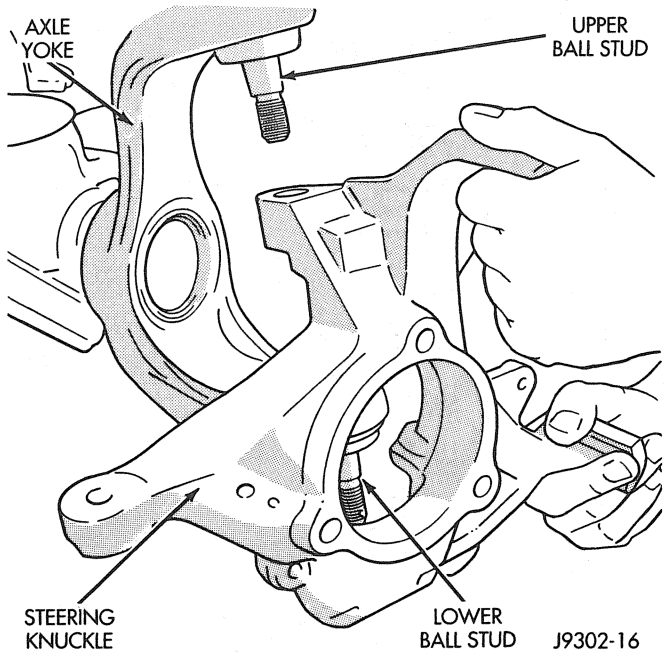


Fig. 9 Steering Knuckle Removal/Installation

(5) Reconnect the tie–rod or drag link end onto the steering knuckle arm. Install the ABS sensor wire and bracket to the knuckle, refer to Group 5 Brakes.

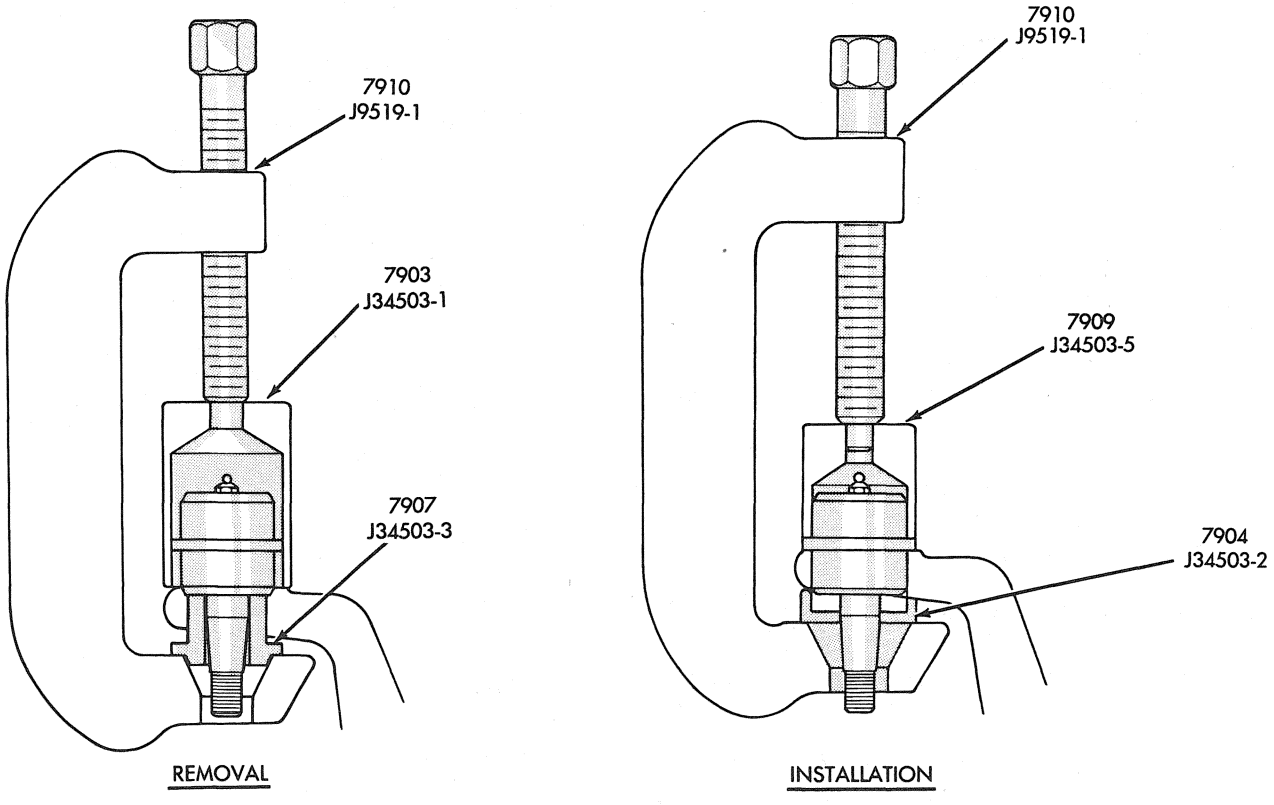


Fig. 10 Upper Ball Stud Remove/Install

REMOVAL AND INSTALLATION (Continued)

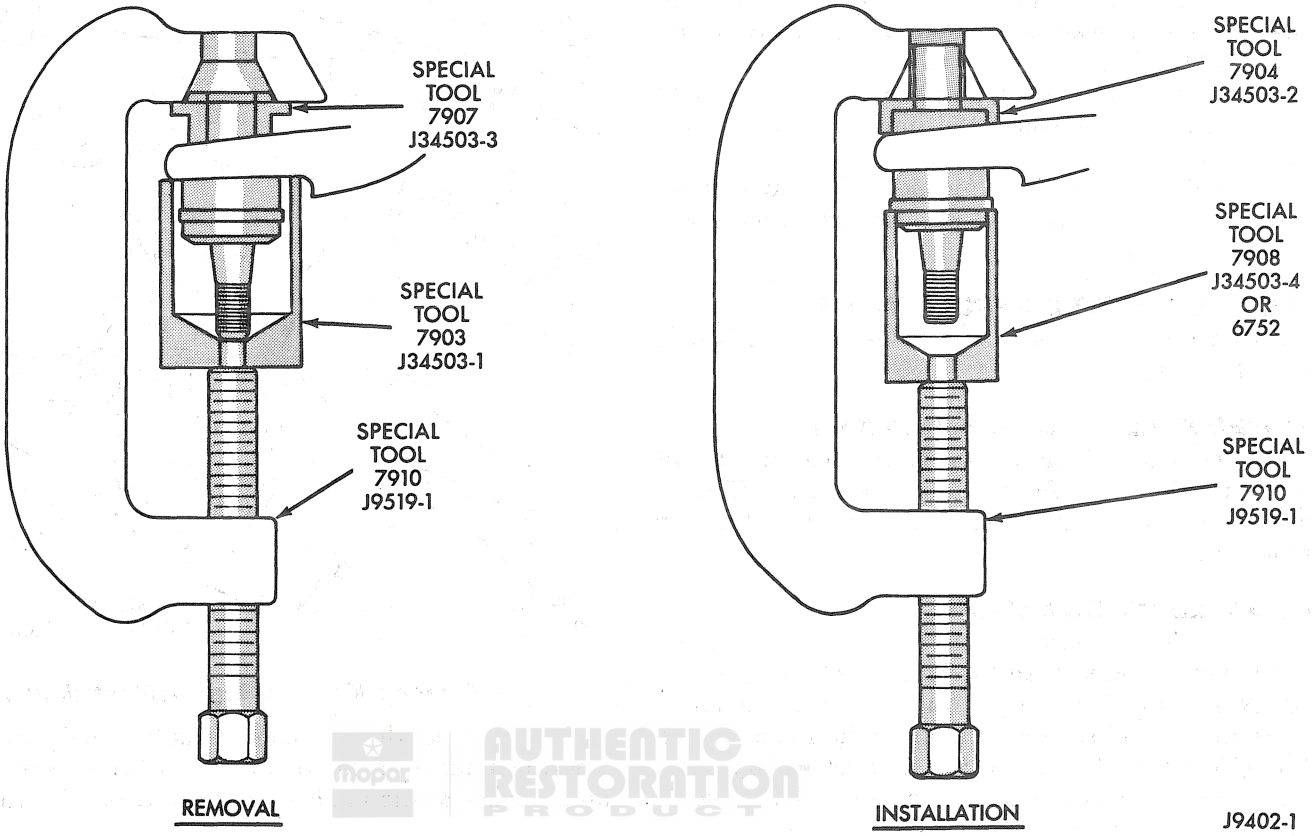


Fig. 11 Lower Ball Stud Remove/Install

AXLE BUSHING REPLACEMENT

Refer to Axle Bushing Replacement in the Front Suspension section.

DIFFERENTIAL

REMOVAL

To service the differential the axle assembly and axle shafts must be removed. Refer to the removal procedures in this Group.

(1) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 12).

(2) Remove the differential bearing caps.

(3) Position Spreader W–129B with the tool dowel pins seated in the locating holes (Fig. 13). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

(4) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 13) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–separated, it could be distorted or damaged.

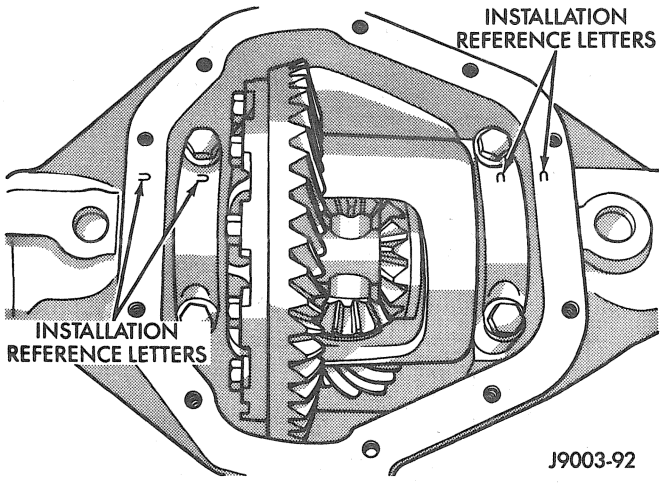


Fig. 12 Bearing Cap Identification

(5) Separate the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 13).

(6) Remove the dial indicator.

(7) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 14).

(8) Remove the case from housing. Mark or tag bearing cups indicating which side they were removed. Remove spreader from housing.

REMOVAL AND INSTALLATION (Continued)

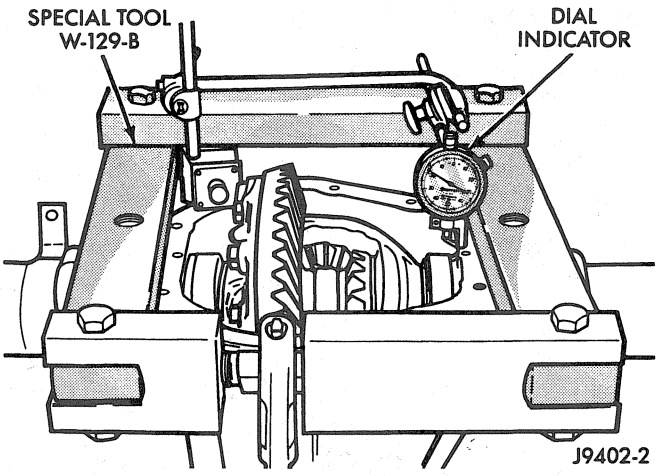


Fig. 13 Spread Differential Housing

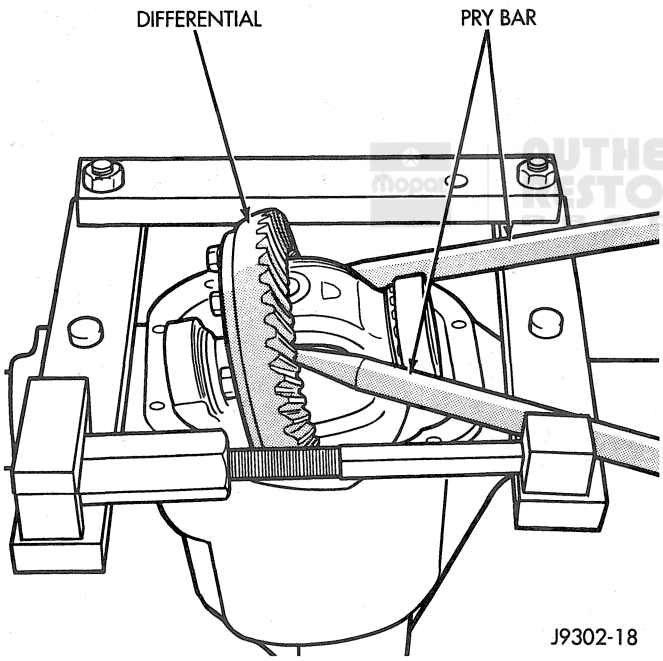


Fig. 14 Differential Removal

INSTALLATION

(1) Position Spreader W–129B with the tool dowel pins seated in the locating holes (Fig. 15). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

(2) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 15) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–separated, it could be distorted or damaged.

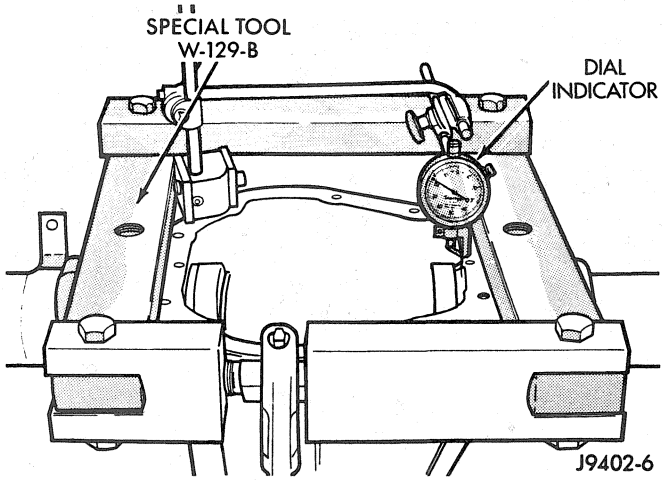


Fig. 15 Spread Differential Housing

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 15).

(4) Remove the dial indicator.

(5) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 16). Remove the spreader.

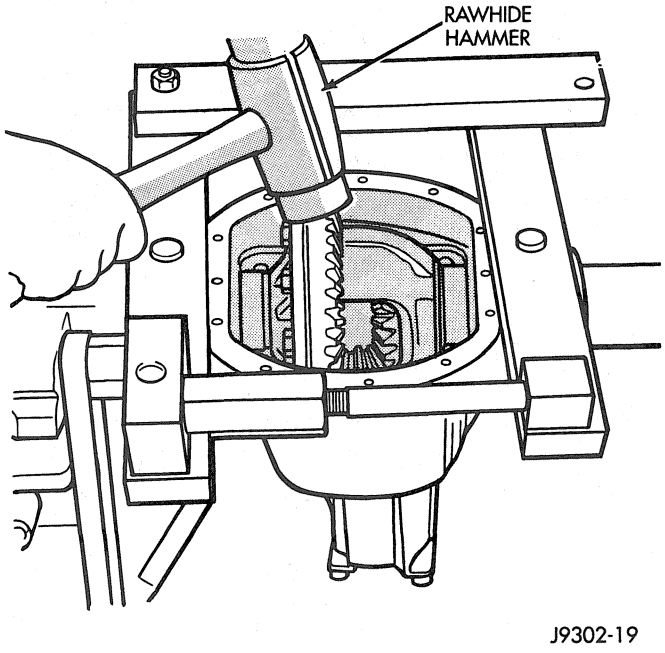


Fig. 16 Differential Installation

(6) Install the bearing caps at their original locations (Fig. 17). Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

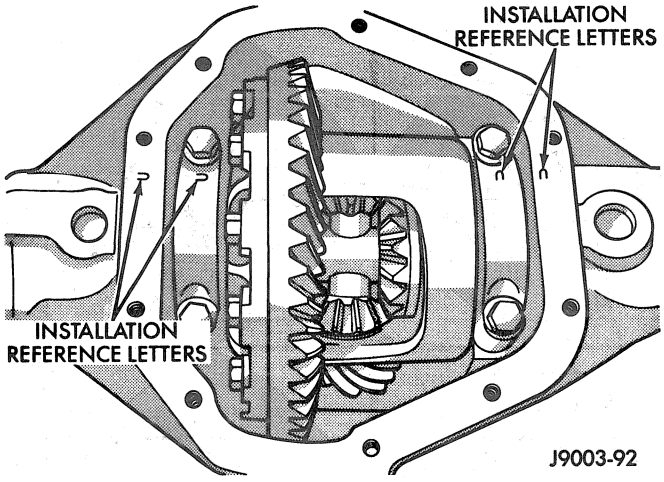


Fig. 17 Differential Bearing Cap Reference Letters

INNER AXLE SHAFT OIL SEAL REPLACEMENT

SELECT-TRAC

(1) Remove the inner axle shaft seals with a pry bay.

(2) Install oil seals with Discs 6764 and Turnbuckle D–112A (Fig. 18). Tighten tool until disc bottoms in housing.

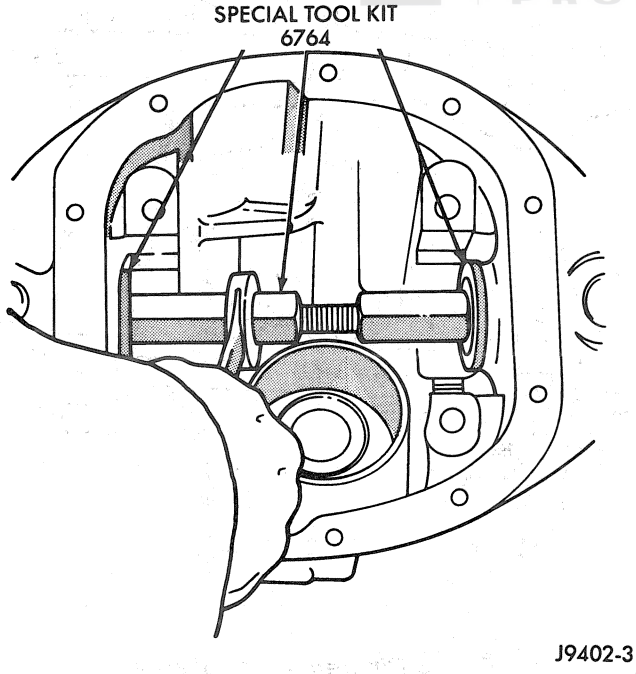


Fig. 18 Axle Seal Installation

PINION GEAR

REMOVAL/DISASSEMBLY

(1) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 19).

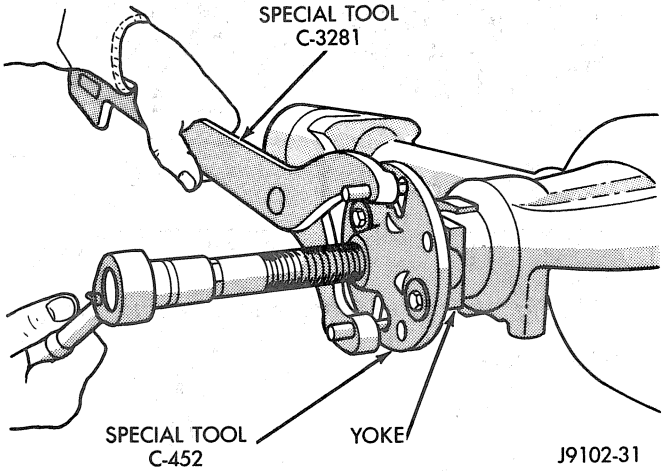


Fig. 19 Pinion Yoke Removal

(2) Remove the pinion gear seal with a slide hammer or pry out with bar.

(3) Drive out pinion gear from housing with rawhide or plastic hammer (Fig. 20). Catch the pinion with your hand to prevent it from falling and being damaged. **This will damage the front bearing rollers and bearing cup. The front bearing and cup must be replaced.** Remove preload shims and record the thickness.

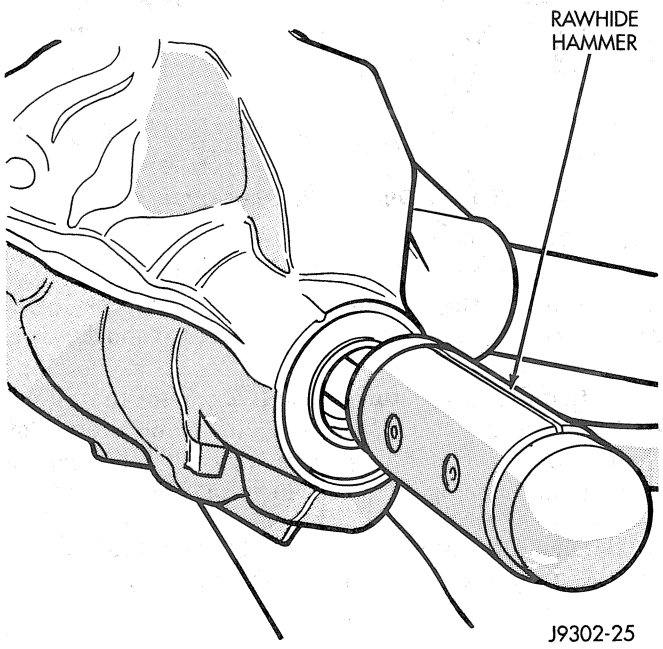


Fig. 20 Remove Pinion Gear

REMOVAL AND INSTALLATION (Continued)

(4) Remove front bearing from housing.

(5) Remove the front pinion bearing cup and seal with Remover D–147 and Handle C–4171 (Fig. 21).

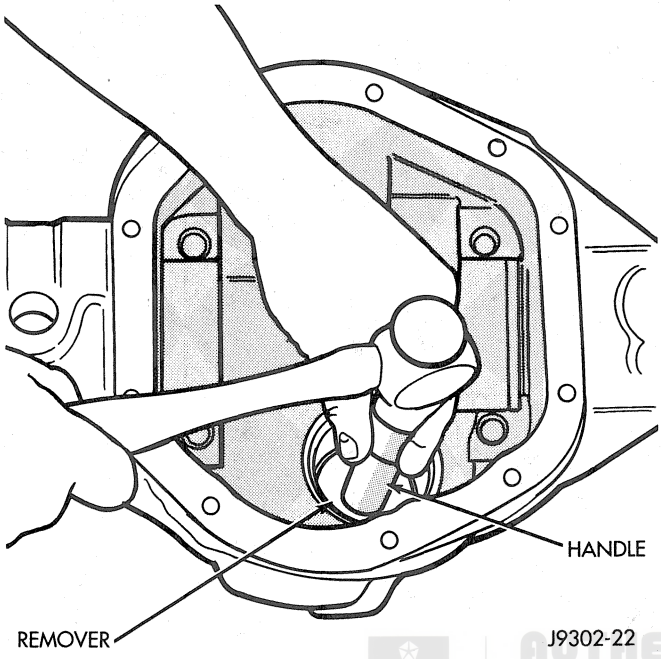


Fig. 21 Front Bearing Cup Removal

(6) Remove the rear bearing cup from housing (Fig. 22). Use Remover D– 149 and Handle C–4171.

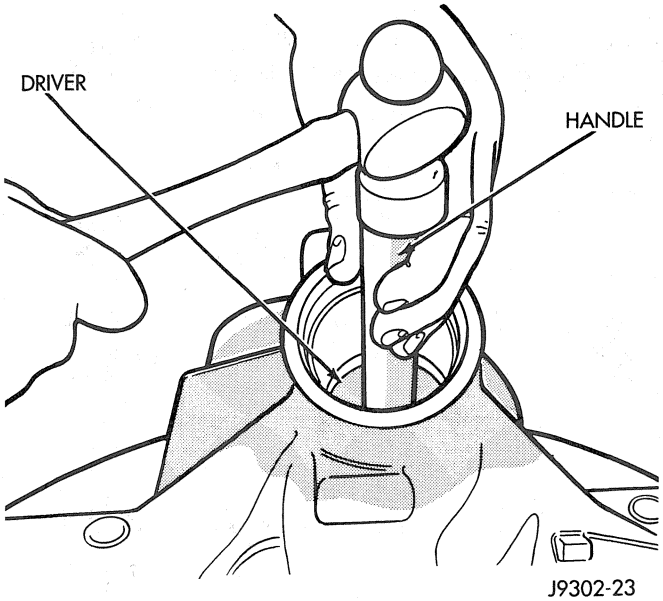


Fig. 22 Rear Bearing Cup Removal

(7) Remove the inner bearing from the pinion with Puller C–293PA and Adapter C–293–39 (Fig. 23).

Place adapter rings so they do not damage the bearing cage.

(8) Remove the oil slinger from the pinion gear shaft. **Save the slinger it is used as select shim for pinion depth.**

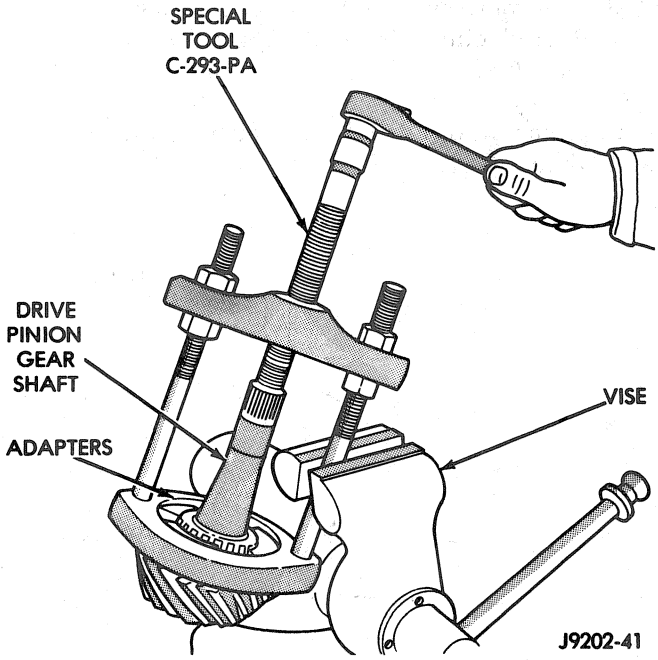


Fig. 23 Inner Bearing Removal

PINION GEAR ASSEMBLY/INSTALLATION

(1) Remove rear pinion bearing cup with Remover D–149 and Handle C– 4171. Place shims (and baffle if equipped) in the pinion gear rear bearing bore. Install the bearing cup with Installer D–146 and Driver Handle C– 4171. Ensure cup is correctly seated.

(2) Install rear bearing and oil slinger on pinion gear with Installer W–262 until completely seated (Fig. 24).

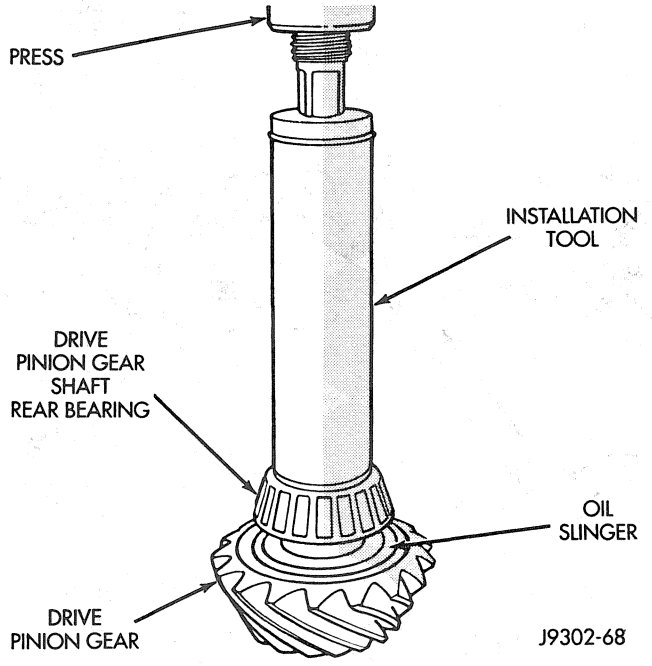


Fig. 24 Pinion Rear Bearing Installation

REMOVAL AND INSTALLATION (Continued)

(3) Assemble preload shims onto pinion shaft.

(4) Install pinion front bearing cone into cup and end yoke thrust washer.

(5) Apply a light coat of gear lubricant on lip of new pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 25).

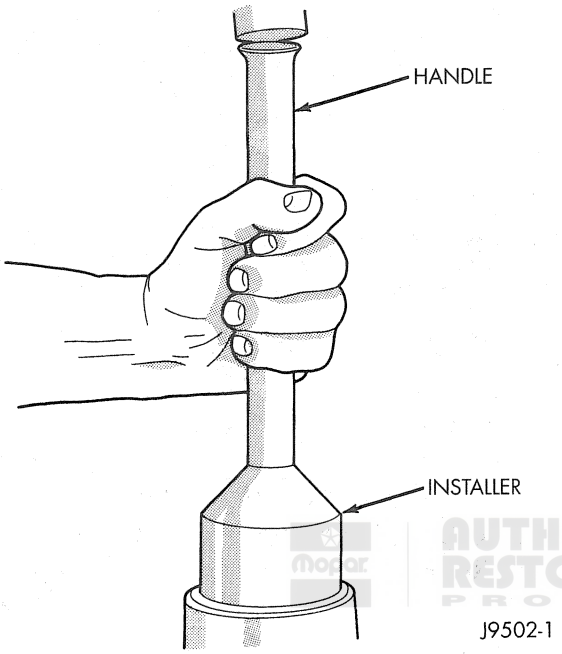


Fig. 25 Pinion Seal Installation

(6) Install pinion gear into differential housing.

(7) Install yoke with Installer W–162D and Wrench C–3281 (Fig. 26).

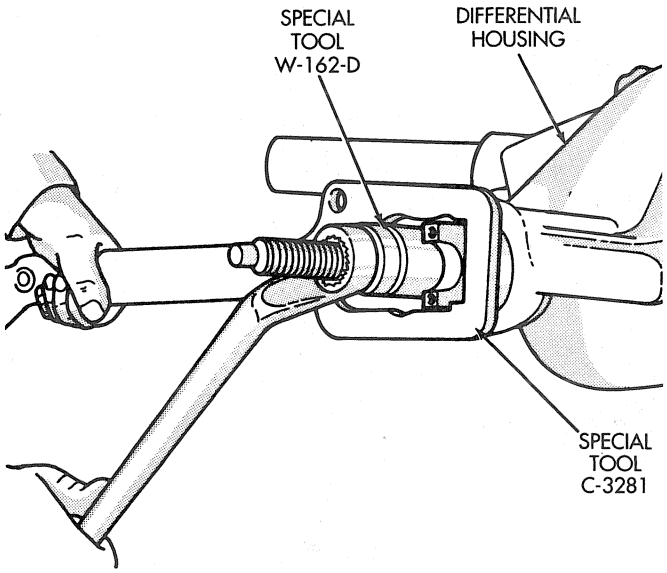


Fig. 26 Pinion Yoke Installation

(8) Install the yoke washer and **old nut** on the pinion gear. Use Flange Wrench C–3281 to retain the yoke (Fig. 27). Tighten nut to 216– 352 N·m (160–260 ft. lbs.) torque.

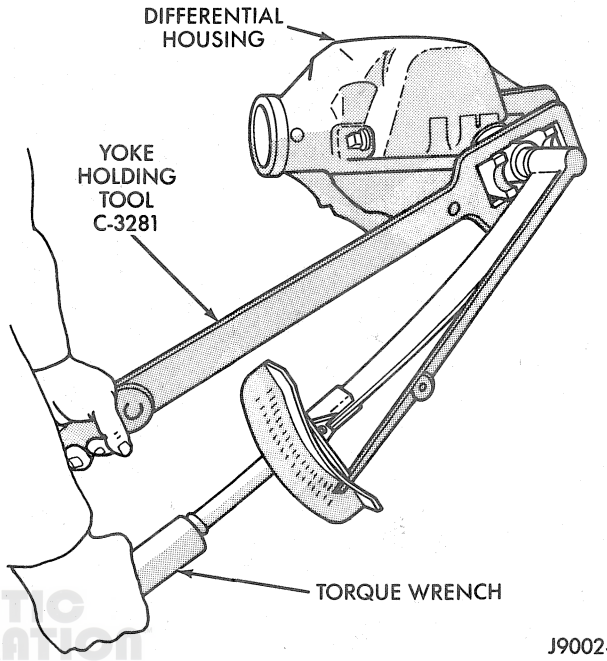


Fig. 27 Tightening Pinion Nut

(9) Check bearing rotating torque with an inch pound torque wrench (Fig. 28). If torque to rotate is within specification, remove old nut and install new nut. The torque necessary to rotate the pinion gear should be;

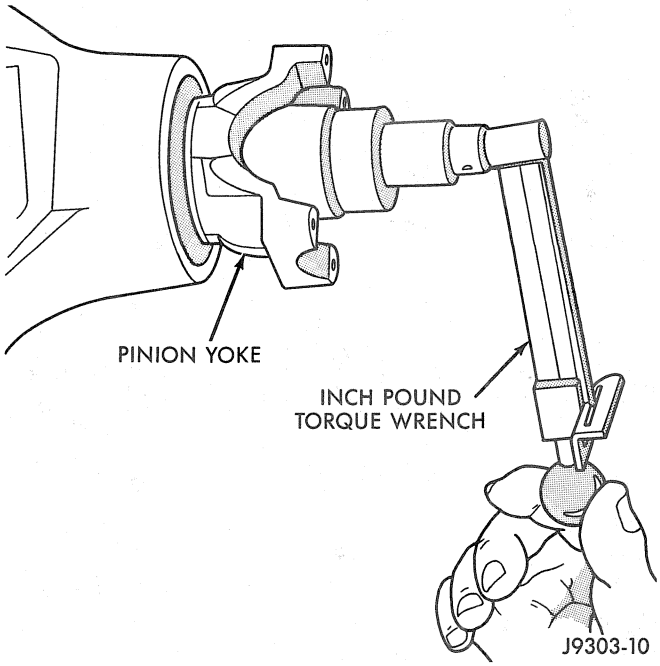


Fig. 28 Check Pinion Gear Torque

REMOVAL AND INSTALLATION (Continued)

- Original Bearings: 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings: 2 to 5 N·m (15 to 35 in. lbs.).

(10) If rotating torque is high, add shims to decrease torque. If rotating torque is low, remove shims to increase torque.

DISASSEMBLY AND ASSEMBLY

AXLE SHAFT—CARDAN U-JOINT

DISASSEMBLY

Single cardan U–joints are not serviceable. If defective, they must be replaced as a unit. If the bearings, seals, spider or bearing caps are damaged or worn, replace the complete U–joint.

CAUTION: Clamp only the forged portion of the yoke in the vise. Also, to avoid distorting the yoke, do not over tighten the vise jaws.

(1) Remove the bearing cap retaining snap rings (Fig. 29).

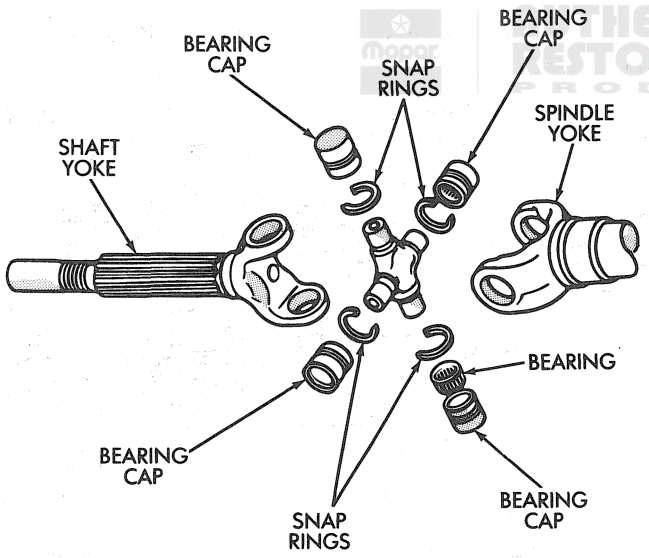


Fig. 29 Axle Shaft Outer U–Joint

It can be helpful to saturate the bearing caps with penetrating oil prior to removal.

(2) Locate a socket that is larger in diameter than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed. Locate a socket that is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap. Position the yoke with the sockets in a vise (Fig. 30).

(3) Compress the vise jaws to force the bearing cap into the larger socket (receiver).

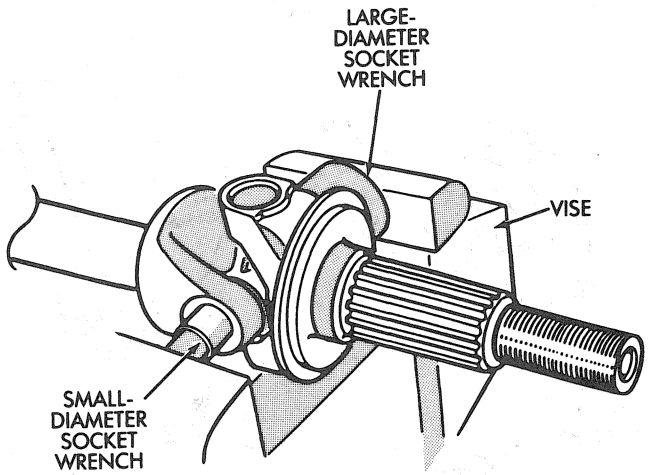


Fig. 30 Yoke Bearing Cap Removal

(4) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.

(5) Repeat the above procedure for the remaining bearing cap.

(6) Remove the remaining bearing cap, bearings, seals and spider from the propeller shaft yoke.

ASSEMBLY

(1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium–base lubricant to aid in installation.

(2) Position the spider in the yoke. Insert the seals and bearings. Tap the bearing caps into the yoke bores far enough to hold the spider in position.

(3) Place the socket (driver) against one bearing cap. Position the yoke with the socket wrench in a vise.

(4) Compress the vise to force the bearing caps into the yoke. Force the caps enough to install the retaining clips.

(5) Install the bearing cap retaining clips.

(6) Install the axle shaft, refer to Hub Bearing and Axle Shaft installation.

DIFFERENTIAL

DISASSEMBLY

(1) Remove the bearings from the differential case with Press C–293PA, Plug C–293–3, Adapter C–293–39 (Fig. 31).

Place adapter rings so they do not damage the bearing cage.

DISASSEMBLY AND ASSEMBLY (Continued)

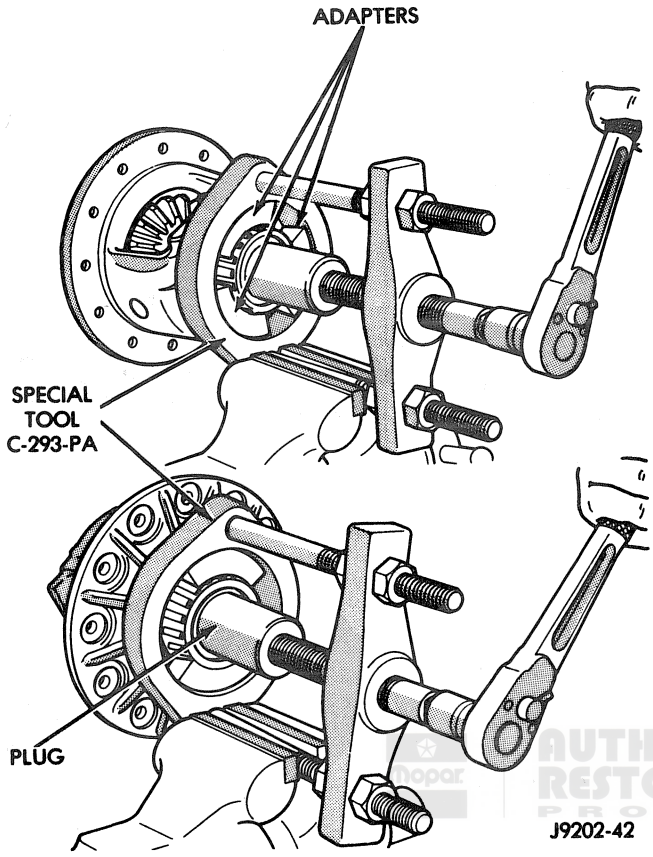


Fig. 31 Differential Bearing Removal

(2) Remove bearing shims from case hubs and mark them (with hub identity) for assembly reference. Record the thickness of the shims.

(3) Clamp the differential case in a vise equipped with soft jaws. Remove and **discard** the ring gear bolts. Tap the ring gear with a rawhide or plastic mallet and remove (Fig. 32).

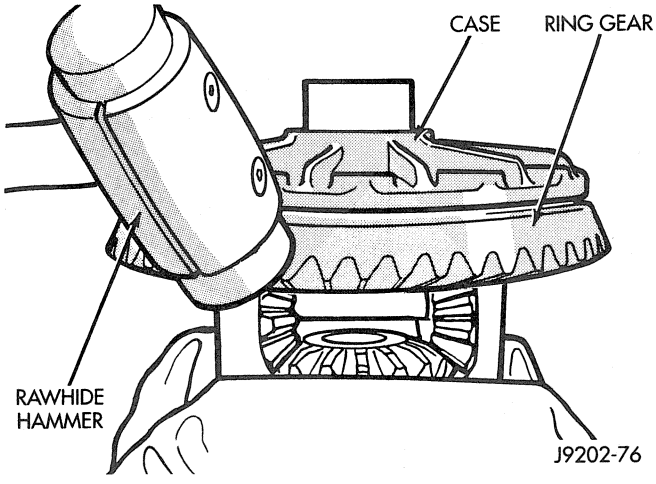


Fig. 32 Ring Gear Removal

(4) Use a drift to remove the pinion gear mate shaft lock pin (Fig. 33).

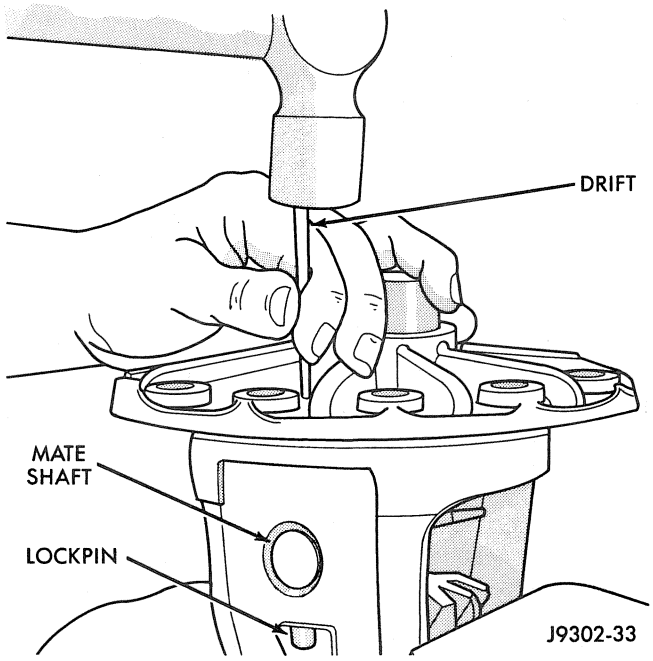


Fig. 33 Mate Shaft Lock Pin Removal

(5) Remove the mate shaft with a drift and hammer (Fig. 34).

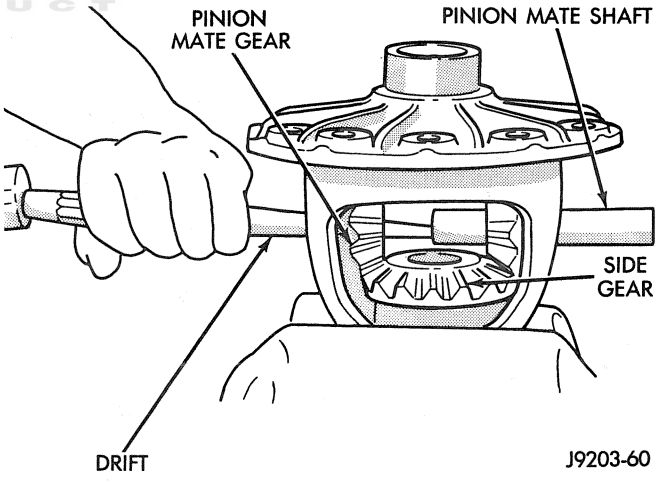


Fig. 34 Mate Shaft Removal

(6) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 35).

(7) Remove the differential side gears and thrust washers.

(8) Remove the case from the vise.

DIFFERENTIAL ASSEMBLY

(1) Install the following components in the differential case (Fig. 36).

- Differential side gears and thrust washers
- Pinion gears and thrust washers
- Pinion gear mate shaft (align holes in shaft and case)

DISASSEMBLY AND ASSEMBLY (Continued)

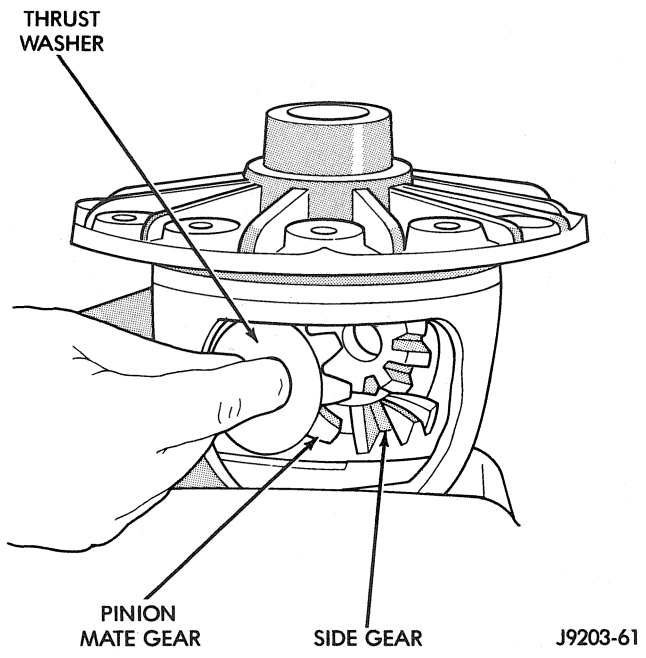


Fig. 35 Pinion Mate Gear Removal

(2) Install and seat the locking roll pin in the differential case and mate shaft with a punch and hammer (Fig. 36). Peen metal part of case over pin in two places 180 degrees apart.

If replacement gears and thrust washers were installed, it is not necessary to measure the gear backlash. Correct fit is due to close machining tolerances during manufacture.

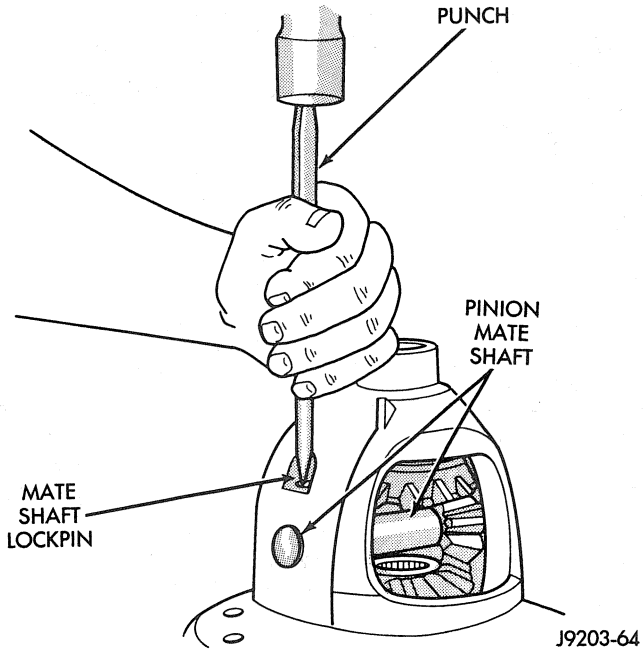


Fig. 36 Mate Shaft Pin Installation

(3) Invert the differential case and start two ring gear bolts. This will provide case–to–ring gear bolt hole alignment.

(4) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 37).

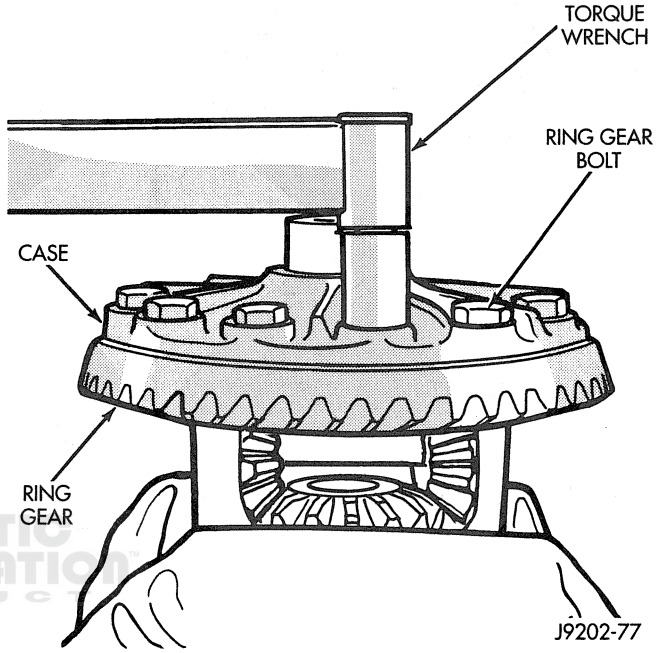


Fig. 37 Ring Gear Bolt Installation

(5) Lubricate all differential components with hypoid gear lubricant.

DIFFERENTIAL AND PINION MEASUREMENT

DIFFERENTIAL ZERO END PLAY MEASUREMENT

(1) Place Master Differential Bearing D–134 (D–348) on the case hubs (Fig. 38). Install differential case into housing.

(2) Install a pilot stud at the right side of housing. Attach Dial Indicator to the pilot stud. Load indicator plunger against the back of the ring gear (Fig. 39).

(3) Insert a small pry bar between the bearing cap and left side of differential case. Pry the case as far as possible to right side (Fig. 39). Zero the dial indicator pointer.

(4) Pry the case to left side and **record** the travel distance.

The measurement above is the shim thickness necessary for case zero end–play. The total thickness will be determined during the ring gear backlash adjustment.

(5) Remove indicator, pilot stud and differential case from housing.

DISASSEMBLY AND ASSEMBLY (Continued)

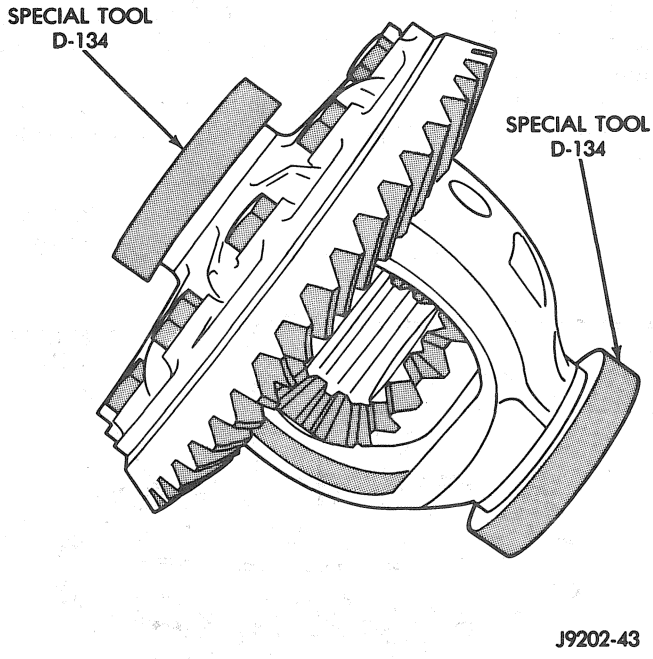


Fig. 38 Master Bearing Tools On Hubs

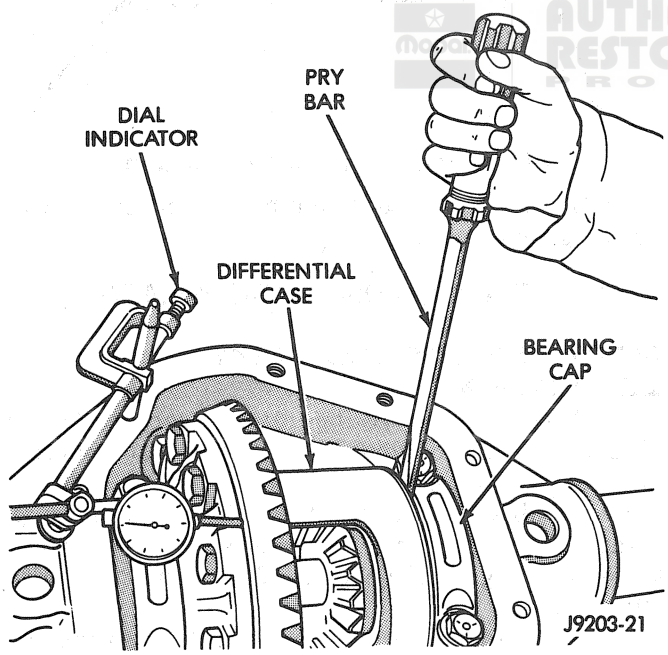


Fig. 39 Differential Case End Play Measurement

PINION GEAR DEPTH MEASUREMENT

Pinion gear depth measurement is necessary when;

- Axle housing or differential case is replaced
- Pinion select shim pack is unknown
- Ring and pinion gears are replaced

Measurements are done with pinion cups and pinion bearings installed in housing. Take measurements with Pinion Gauge Set 6774, Pinion Block 6733 and Dial Indicator C–3339 (Fig. 40).

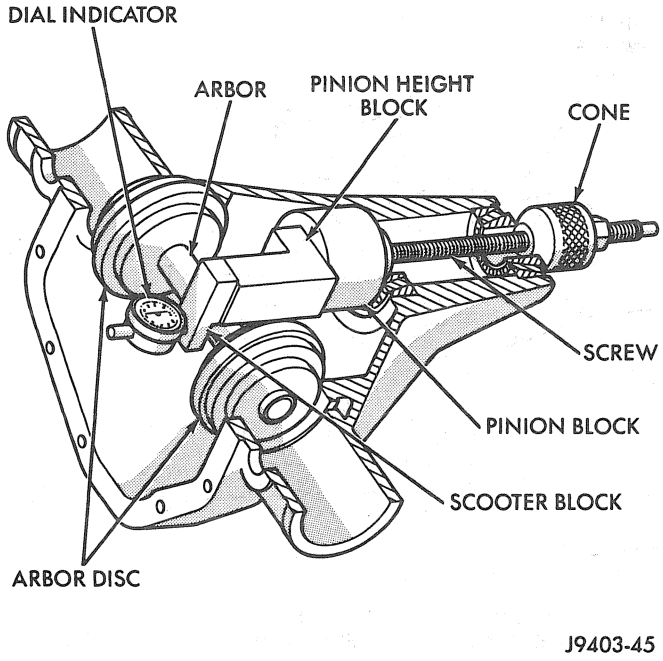


Fig. 40 Pinion Gear Depth Gauge Tools

(1) Install the pinion front bearing cup with Installer D–144 and Handle C–4171 (Fig. 41).

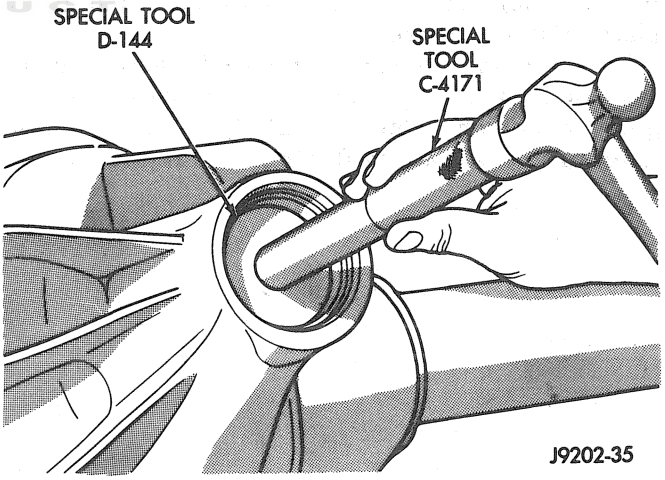


Fig. 41 Pinion Front Bearing Cup Installation

(2) Install the bearing cup with Installer D–146 and Driver Handle C– 4171 (Fig. 42). Ensure cup is correctly seated.

(3) Assemble Pinion Gauge Set, Pinion Block and pinion bearings. Install assembly into differential pinion gear bore and hand tighten cone (Fig. 43).

(4) Place Arbor Disc 6732 on Arbor D–115–3 and position in the bearing cradles (Fig. 44). Install differential bearing caps on Arbor Discs and tighten caps snug only.

Arbor Discs have different steps to fit other axle sizes. Pick correct size step for axle being serviced.

DISASSEMBLY AND ASSEMBLY (Continued)

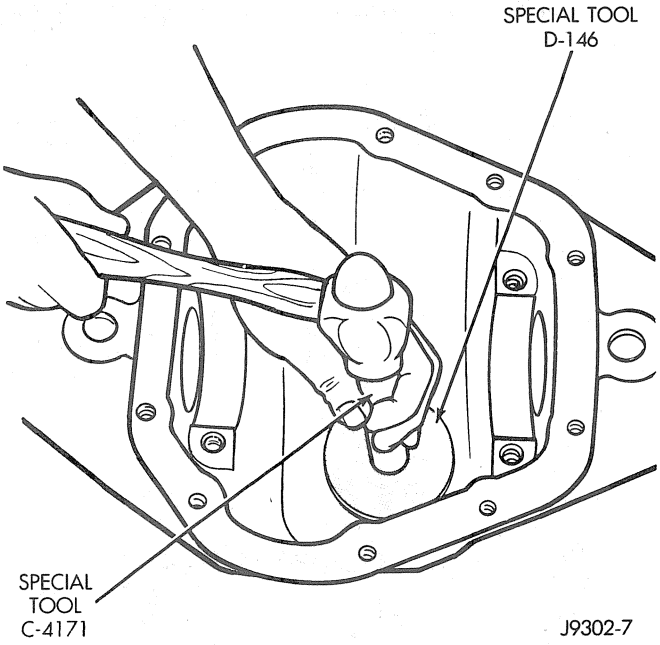


Fig. 42 Pinion Rear Bearing Cup Installation

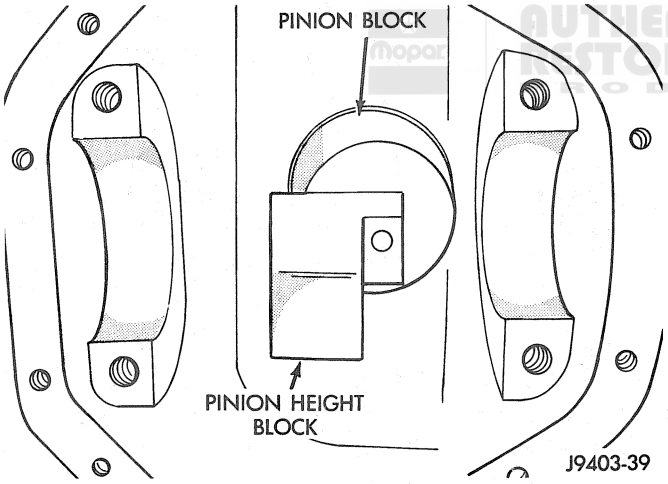


Fig. 43 Pinion Height Block

(5) Firmly place Scooter Block and Dial Indicator on pinion height block tool and zero the dial indicator pointer.

(6) Slide the Scooter Block across the arbor while observing indicator (Fig. 45). Record the longest travel distance, whether inward (–) or outward (+), indicated by the pointer.

The plunger travel, plus or minus the variance etched in the gear, is the required thickness for the depth shims.

(7) Measure the thickness of each depth shim with a micrometer. Combine the shims necessary for total required shim pack thickness. **Include oil slinger or baffle thickness with the total shim pack thickness.**

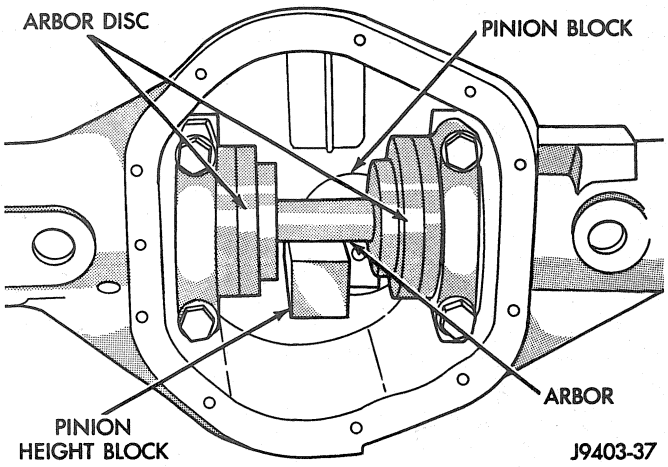


Fig. 44 Gauge Tools In Housing

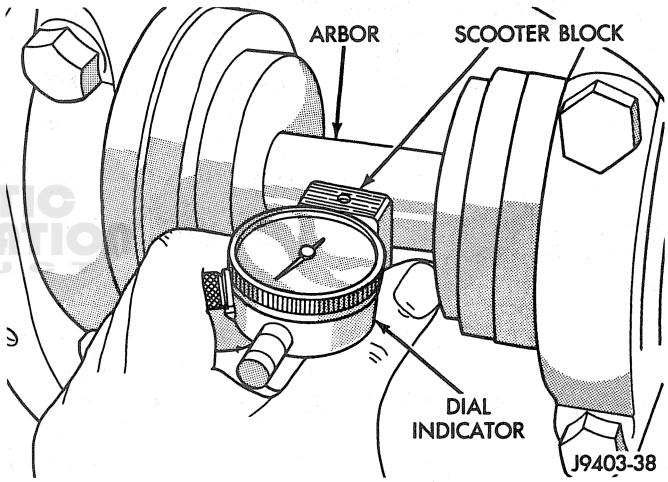


Fig. 45 Pinion Depth Measurement

(8) Remove the measurement tools from the differential housing.

DIFFERENTIAL SHIM PACK MEASUREMENT AND ADJUSTMENT

(1) Place Master Differential Bearing D–134 (D–348) on the case hubs.

(2) Install a pilot stud at the left side of housing. Attach Dial Indicator to housing. Load the indicator plunger against the back of the ring gear (Fig. 46). Ensure ring and pinion gear teeth are tightly meshed. Zero the indicator.

(3) Insert a small pry bar between the bearing cap and left side of differential case. Pry the case as far as possible to right side (Fig. 46). Zero the dial indicator pointer.

(4) Repeat the measurement several times to check consistency. Record the travel distance.

The measurement above shows shim thickness necessary to eliminate ring gear backlash. Subtract this thickness from case zero end–play

DISASSEMBLY AND ASSEMBLY (Continued)

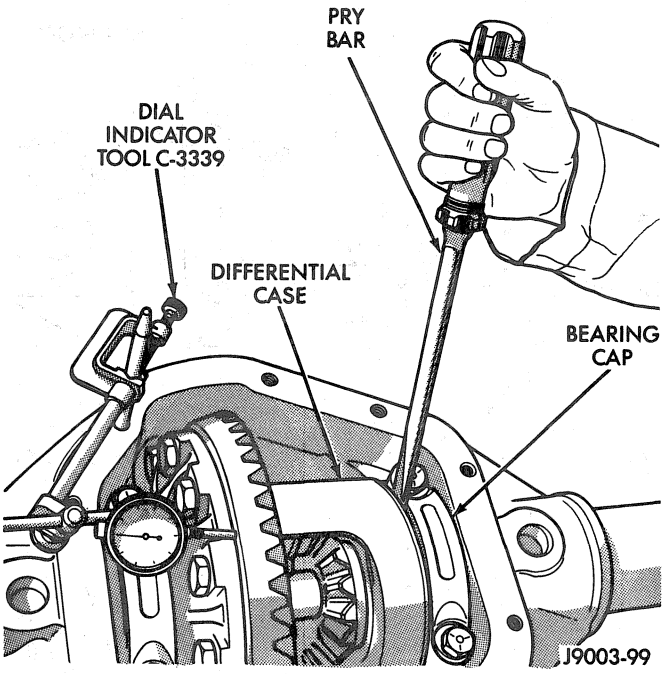


Fig. 46 Shim Pack Measurement

shim thickness (Fig. 47). The shims must be placed at the ring gear side between the case and bearing.

For Example:

Indicator Reading	LESS PINION	0.085 in.	total
Indicator Reading	WITH PINION	0.055 in.	total
BALANCE OF SHIM PACK		0.030 in.	total

Place BALANCE of shims at opposite side of ring gear

ADD an additional 0.015 in. shim to opposite side of ring gear for bearing preload

Ring Gear Side (Flange Side)	0.055 in.	
Opposite Side	0.030 in.	
Opposite Side Preload	0.015 in.	
Total Opposite Side	0.045 in.	J9302-65

Fig. 47 Shim Pack Calculations

(5) Remove indicator and pilot stud.

(6) Remove the differential case from housing.

(7) Remove the master bearing tools from the differential case hubs.

(8) Position the backlash shims (with determined thickness) on case hub (ring gear side). Install bearing on the hub with Bearing Installer C– 3716A and Driver Handle C–4171 (Fig. 48).

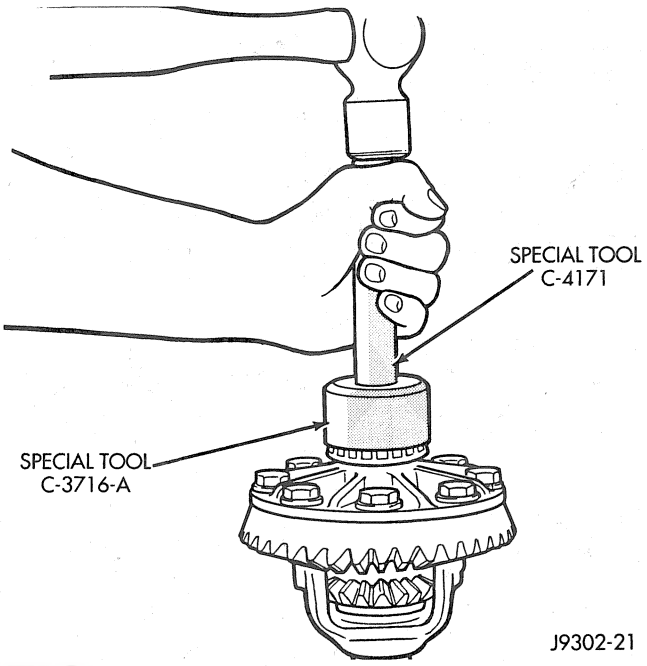


Fig. 48 Differential Bearing Installation

(9) Position the remaining zero end–play shims on hub at opposite side of case. Include an additional 0.015 in. (0.38 mm) thick shim on this hub. This will provide the required differential bearing preload.

(10) Install bearings on hubs with Installer C–3716A and Handle C–4171 (Fig. 48).

(11) Match each bearing cup with bearing (original). Install the cups on the bearings.

BACKLASH AND CONTACT PATTERN ANALYSIS

(1) Rotate assembly several revolutions to seat bearings. Measure backlash at three equally spaced locations around the perimeter of the ring gear with a dial indicator (Fig. 49).

The ring gear backlash must be within 0.12 – 0.20 mm (0.005 – 0.008 inch). It cannot vary more than 0.05 mm (0.002 inch) between the points checked.

If backlash must be adjusted, transfer shims from one side of carrier to the other side. Adjust the backlash accordingly (Fig. 50). **DO NOT INCREASE THE TOTAL SHIM PACK THICKNESS, EXCESSIVE BEARING PRELOAD AND DAMAGE WILL OCCUR.**

If the mesh and backlash steps have been followed, good gear teeth contact patterns should exist.

The ring gear teeth contact patterns will show if the pinion gear depth is correct. It will also show if the ring gear backlash has been adjusted correctly. The backlash must be maintained within the speci-

DISASSEMBLY AND ASSEMBLY (Continued)

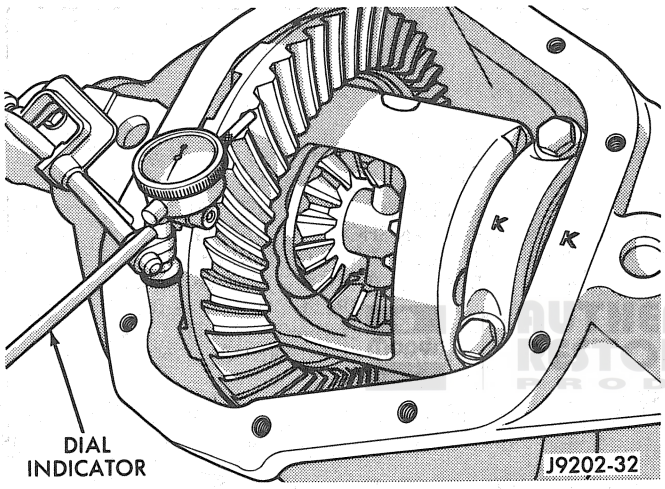


Fig. 49 Ring Gear Backlash Measurement

fied limits until the correct tooth contact patterns are obtained.

(2) Apply a thin coat of hydrated ferric oxide (yellow oxide of iron) to the drive and coast side of the ring gear teeth.

(3) Rotate the ring gear one complete revolution in both directions while a load is being applied. Insert a pry bar between the differential housing and the case flange to load gears. This will produce a distinct contact patterns on both the drive side and coast side of the ring gear teeth.

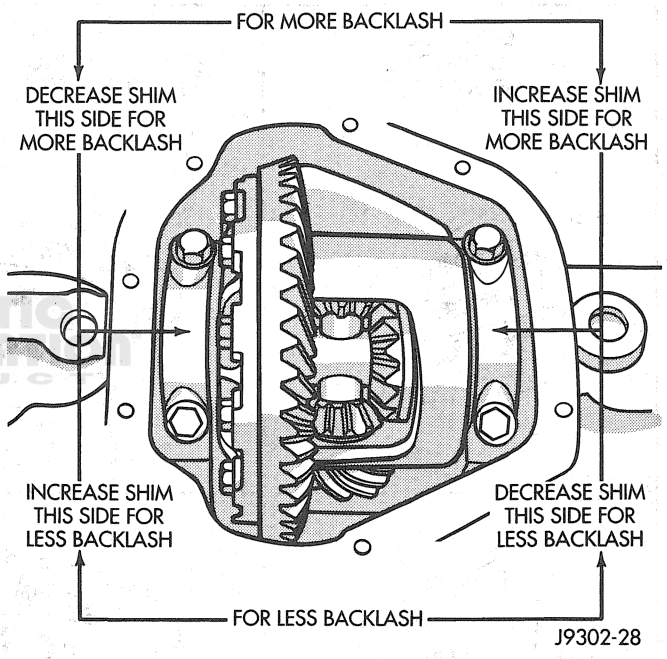
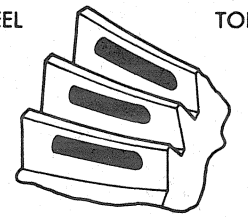
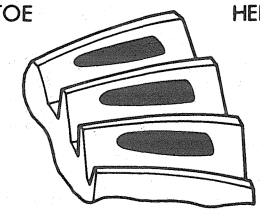
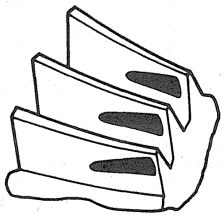
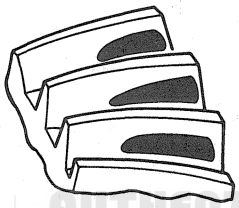
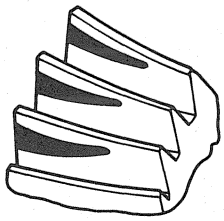
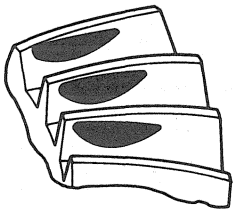
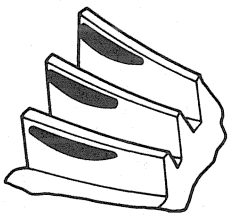
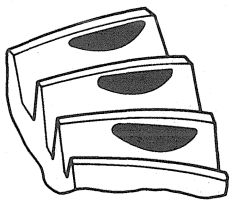
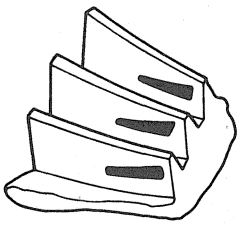
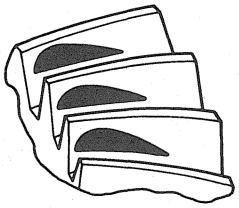


Fig. 50 Backlash Shim Adjustment

(4) Note patterns in compound. Refer to (Fig. 51) for interpretation of contact patterns and adjust accordingly.

DISASSEMBLY AND ASSEMBLY (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 51 Gear Tooth Contact Patterns

DISASSEMBLY AND ASSEMBLY (Continued)

FINAL ASSEMBLY

(1) Install the axle shafts. Refer to Axle Shaft Installation in this Group.

(2) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar Silicone Rubber Sealant on the housing cover. Allow the sealant to cure for a few minutes.

Install the housing cover within 5 minutes after applying the sealant. If not installed the sealant must be removed and another bead applied.

(3) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts with 41 N·m (30 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(4) Refill the differential housing with the specified quantity of Mopar Hypoid Gear Lubricant.

(5) Install the fill hole plug and tighten to 34 N·m (25 ft. lbs.) torque.

CLEANING AND INSPECTION

CARDAN U-JOINT

(1) Clean all the U–joint yoke bores with cleaning solvent and a wire brush. Ensure that all the rust and foreign matter are removed from the bores.

(2) Inspect the yokes for distortion, cracks and worn bearing cap bores.

(3) Replace the complete U–joint if any of the components are defective.

DIFFERENTIAL

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as a matched sets only.**

Clean axle shaft tubes and oil channels with clean cloth.

Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear or damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Worn or chipped teeth to ring and pinion gears.
- Damaged bolt threads to ring gear. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace the as necessary.

SPECIFICATIONS

FRONT AXLE—MODEL 30

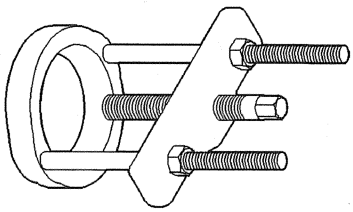
Axle Type	Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lube Capacity	1.48 L (3.13 pts.)
Axle Ratio	3.07 3.55 3.73 4.10
Differential	
Side Gear Clearance	0.12–0.20 mm (0.005–0.008 in.)
Ring Gear	
Diameter	18.09 cm (7.125 in.)
Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.1 mm (3.625 in.)
Pinion Bearing Preload	
Original Bearing	1–2 N·m (10–20 in. lbs.)
New Bearing	1.5–4 N·m (15–35 in. lbs.)

TORQUE—MODEL 30 AXLE

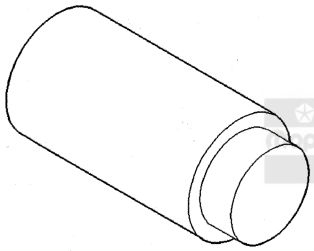
DESCRIPTION	TORQUE
Fill Hole Plug	34 N·m (25 ft. lbs.)
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	61 N·m (45 ft. lbs.)
Ring Gear Bolt	95–122 N·m (70–90 ft. lbs.)
Shift Motor Bolt	11 N·m (8 ft. lbs.)
Axle Nut	237 N·m (175 ft. lbs.)
Wheel Brg. Bolt	102 N·m (75 ft. lbs.)
Lower Ball Stud	108 N·m (80 ft. lbs.)
Upper Ball Stud	101 N·m (75 ft. lbs.)
ABS Sensor Bolt	11 N·m (96 in. lbs.)

SPECIAL TOOLS

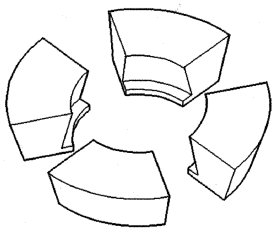
FRONT AXLE—MODEL 30



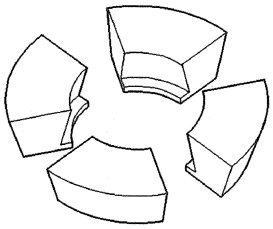
Puller—C-293-PA



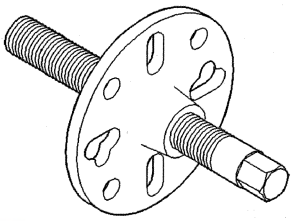
Extension—C293–3



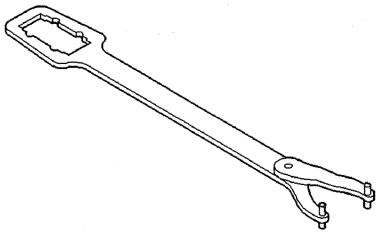
Adapter—C-293-39



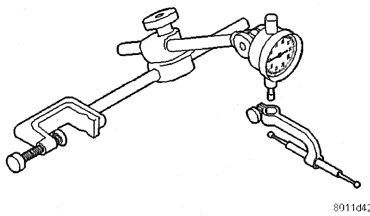
Adapter—C-293-48



Puller—C-452



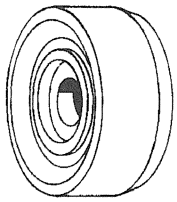
Wrench—C-3281



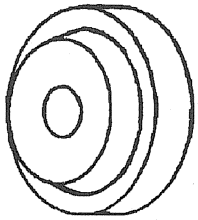
Dial Indicator—C-3339

AUTHENTIC RESTORATION PRODUCT

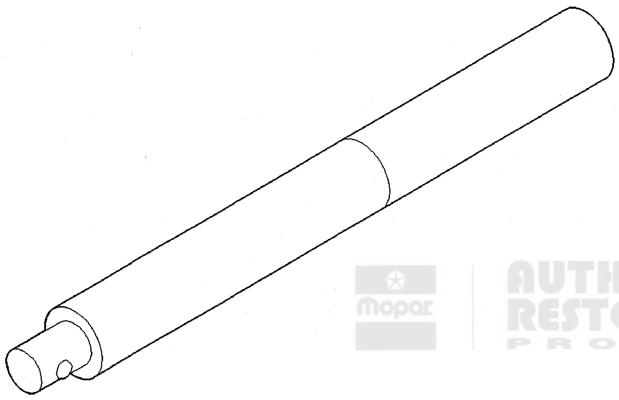
SPECIAL TOOLS (Continued)



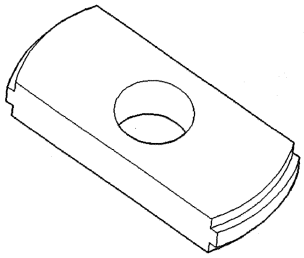
Driver—C-3716-A



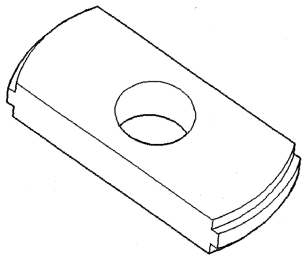
Installer—D-146



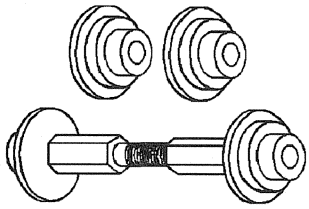
Handle—C-4171



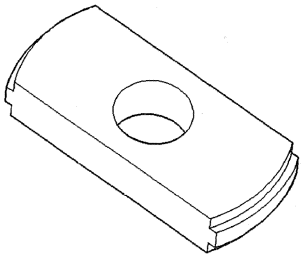
Remover—D-147



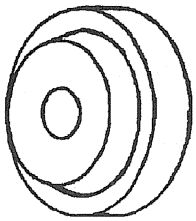
Remover—D-148



Installer—D-112



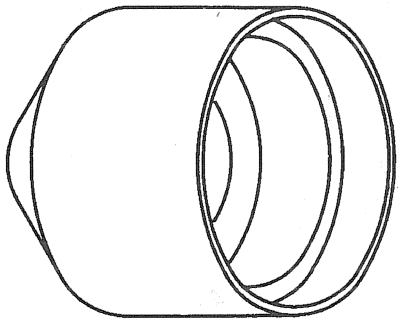
Remover—D-149



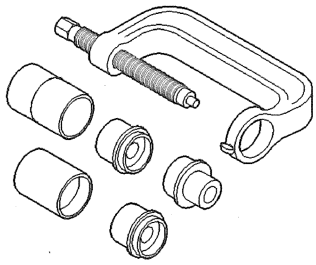
Installer—D-144

Mopar AUTHENTIC RESTORATION PRODUCT

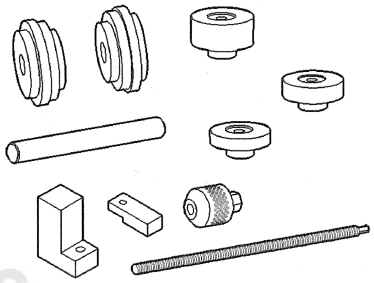
SPECIAL TOOLS (Continued)



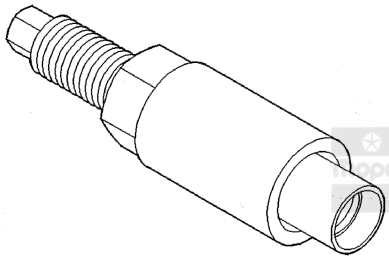
Installer—D163



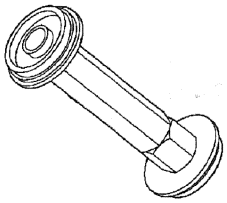
Remover/Installer—6289



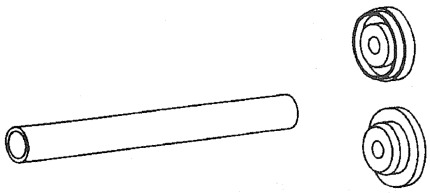
Tool Set, Pinion Depth—6774



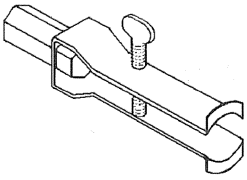
Installer—W-162-D



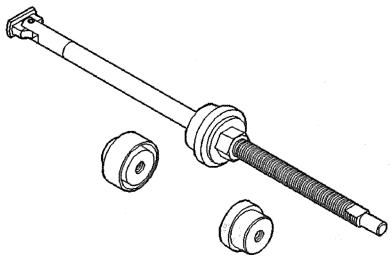
Installer—6764



Installer—6228



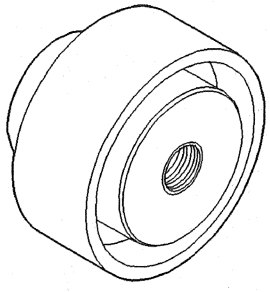
Puller—7794-A



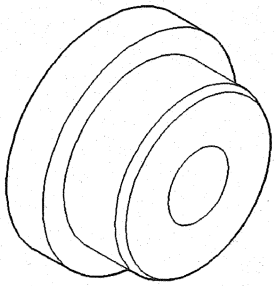
Remover/Installer—6288

AUTHENTIC RESTORATION PRODUCT

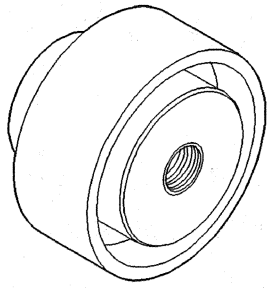
SPECIAL TOOLS (Continued)



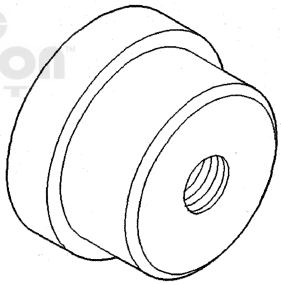
Remover—7916



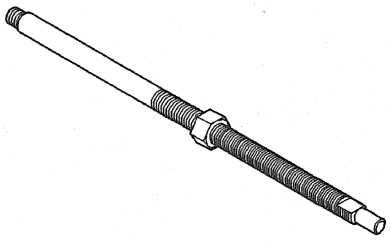
Support—7919



Installer—7917



Remover—7920



Screw, Forcing—7918

Mopar AUTHENTIC RESTORATION PRODUCT

MODEL 35 AXLE

INDEX

	page
GENERAL INFORMATION	
GENERAL INFORMATION	42
LUBRICANT SPECIFICATIONS	42
DESCRIPTION AND OPERATION	
AXLES	43
DIAGNOSIS AND TESTING	
DRIVELINE SNAP	45
GEAR AND BEARING NOISE	44
GENERAL INFORMATION	44
LIMITED SLIP DIFFERENTIAL	46
LOW SPEED KNOCK	45
REAR AXLE ALIGNMENT	45
SERVICE DIAGNOSIS	47
VIBRATION	45
SERVICE PROCEDURES	
LUBRICANT CHANGE	49
REMOVAL AND INSTALLATION	
AXLE SHAFT SEAL AND BEARING	52
AXLE SHAFT	51
DRIVE AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES	49
PINION SHAFT SEAL REPLACEMENT	50
DISASSEMBLY AND ASSEMBLY	
BACKLASH AND CONTACT PATTERN ANALYSIS	61
DIFFERENTIAL ASSEMBLY	57
DIFFERENTIAL MEASUREMENT AND INSTALLATION	60
DIFFERENTIAL REMOVAL	52
FINAL ASSEMBLY	64
PINION GEAR DEPTH INFORMATION	57
PINION GEAR	54
PINION MEASUREMENT AND ASSEMBLY	59
STANDARD DIFFERENTIAL	53
CLEANING AND INSPECTION	
AXLE COMPONENTS	64
SPECIFICATIONS	
MODEL 35 AXLE	64
MODEL 35 AXLE	64
SPECIAL TOOLS	
FRONT AXLE—MODEL 35	65

GENERAL INFORMATION

GENERAL INFORMATION

The Model 35 housing has an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one–piece axle housing.

The integral type housing, hypoid gear design has the center line of the pinion set below the center line of the ring gear.

The axle has a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the axle shaft and bearings. The axle shafts are retained by C–clips in the differential side gears.

The cover provides a means for servicing the differential without removing the axle.

Axles may be equipped with drum or disc brakes. The axles that are equipped with ABS brake have a tone ring pressed on the axle shaft. Use care when removing axle shafts as NOT to damage the tone wheel or the sensor.

The Model 35 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover. Build date identification codes are stamped on the axle shaft tube cover side.

The differential case is a one–piece design. The differential pinion mate shaft is retained with a threaded roll pin. Differential bearing preload and ring gear backlash is adjusted by the use of spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

For complete drive axle assembly removal and installation refer to Drive Axle Assembly Replacement in this Group.

LUBRICANT SPECIFICATIONS

Multi–purpose, hypoid gear lubricant should be used. The lubricant should have MIL–L–2105C and API GL 5 quality specifications. Mopar Hypoid Gear Lubricant conforms to both of these specifications.

- Lubricant for Model 35 axle is a thermally stable SAE 80W–90 gear lubricant.
- Lubricant for Model 35 axle with Trailer Tow is SAE 75W–140 SYNTHETIC gear lubricant.
- Trac–Lok differentials add 4 oz. of friction modifier.
- Lubricant capacity is 1.66 L (3.50 pts.).

GENERAL INFORMATION (Continued)

CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

DESCRIPTION AND OPERATION

AXLES

The Model 35 axle is standard for XJ vehicles. The 8 1/4 axle is available in XJ vehicles without ABS brakes.

The Model 35 and 8 1/4 axle housings has a cast iron center section. Two steel axle shaft tubes are pressed into the differential housing and welded.

It is not necessary to remove the axle from the vehicle for service. A removable differential cover is provided for routine vehicle service. If the differential housing is damaged, the complete axle assembly can be removed.

For complete drive axle assembly removal and installation refer to Drive Axle Assembly Replacement in this Group.

IDENTIFICATION

Model 35 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the left side of the housing cover (Fig. 1). Build date identification codes on axles are stamped on the axle shaft tube cover side. The Model 35 axle has a flat housing cover gasket flange at the outer edge (Fig. 1).

The 8 1/4 axle has the build date code and gear ratio tags attached to the housing cover (Fig. 2). The housing cover gasket has a rolled gasket flange at the outer edge (Fig. 2).

- The Model 35 axle has shaft tubes that are 2.625 inch (66.67 mm) in diameter.
- The 8 1/4 axle has axle shaft tubes that are 3.0–inch (76.2 mm) in diameter.

STANDARD DIFFERENTIAL OPERATION

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears

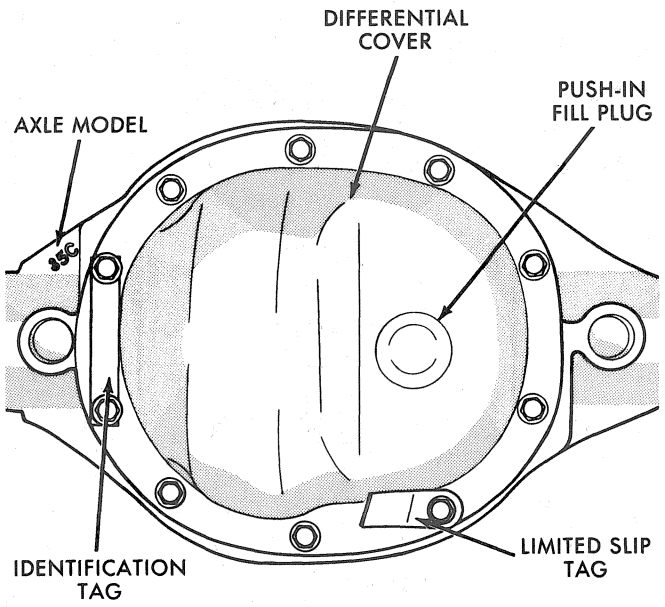


Fig. 1 Model 35 Differential Cover

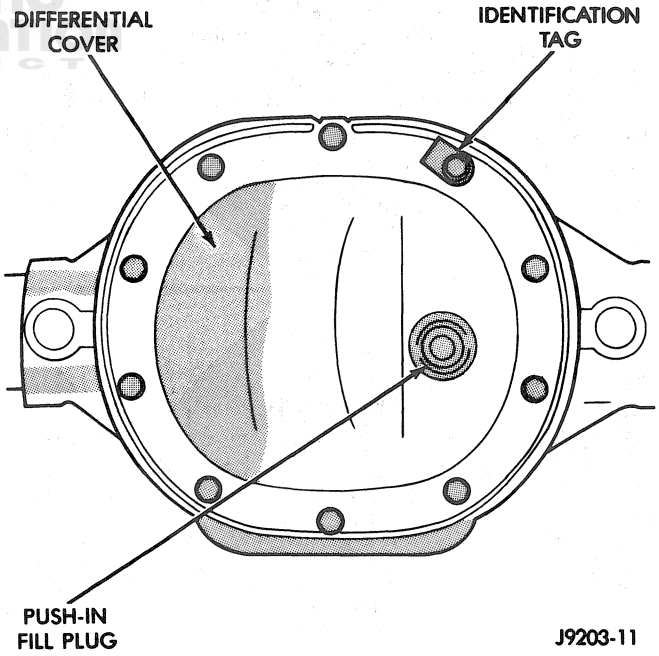


Fig. 2 Differential Cover–8 1/4

- The side gears (splined to the axle shafts) rotate the shafts

During straight- ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).

DESCRIPTION AND OPERATION (Continued)

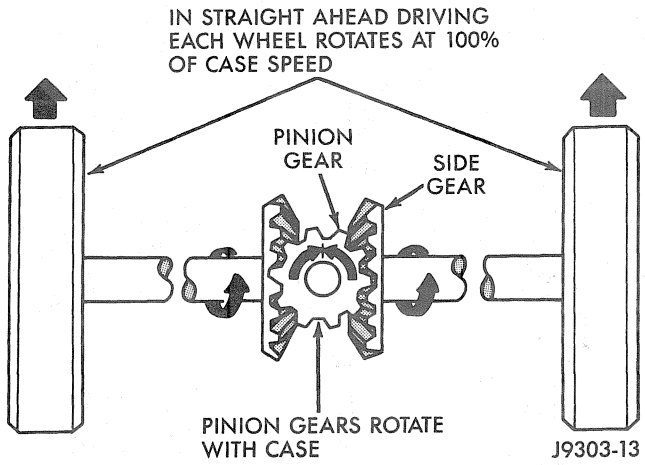


Fig. 3 Differential Operation—Straight Ahead Driving

When turning corners, the outside wheel must travel a greater distance than the inside wheel in order to complete a turn. The difference must be compensated for, to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 4). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

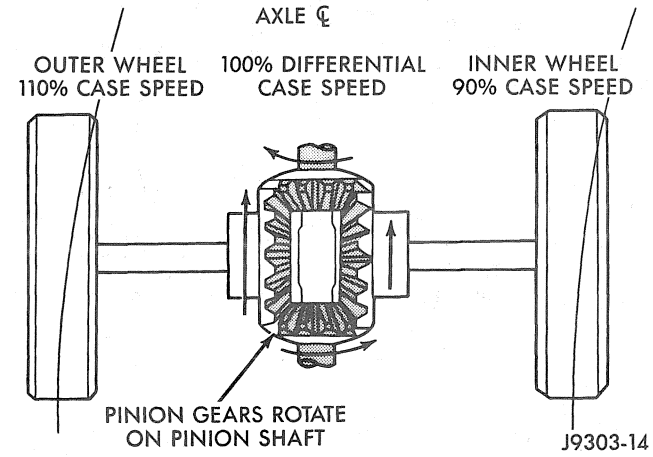


Fig. 4 Differential Operation—On Turns

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant
- Foreign matter/water contamination
- Incorrect bearing preload torque adjustment
- Incorrect backlash (to tight)

When serviced, the bearings must be cleaned thoroughly. They should be dried with lint–free shop towels.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication
- Incorrect or contaminated lubricant
- Overloading (excessive engine torque) or exceeding vehicle weight capacity
- Incorrect clearance or backlash adjustment

Insufficient lubrication is usually the result of a housing cover leak. It can also be from worn axle shaft or pinion gear seals. Check for cracks or porous areas in the housing or tubes.

Using the wrong lubricant will cause overheating and gear failure. Gear tooth cracking and bearing galling are indicators of this.

Axle component breakage is most often the result of:

- Severe overloading
- Insufficient lubricant
- Incorrect lubricant
- Improperly tightened components

Overloading occurs when towing heavier than recommended loads. Component breakage can occur when the wheels are spun excessively. Incorrect lubricant quantity contributes to breakage. Loose differential components can also cause breakage.

Incorrect bearing preload or gear backlash will not result in component breakage. Misadjustment will produce enough noise to cause service repair before a failure occurs. If a misadjustment condition is not corrected, component failure can result.

Excessive bearing preload may not be noisy. This condition will cause high temperature which can result in bearing failure.

GEAR AND BEARING NOISE

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant. Incorrect backlash, tooth contact, or worn/damaged gears can cause noise.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, accelerate the vehicle to the speed range where the noise is the greatest. Shift out–of–gear and coast through the peak–noise range. If the noise stops or changes greatly, check for insufficient lubricant. Incorrect ring gear backlash, or gear damage can cause noise changes.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise in straight–ahead driving. The side gears are

DIAGNOSIS AND TESTING (Continued)

loaded during vehicle turns. If noise does occur during vehicle turns, the side or pinion gears could be worn or damaged. A worn pinion gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion gear bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion gear bearings have a constant–pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs the pinion rear bearing is the source of the noise. If the bearing noise is heard during a coast, front bearing is the source.

Worn, damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U–joint or by worn side–gear thrust washers. A worn pinion gear shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft
- Missing drive shaft balance weight
- Worn, out–of–balance wheels
- Loose wheel lug nuts
- Worn U–joint
- Loose spring U–bolts
- Loose/broken springs
- Damaged axle shaft bearings
- Loose pinion gear nut
- Excessive pinion yoke run out
- Bent axle shaft

Check for loose or damaged front–end components or engine/transmission mounts. These components can contribute to what appears to be a rear–end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires for additional information.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed
- Loose engine/transmission/transfer case mounts
- Worn U–joints
- Loose spring mounts
- Loose pinion gear nut and yoke
- Excessive ring gear backlash
- Excessive side gear/case clearance

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

REAR AXLE ALIGNMENT

MEASUREMENT

The following procedure can be used to determine if abnormal rear tire tread wear is the result of a bent or deformed rear axle shaft.

(1) Raise both rear wheels off the surface with a frame contact hoist.

(2) Attach a one–inch long piece of masking tape at the center of each tire tread for use as reference marks.

(3) Rotate the rear wheels until both reference marks face the front of the vehicle. Measure the distance between the outside edges of the two pieces of tape. Record this measurement as the front of tire (FTR) measurement.

(4) Rotate the rear wheels until both reference marks face the rear of the vehicle. Measure the distance between the outside edges of the two pieces of tape. Record this measurement as the rear of tire (RTR) measurement.

(5) Subtract the (RTR) measurement from the (FTR) measurement to obtain the amount of wheel toe. The acceptable rear wheel toe–in position is 1/16 in. (1.6 mm) to 3/16 inch (4.8 mm) toe–out.

(6) Rotate the rear wheels until the reference marks are facing downward. Measure the distance between the outside edges of the two pieces of tape. Record this measurement as the bottom of tire (BTR) measurement.

(7) Average the (FTR) and the (RTR) distance measurements. Subtract the (BTR) measurement from this average distance to obtain the camber. The acceptable amount of camber is 1/16 inch to 3/32 inch (1.6 to 2.4 mm).

(FTR + RTR) DIVIDED BY 2 (TWO) MINUS BTR EQUALS CAMBER

DIAGNOSIS AND TESTING (Continued)

If the (BTR) distance measurement is less than the average FTR and RTR distance measurement, the camber will be positive (+). If the (BTR) distance measurement is greater than the average FTR and RTR distance, the camber will be negative (–).

If the toe position or camber is not acceptable, a bent or deformed rear axle shaft is most likely the cause.

LIMITED SLIP DIFFERENTIAL

Under normal traction conditions, engine torque is divided evenly. With low–traction surfaces, engine torque is transferred to the wheel with the most tire traction. When diagnosing a limited–slip differential the wheel with the least traction can continue spinning.

The most common problem is a chatter noise when turning corners. Check for incorrect or contaminated lubricant. Replace the gear lubricant if necessary.

- With Trac–Lok™ differentials add a container of Mopar Trac–Lok Lubricant.

This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure–eight turns. This maneuver will pump lubricant through the clutches.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS

SERVICE DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces.	1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

Mopar AUTHENTIC RESTORATION PRODUCTS

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS (CONT'D)

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed.	2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts	1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

AUTHENTIC RESTORATION PRODUCT

SERVICE PROCEDURES

LUBRICANT CHANGE

The gear lubricant will drain quicker if the vehicle has been recently driven.

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**

(5) Remove the sealant from the housing and cover surfaces.

(6) Apply a bead of Mopar Silicone Rubber Sealant to the housing cover (Fig. 5). **Allow the sealant to cure for a few minutes.**

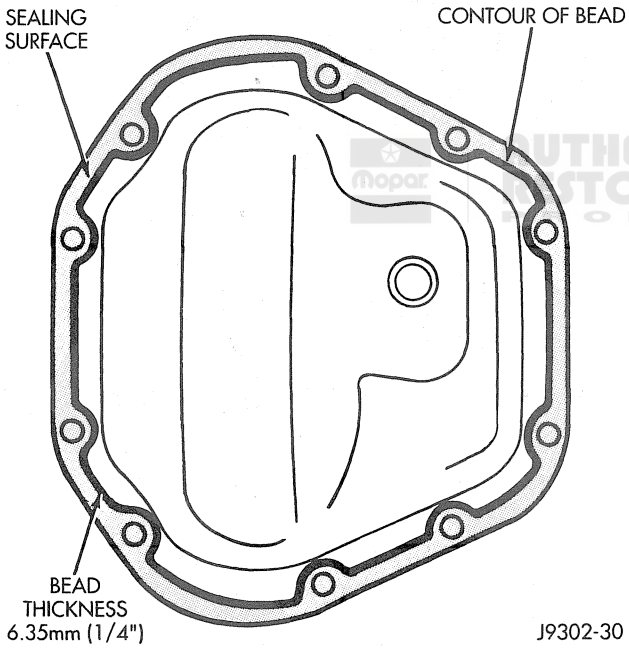


Fig. 5 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant.

(7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

(8) Refill differential with Mopar Hypoid Gear Lubricant to bottom of the fill plug hole.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

Trac–Lok Differentials; A container of Trac–Lok lubricant (friction modifier) should be added after repair service or a lubricant change.

(9) Install the fill hole plug and lower the vehicle.

Limited slip differential vehicles should be road tested by making 10 to 12 slow figure–eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES

REMOVAL

(1) Raise the vehicle and position support stands under the frame rails slightly in front the springs.

(2) Remove the rear wheels.

(3) Mark the drive shaft yoke and axle pinion yoke for alignment reference. Disconnect the drive shaft from the axle.

(4) Disconnect the axle vent hose.

(5) Disconnect the parking brake cables at the equalizer or backing plate.

(6) Disconnect the shock absorbers from the axle brackets.

(7) Disconnect the brake hose at the axle junction block. **Do not disconnect the wheel cylinder tubing fittings.**

(8) If equipped, disconnect ABS wiring connections at the axle.

(9) Support the axle with a hydraulic jack under the differential.

(10) Remove the spring U–bolts from the plate brackets.

(11) Lower the jack enough to remove the axle.

INSTALLATION

CAUTION: Suspension components with rubber bushings should be tightened with the vehicle at normal height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur. Rubber bushings must never be lubricated.

(1) Support the axle on a hydraulic jack under the differential. Position the axle under the vehicle.

(2) Raise the axle and align the spring center bolts with the locating holes in the axle pads and plate brackets.

(3) Install the spring U–bolts through the plate brackets and tighten to 70 N·m (52 ft. lbs.) torque.

(4) Install ABS wiring connections (if equipped) at the axle.

(5) Connect the brake hose at the axle junction block.

REMOVAL AND INSTALLATION (Continued)

(6) Install the shock absorbers to the axle brackets and tighten to 62 N·m (46 ft. lbs.) torque.
(7) Connect the parking brake cables at the equalizer or backing plate.
(8) Connect the vent hose to the tube fitting.
(9) Align the reference marks and connect the drive shaft to the axle yoke. Tighten the U–joint clamp bolts to 19 N·m (14 ft. lbs.) torque.
(10) Check differential lubricant and add if necessary.
(11) Install the wheel and tire.
(12) Bleed the brakes.
(13) Remove the supports and lower the vehicle.

PINION SHAFT SEAL REPLACEMENT

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Mark the drive shaft yoke and pinion yoke for installation alignment reference.
(4) Remove the drive shaft from the yoke.
(5) Rotate the pinion gear three or four times. **Make sure brakes are not dragging during this procedure.**
(6) Measure the amount of torque (in Newton–meters or inch–pounds) necessary to rotate the pinion gear with a torque wrench. Note the torque for installation reference. **It must be known to properly adjust the pinion gear bearing preload torque after seal installation.**
(7) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 6).
(8) Mark the positions of the yoke and pinion gear for installation alignment reference.

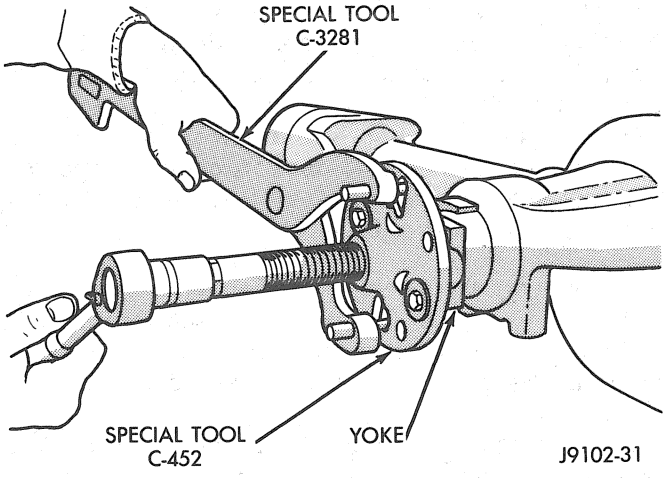


Fig. 6 Pinion Yoke Removal

(9) Use Remover 7794A and slide hammer to remove the pinion gear seal (Fig. 7).

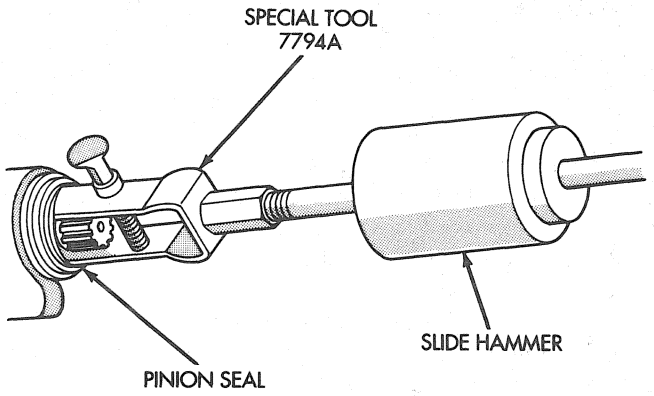


Fig. 7 Seal Removal

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 8).

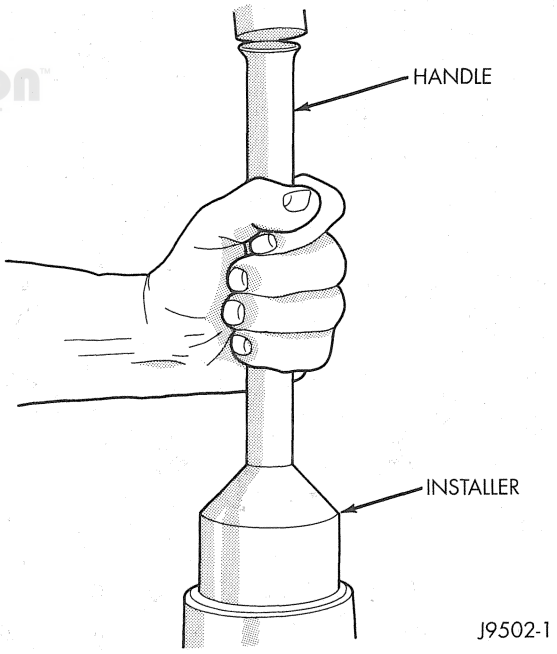


Fig. 8 Pinion Seal Installation

(2) Align the installation reference marks and install yoke on the pinion gear with Installer W–162D.
(3) Install a new nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

REMOVAL AND INSTALLATION (Continued)

CAUTION: Exercise care during the bearing preload torque adjustment. Do not over–tighten, or loosen and then re–tighten the nut. Do not exceed the bearing preload torque. The collapsible preload spacer on the shaft will have to be replaced. The bearing preload torque will be re–adjusted afterward.

(4) Install a socket and inch–pound torque wrench on the pinion nut.

(5) Rotate the shaft with the torque wrench and note the torque.

The required preload torque is equal to the amount recorded during removal plus an additional 0.56 N·m (5 in. lbs.).

(6) Use Flange Wrench C–3281 to retain the yoke and shaft (Fig. 9). Tighten the shaft nut in very small increments.

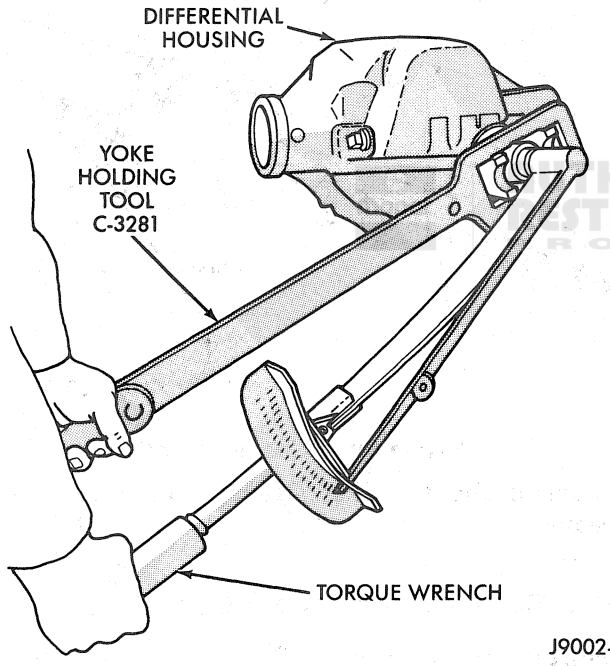


Fig. 9 Tightening Pinion Shaft Nut

(7) Continue tightening the shaft nut in small increments until the correct bearing preload torque is attained.

(8) Align the installation reference marks and attach the drive shaft to the yoke.

(9) Add API grade GL 5 hypoid gear lubricant to the differential housing, if necessary.

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

AXLE SHAFT

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire.

(3) Remove the brake drum.

(4) Clean all the foreign material from housing cover area.

(5) Loosen the housing cover bolts. Drain the lubricant from the housing and the axle shaft tubes. Remove the housing cover.

(6) Rotate the differential case so that the pinion mate gear shaft lock screw is accessible. Remove the lock screw and the pinion mate gear shaft from the case (Fig. 10).

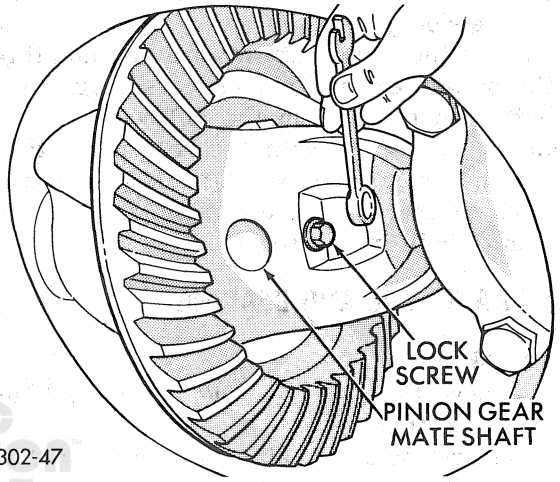


Fig. 10 Mate Shaft Lock Screw

(7) Force the axle shaft in toward the center of the vehicle. Remove the axle shaft C–clip lock from the axle shaft (Fig. 11).

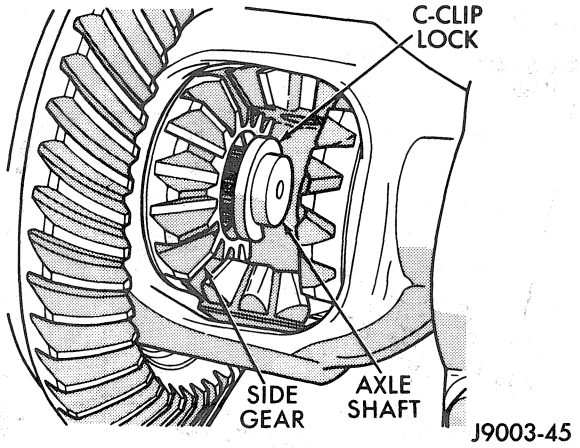


Fig. 11 Axle Shaft C–Clip Lock

(8) Remove the axle shaft. Use care to prevent damage to the axle shaft bearing and seal, which will remain in the axle shaft tube.

(9) Inspect axle shaft seal for leakage or damage.

(10) Inspect the roller bearing contact surface on the axle shaft for signs of brinelling, galling and pitting.

REMOVAL AND INSTALLATION (Continued)

(11) If any of these conditions exist, the axle shaft and bearing or seal must be replaced.

INSTALLATION

(1) Lubricate the bearing bore and seal lip with gear lubricant. Insert the axle shaft through the seal, bearing, and engage it with the side gear splines. **Use care to prevent the shaft splines from damaging the axle shaft seal lip.**

(2) Insert the C–clip lock in the end of the axle shaft. Push the axle shaft outward to seat the C–clip lock in the side gear.

(3) Insert the mate shaft into the case and through the thrust washers and pinion gears. Align the hole in shaft with the hole in the differential case and install the lock screw with Loctite® on the threads. Tighten the screw to 19 N·m (14 ft. lbs.) torque.

(4) Install the cover and add fluid. Refer to the Drain and Refill in this section.

AXLE SHAFT SEAL AND BEARING

REMOVAL

(1) Remove the axle shaft. Refer to the Removal procedures in this Group.

(2) Remove the axle shaft seal from the end of the axle shaft tube with a small pry bar.

(3) Remove the bearing if it appears damaged.

The seal and bearing can be removed at the same time with the bearing removal tool.

(4) Remove the axle shaft bearing from the tube (Fig. 12) with Bearing Removal Tool Set 6310 (T. Ar 960–02).

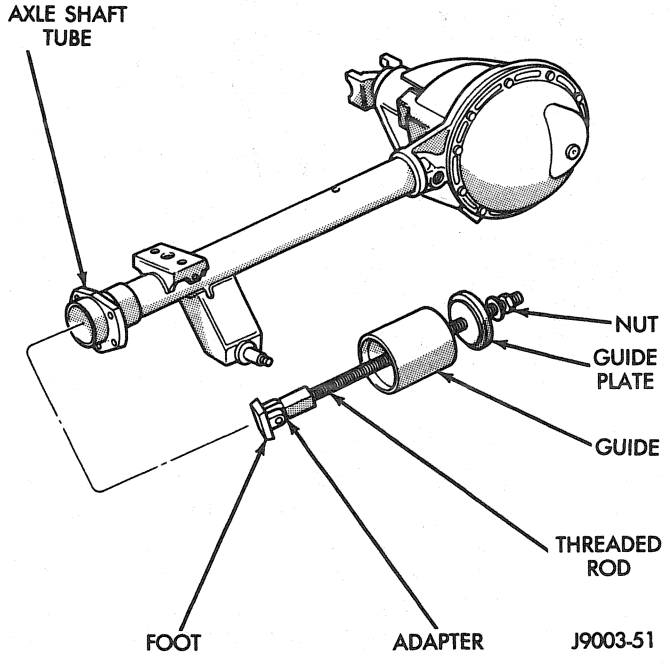


Fig. 12 Axle Shaft Bearing Removal Tool

(5) Inspect the axle shaft tube bore for roughness and burrs. Remove as necessary.

CAUTION: Inspect the housing bore for burrs. Remove them if they exist.

INSTALLATION

Do not install the original axle shaft seal. Always install a new seal.

(1) Wipe the bore in the axle shaft tube clean.

(2) Install axle shaft bearing with Installer 6436 and Handle C–4171. Ensure part number on the bearing must go against the Installer.

(3) Install the new axle shaft seal (Fig. 13) with Installer 6437 and Handle C–4171.

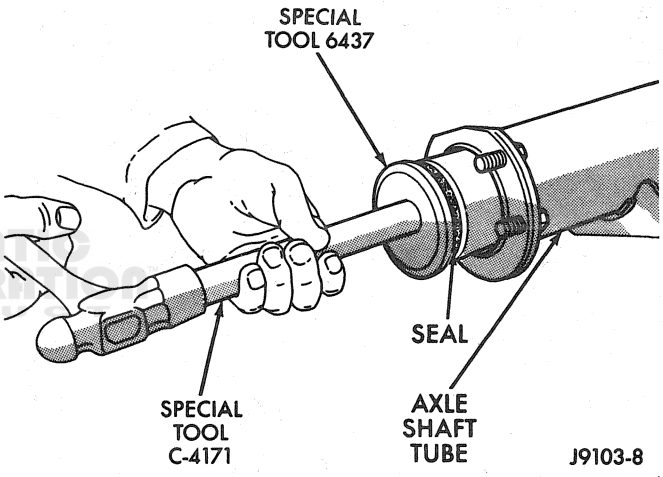


Fig. 13 Axle Shaft Seal Installation

(4) Install the Axle Shaft. Refer to the installation procedure.

DISASSEMBLY AND ASSEMBLY

DIFFERENTIAL REMOVAL

To service the differential the axle shafts must be removed. Refer to the removal procedures in this Group.

(1) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 14).

(2) Remove the differential bearing caps.

(3) Position Spreader W–129B with the tool dowel pins seated in the locating holes (Fig. 15). Install the hold down clamps and tighten the tool turnbuckle finger–tight.

(4) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 15) and zero the indicator.

DISASSEMBLY AND ASSEMBLY (Continued)

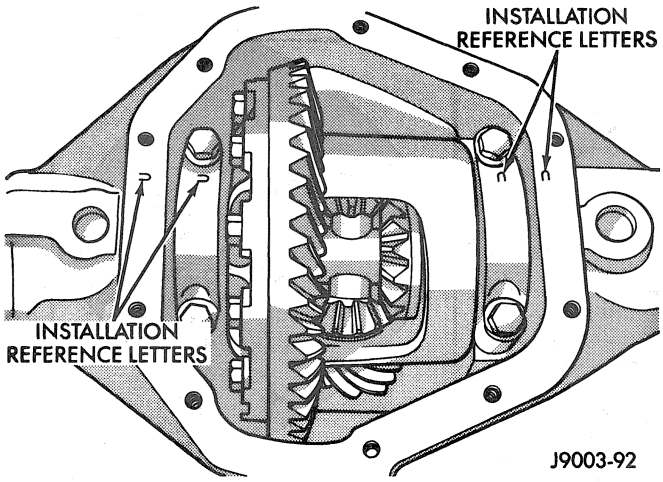


Fig. 14 Bearing Cap Identification

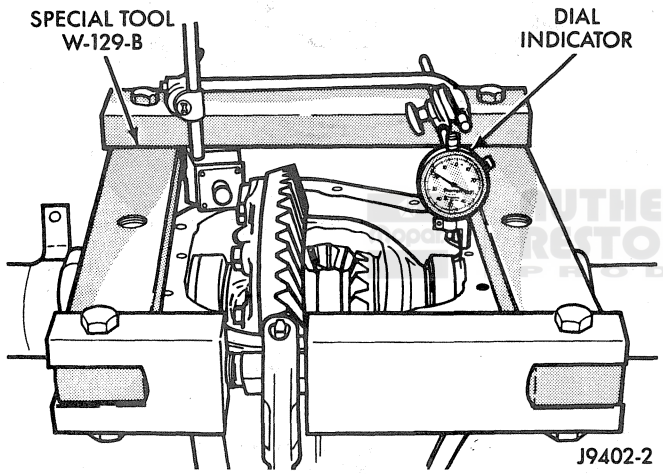


Fig. 15 Spread Differential Housing

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–separated, it could be distorted or damaged.

(5) Separate the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 15).

(6) Remove the dial indicator.

(7) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 16).

(8) Remove the case from housing. Mark or tag bearing cups and outboard shim/spacer (selected thickness) indicating which side they were removed. Remove spreader from housing.

STANDARD DIFFERENTIAL

DISASSEMBLE

(1) Remove pinion gear mate shaft.

(2) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 17).

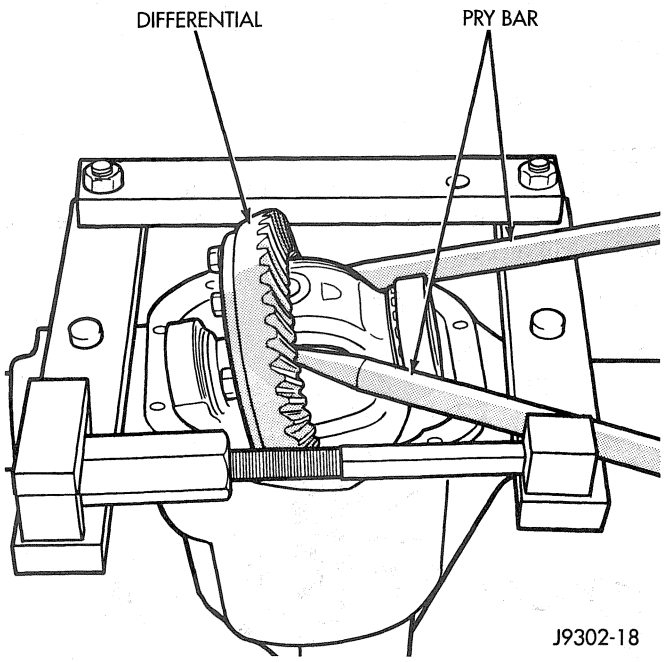


Fig. 16 Differential Removal

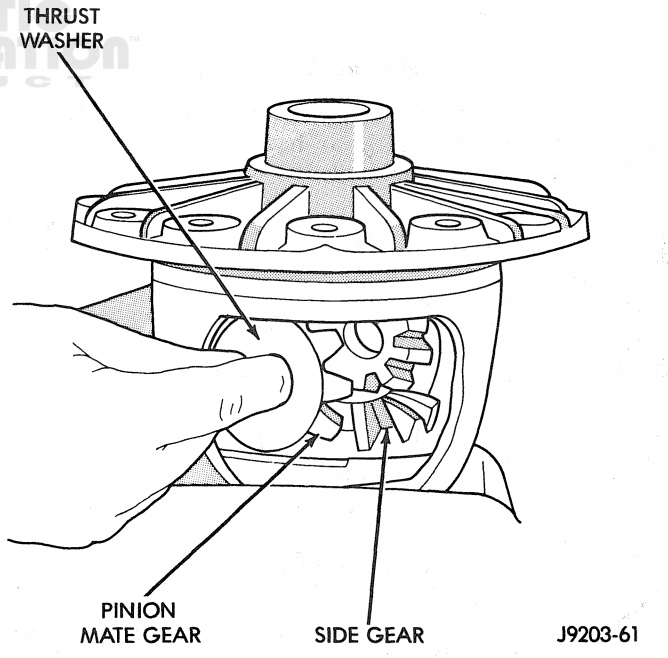


Fig. 17 Pinion Mate Gear Removal

(3) Remove the differential side gears and thrust washers.

DIFFERENTIAL ASSEMBLE

(1) Differential side gears and thrust washers

(2) Pinion gears and thrust washers

(3) Pinion gear mate shaft (align holes in shaft and case)

(4) Lubricate all differential components with hypoid gear lubricant.

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Install differential case in axle housing. Refer to Differential removal and installation procedure.

PINION GEAR

REMOVAL

(1) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 18).

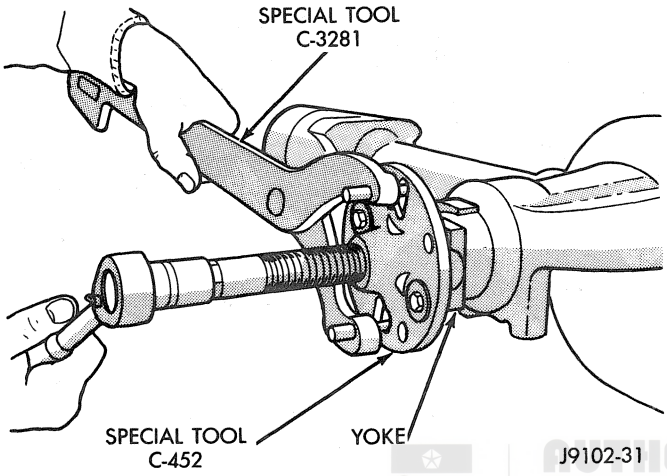


Fig. 18 Pinion Yoke Removal

(2) Remove the pinion gear from housing (Fig. 19). Catch the pinion with your hand to prevent it from falling and being damaged.

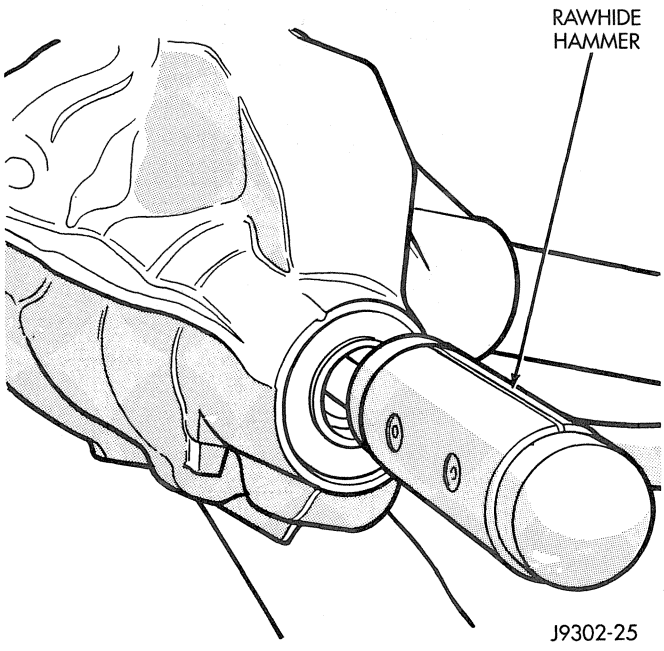


Fig. 19 Remove Pinion Gear

(3) Remove the pinion gear seal with a slide hammer or pry out with bar.

(4) Remove oil slinger, front bearing.

(5) Remove the front pinion bearing cup and seal with Remover D–147 and Handle C–4171 (Fig. 20).

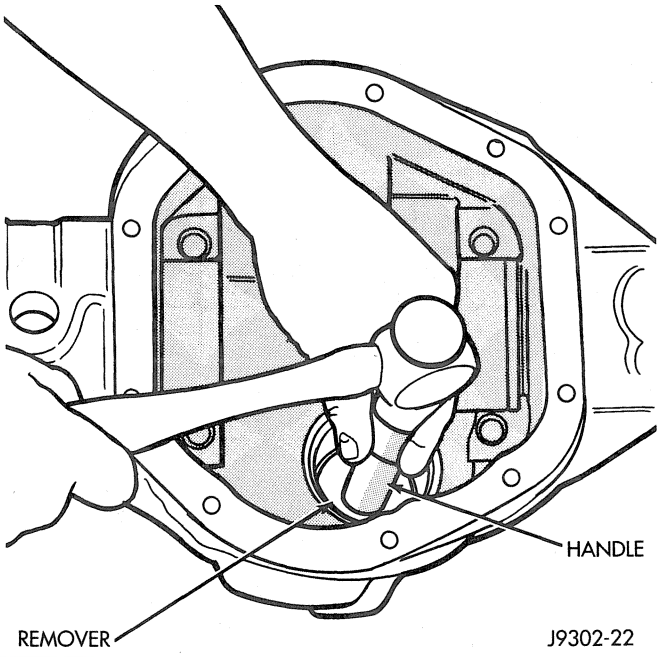


Fig. 20 Front Bearing Cup Removal

(6) Remove the rear bearing cup from housing (Fig. 21). Use Remover D–148 and Handle C–4171.

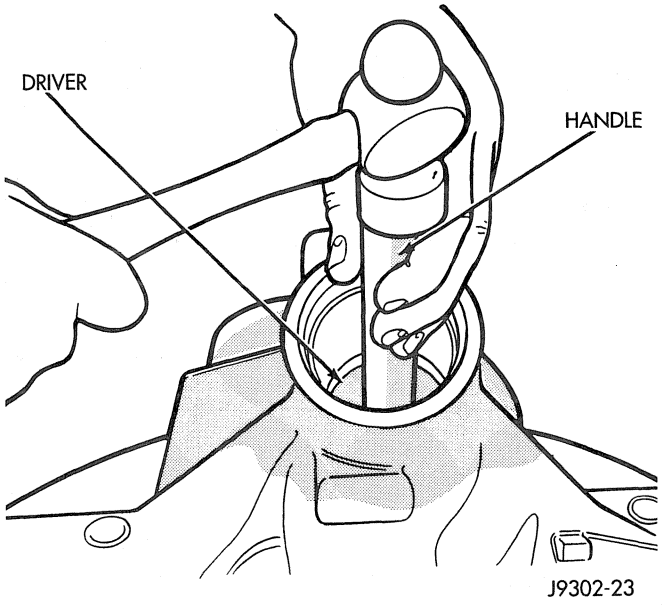


Fig. 21 Rear Bearing Cup Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Remove the collapsible preload spacer (Fig. 22).

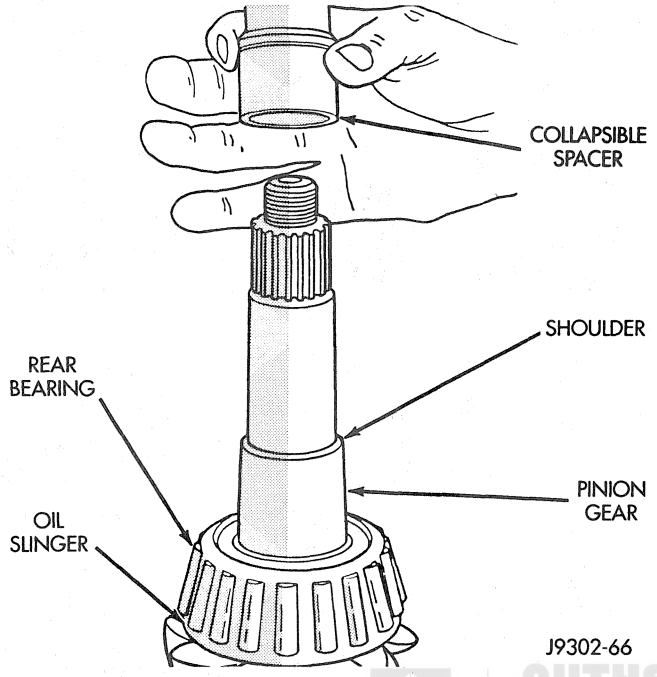


Fig. 22 Collapsible Spacer

(8) Remove the inner bearing from the pinion with Puller C–293PA and Adapter C–293–39 (Fig. 23).

Place adapter rings so they do not damage the bearing cage.

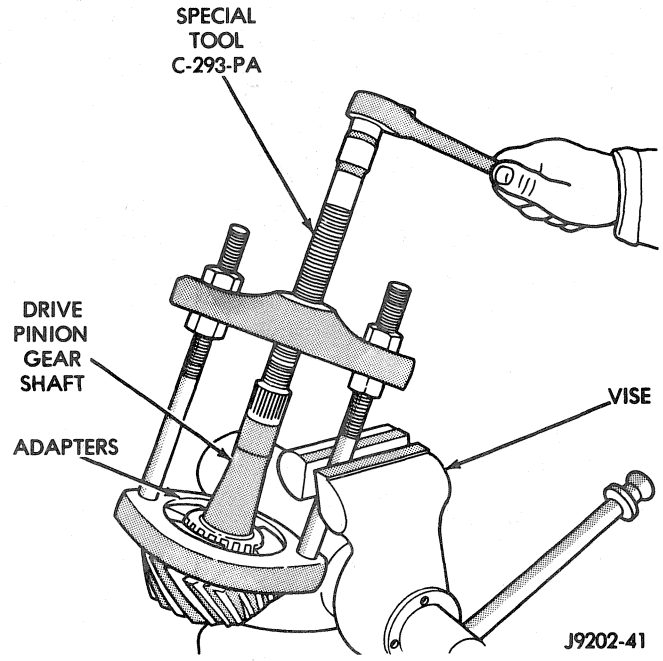


Fig. 23 Inner Bearing Removal

(9) Remove the depth shims from the pinion gear shaft. Record the thickness of the depth shims.

PINION GEAR INSTALLATION

In production depth select shims are placed between the inner pinion bearing cone and pinion gear. For service the select shims are placed under the inner bearing cup.

(1) Place the depth shims (and baffle if equipped) in the pinion gear rear bearing bore. Install the bearing cup with Installer D–146 and Driver Handle C–4171 (Fig. 24). Ensure cup is correctly seated.

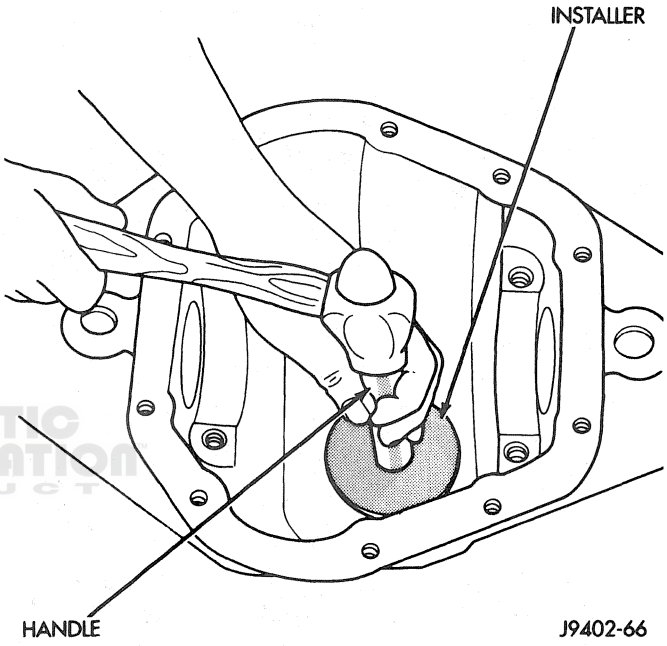


Fig. 24 Pinion Rear Bearing Cup Installation

(2) Install the pinion front bearing cup with Installer D–130 and Handle C–4171 (Fig. 25).

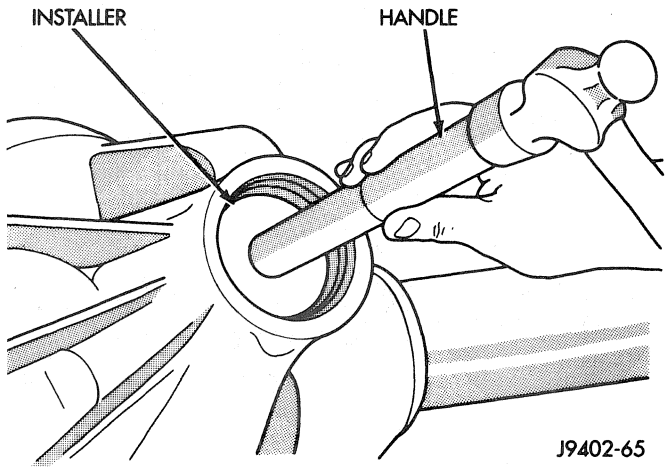


Fig. 25 Pinion Front Bearing Cup Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Install pinion front bearing, oil slinger. Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 26).

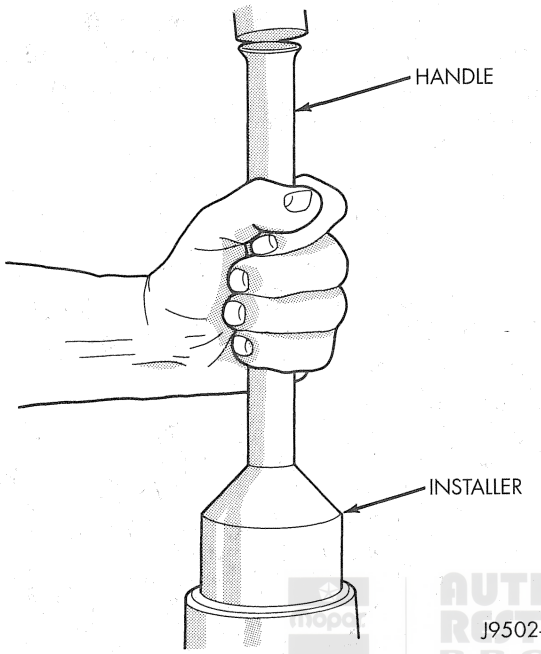


Fig. 26 Pinion Seal Installation

(4) Install the rear bearing (and slinger if used) on the pinion gear with Installer W–262 (Fig. 27).

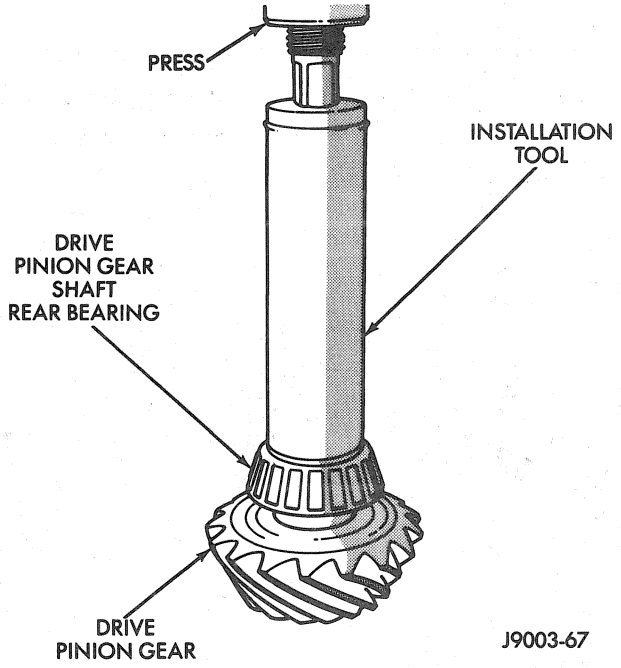


Fig. 27 Shaft Rear Bearing Installation

(5) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 28).

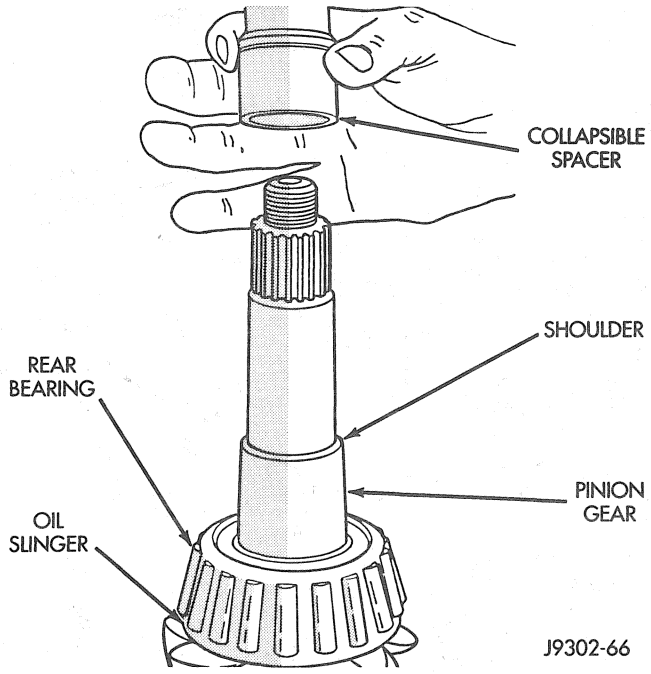


Fig. 28 Collapsible Preload Spacer

(6) Install yoke with Installer W–162D and Wrench C–3281 (Fig. 29).

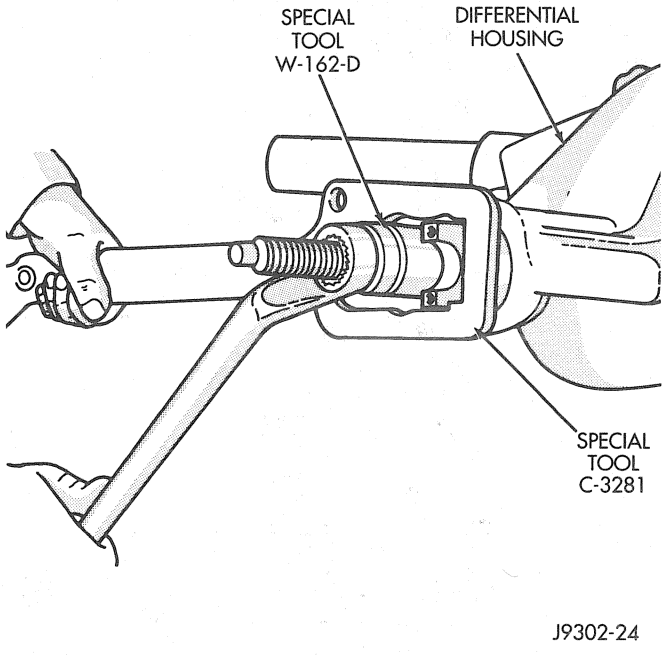


Fig. 29 Pinion Yoke Installation

(7) Install the yoke washer and a new nut on the pinion gear. Tighten the nut to 271 N·m (200 ft. lbs.) minimum. **Do not over–tighten.** Maximum torque is 475 N·m (350 ft. lbs.).

DISASSEMBLY AND ASSEMBLY (Continued)

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing preload torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will have to be repeated.

(8) Use Flange Wrench C–3281 to retain the yoke (Fig. 30). Slowly tighten the nut in small increments until the rotating torque is achieved. Measure the preload torque frequently to avoid over–tightening the nut.

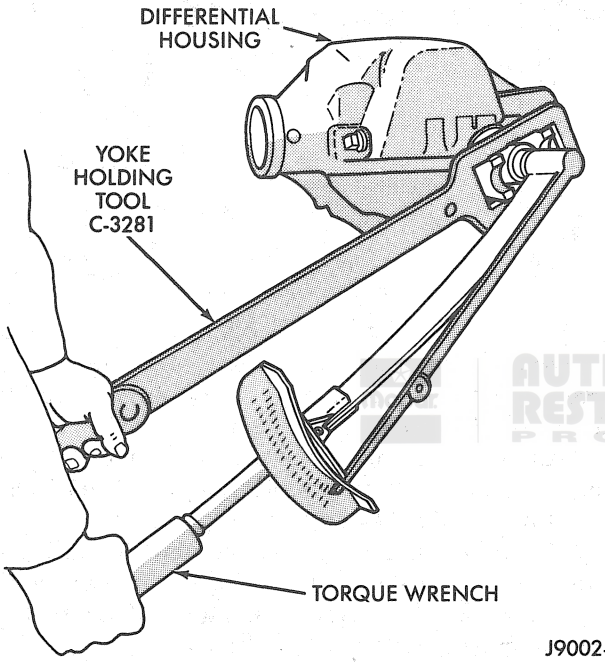


Fig. 30 Tightening Pinion Nut

(9) Check bearing preload torque with an inch pound torque wrench (Fig. 31). The torque necessary to rotate the pinion gear should be:

- Original Bearings — 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

DIFFERENTIAL ASSEMBLY

(1) Install the following components in the differential case.

- Differential side gears and thrust washers
- Pinion gears and thrust washers
- Pinion gear mate shaft (align holes in shaft and case)

(2) Lubricate all differential components with hypoid gear lubricant.

PINION GEAR DEPTH INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig.

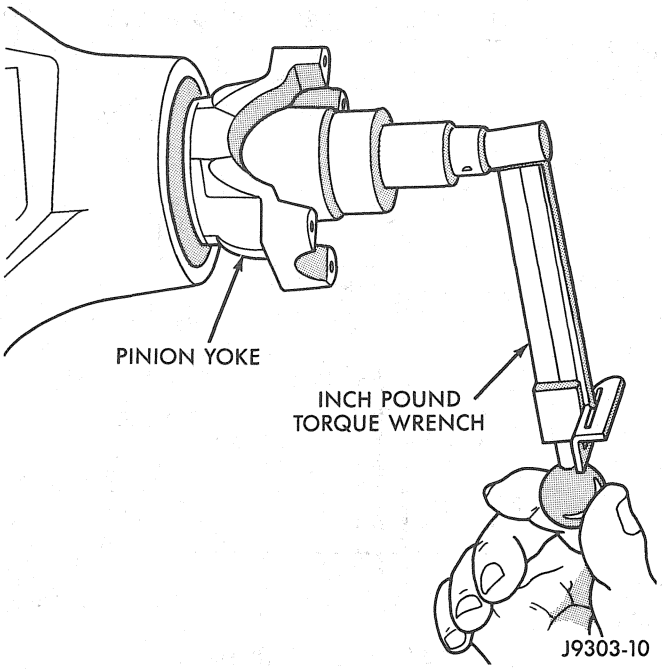


Fig. 31 Check Pinion Gear Torque

32). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 96.8 mm (3.813 inches) for Model 35 axles. The standard depth provides the best teeth contact pattern.

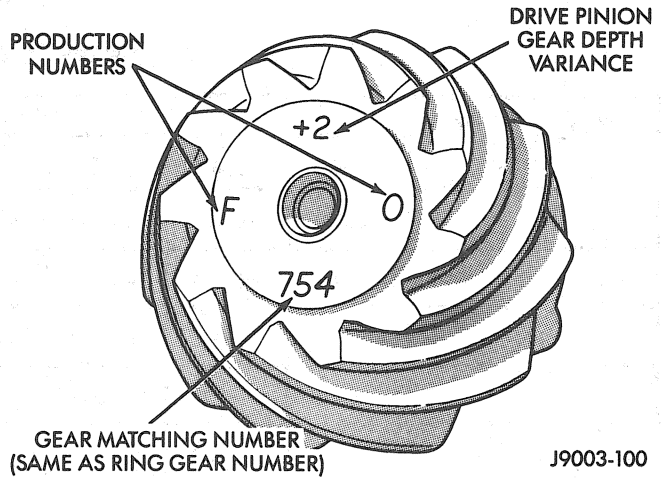


Fig. 32 Pinion Gear ID Numbers

DISASSEMBLY AND ASSEMBLY (Continued)

THE BUTTON END ON THE PINION GEAR HEAD IS NO LONGER A MACHINED–TO–SPECIFICATIONS SURFACE. DO NOT USE THIS SURFACE FOR PINION DEPTH SETUP OR CHECKING (Fig. 33).

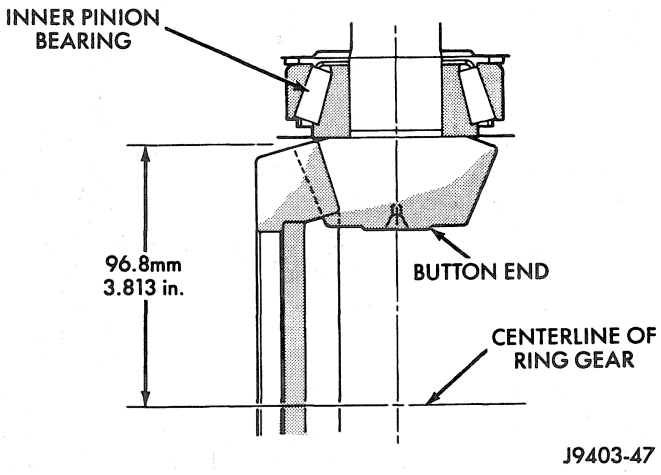


Fig. 33 Pinion Gear Head

Compensation for pinion depth variance is achieved with select shims. In production the shims are placed between the pinion gear and the inner pinion bearing cone. For service the shims are placed under the inner pinion bearing cup (Fig. 34).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance charts.

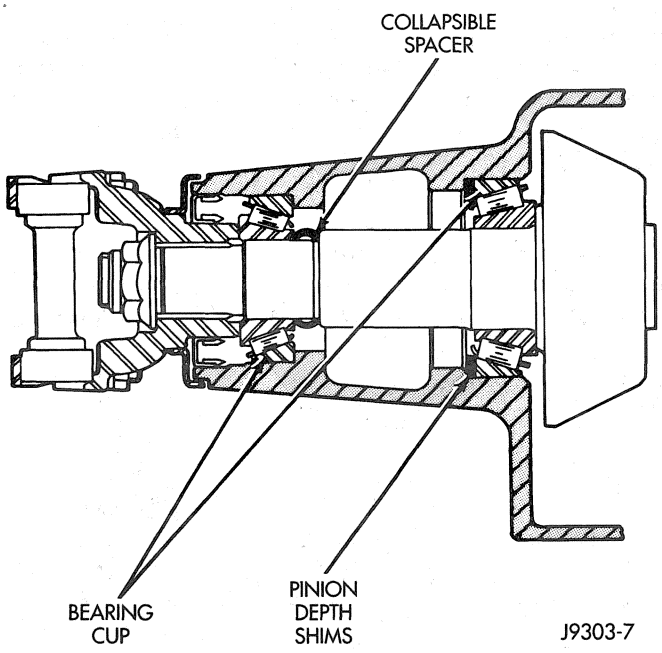


Fig. 34 Shim Locations

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

For example, if old pinion is plus (+) 1 and the new pinion is minus (–) 3, intersecting figure is (+) 0.004 in. (0.10 mm). Add this amount to the original shim. Or if the old pinion is (–) 3 and the new pinion is (–) 2, intersecting figure is (–) 0.001 in. (0.025 mm). Subtract this amount from original shim. Refer to the Pinion Gear Depth Variance Chart.

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

J8902-46

DISASSEMBLY AND ASSEMBLY (Continued)

PINION MEASUREMENT AND ASSEMBLY

PINION GEAR DEPTH MEASUREMENT

Pinion gear depth measurement is necessary when;

- Axle housing or differential case is replaced
- Pinion select shim pack is unknown
- Ring and pinion gears are replaced

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with Pinion Gauge Set 6774, Pinion Block 6735 and Dial Indicator C–3339 (Fig. 35).

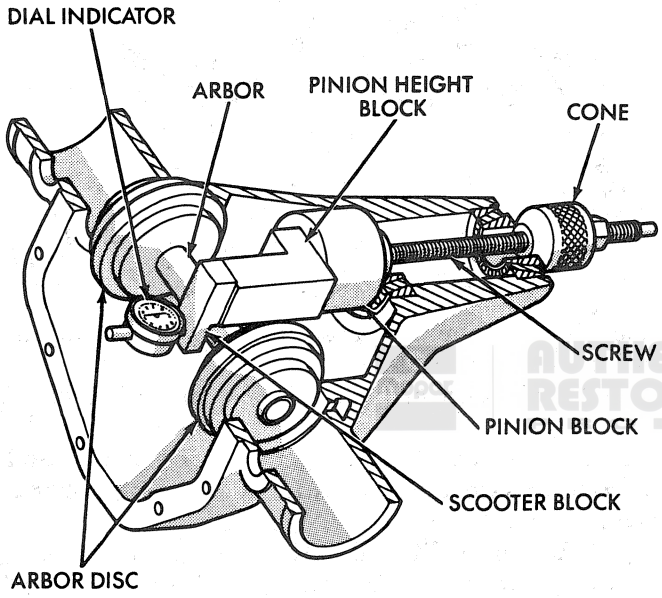


Fig. 35 Pinion Gear Depth Gauge Tools

(1) Assemble Pinion Gauge Set, Pinion Block and pinion bearings. Install assembly into differential pinion gear bore and hand tighten cone (Fig. 36).

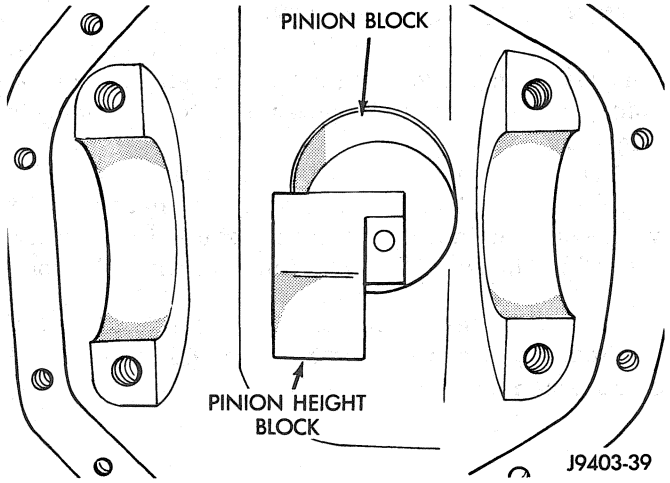


Fig. 36 Pinion Height Block

(2) Place Arbor Disc 6732 on Arbor D–115–3 and position in the bearing cradles (Fig. 37). Install differential bearing caps on Arbor Discs and tighten caps snug only.

Arbor Discs have different steps to fit other axle sizes. Pick correct size step for axle being serviced.

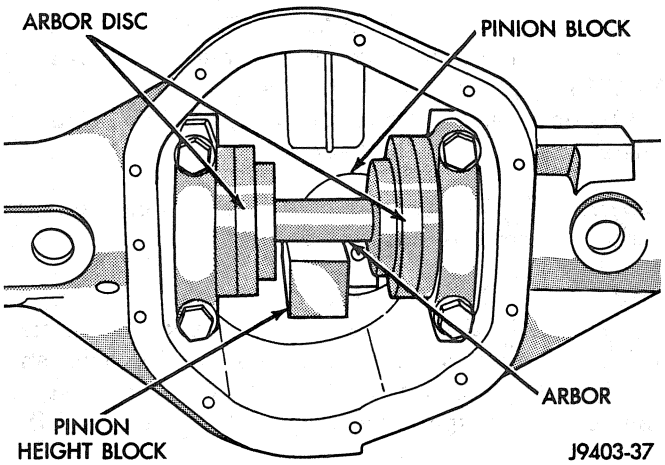


Fig. 37 Gauge Tools In Housing

(3) Firmly place Scooter Block and Dial Indicator on pinion height block tool and zero the dial indicator pointer.

(4) Slide the Scooter Block across the arbor while observing indicator (Fig. 38). Record the longest travel distance, whether inward (–) or outward (+), indicated by the pointer.

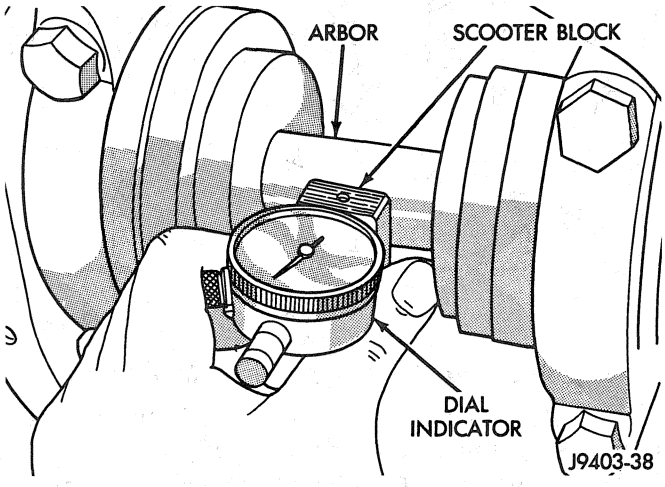


Fig. 38 Pinion Gear Depth Measurement

The plunger travel distance indicated, plus or minus the variance etched in the gear is the required thickness for the depth shims.

(5) Measure the thickness of each depth shim with a micrometer and combine the shims necessary for total required shim pack thickness.**Include oil**

DISASSEMBLY AND ASSEMBLY (Continued)

slinger or baffle thickness with the total shim pack thickness.

(6) Remove the measurement tools from the differential housing.

DIFFERENTIAL MEASUREMENT AND INSTALLATION

DIFFERENTIAL SHIM PACK MEASUREMENT

(1) Install the bearings on the hub with Installer C–3716A and Driver Handle C–4171.

(2) Match each bearing cup with bearing (original). Install the cups on the bearings.

NOTE: It is recommended whenever bearings are removed that they be replaced.

(3) Install the differential case in the housing.

(4) Install the outboard shim/spacer (selected thickness) on each side between bearing cup and housing (Fig. 39). Use 0.142 in. (3.6 mm) as a starting point, shim/spacers are available in various thicknesses.

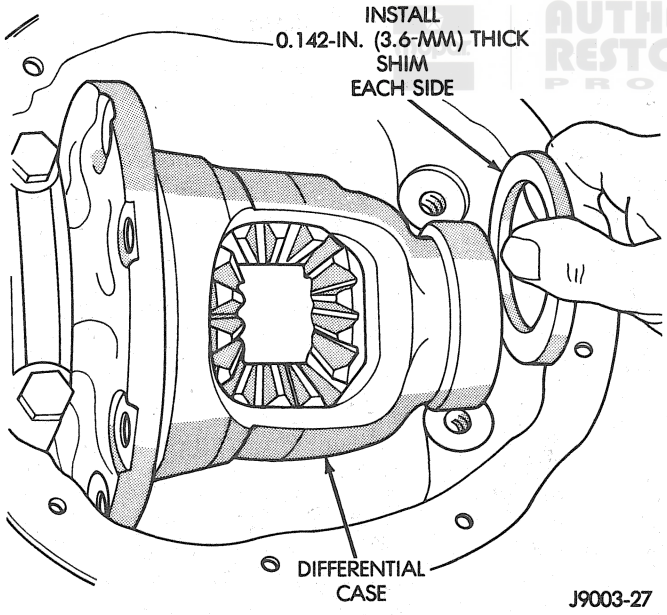


Fig. 39 Differential Bearing Shim Installation

(5) Install the marked bearing caps in their correct positions. Install and snug the bolts.

(6) Attach a dial indicator to the housing. Position the indicator plunger so that it contacts the ring gear mating surface (Fig. 40).

(7) Pry the differential case to one side and zero the dial indicator pointer.

(8) Pry the differential case to the opposite side and record indicator reading. Reading is additional shim thickness needed for zero end play. For example, if reading was 0.008 in. (0.20 mm), an additional

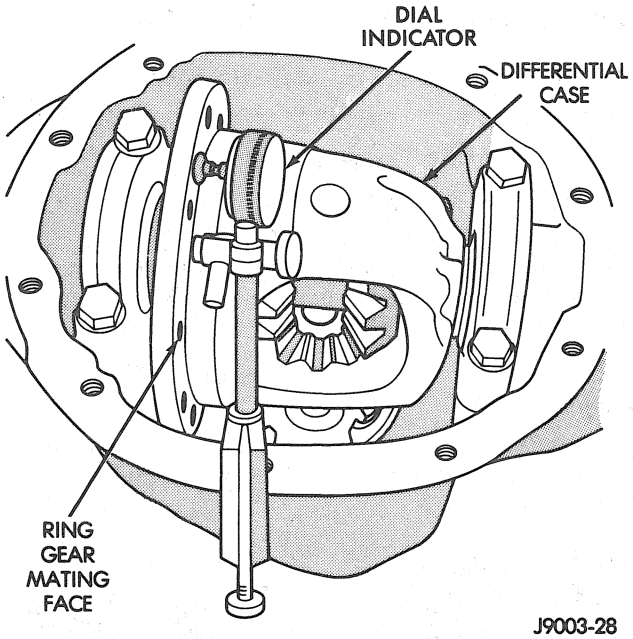


Fig. 40 Shim Measurement

0.004–in. (0.10 mm) thick shim will be needed at each side zero end play.

(9) Install zero end–play shims on each side of case.

The differential bearings must be preloaded to compensate for heat and load during operation.

(10) Add an additional 0.004–in. (0.1 mm) to each outboard shim/spacer for bearing preload.

RING GEAR INSTALLATION

(1) Invert the differential case and start two ring gear bolts. This will provide case–to–ring gear bolt hole alignment.

(2) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 41).

DIFFERENTIAL INSTALLATION

(1) Position Spreader W–129B with the tool dowel pins seated in the locating holes (Fig. 42). Install the hold down clamps and tighten the tool turnbuckle finger–tight.

(2) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 42) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–separated, it could be distorted or damaged.

DISASSEMBLY AND ASSEMBLY (Continued)

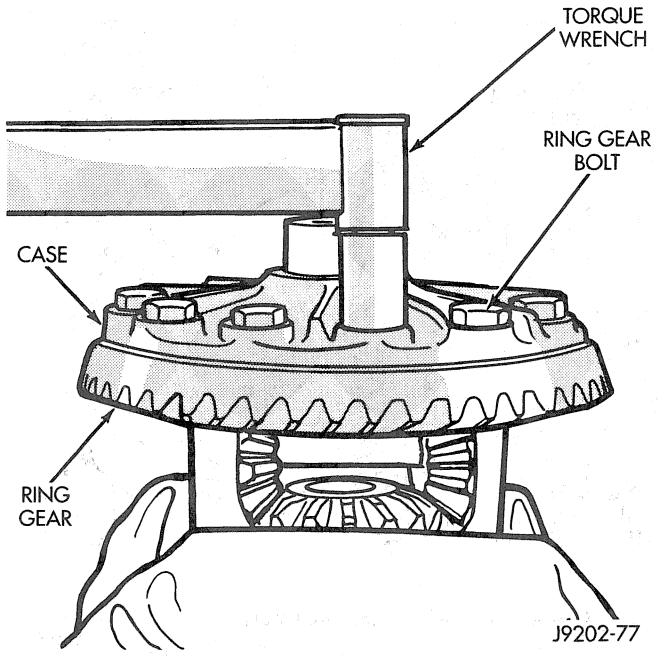


Fig. 41 Ring Gear Bolt Installation

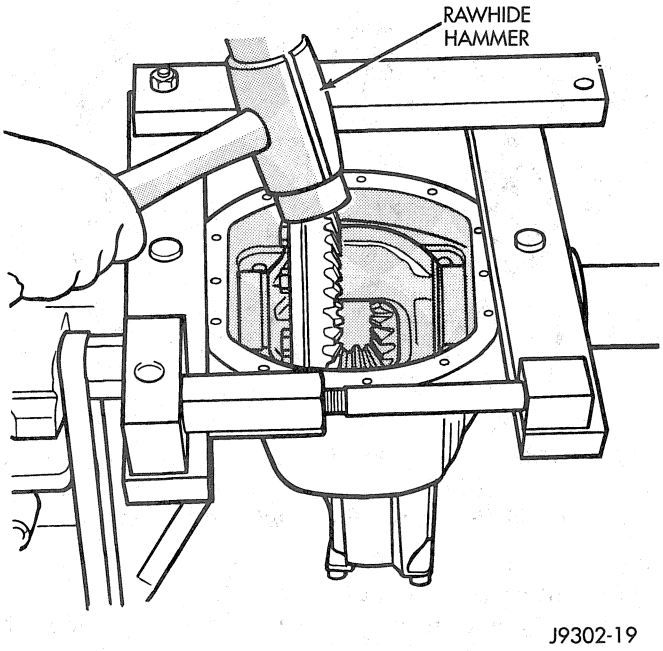


Fig. 43 Differential Installation

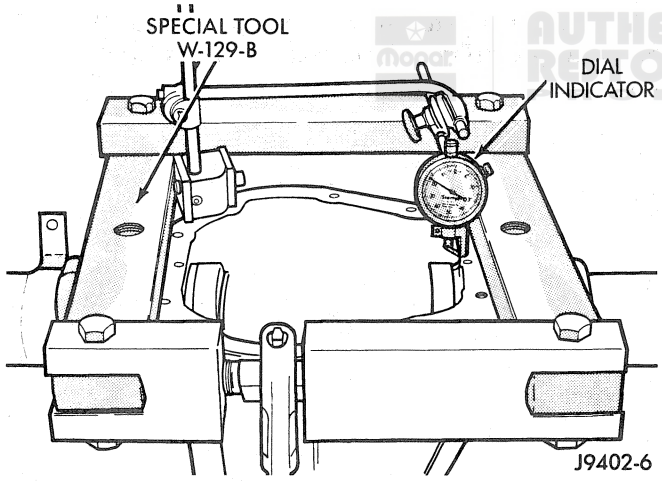


Fig. 42 Spread Differential Housing

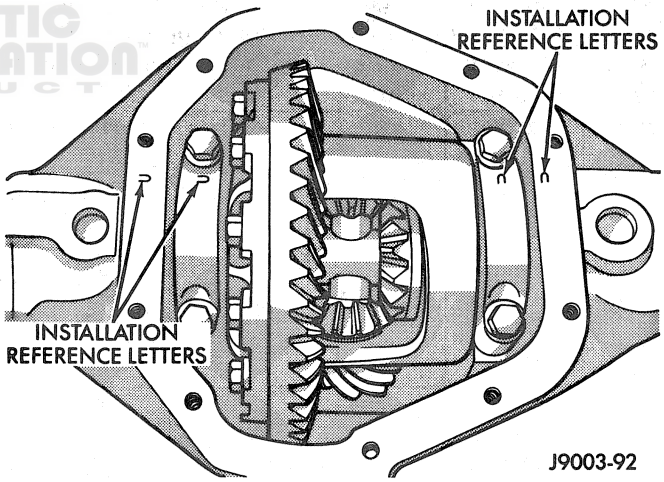


Fig. 44 Differential Bearing Cap Reference Letters

(3) Separate the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 42).

(4) Remove the dial indicator.

(5) Install differential and outboard shim/spacer (selected thickness) in housing.

(6) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 43). Remove the spreader.

(7) Install the bearing caps at their original locations (Fig. 44). Tighten the bearing cap bolts to 77 N·m (57 ft. lbs.) torque.

BACKLASH AND CONTACT PATTERN ANALYSIS

(1) Rotate assembly several revolutions to seat bearings. Measure backlash at three equally spaced locations around the perimeter of the ring gear with a dial indicator (Fig. 45).

The ring gear backlash must be within 0.12 – 0.20 mm (0.005 – 0.008 in.). It cannot vary more than 0.05 mm (0.002 in.) between the points checked.

If backlash must be adjusted, spacers are available in various thicknesses. Adjust the backlash accordingly (Fig. 46). **Do not increase the total shim pack thickness, excessive bearing preload and damage will occur.**

The ring gear teeth contact patterns will show if the pinion gear depth shim(s) have the correct thickness. It will also show if the ring gear backlash has been adjusted correctly. The backlash must be main-

DISASSEMBLY AND ASSEMBLY (Continued)

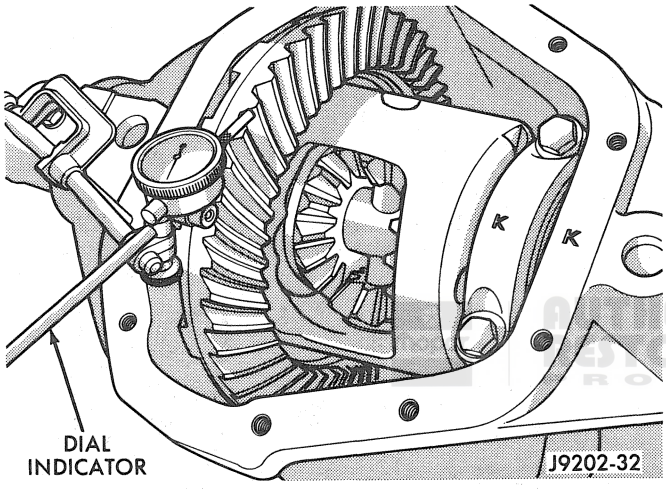


Fig. 45 Ring Gear Backlash Measurement

tained within the specified limits until the correct tooth contact patterns are obtained.

(2) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(3) Rotate the ring gear one complete revolution in both directions while a load is being applied. Insert a pry bar between the differential housing and the case flange. This will produce distinct contact patterns on both the drive side and coast side of the ring gear teeth.

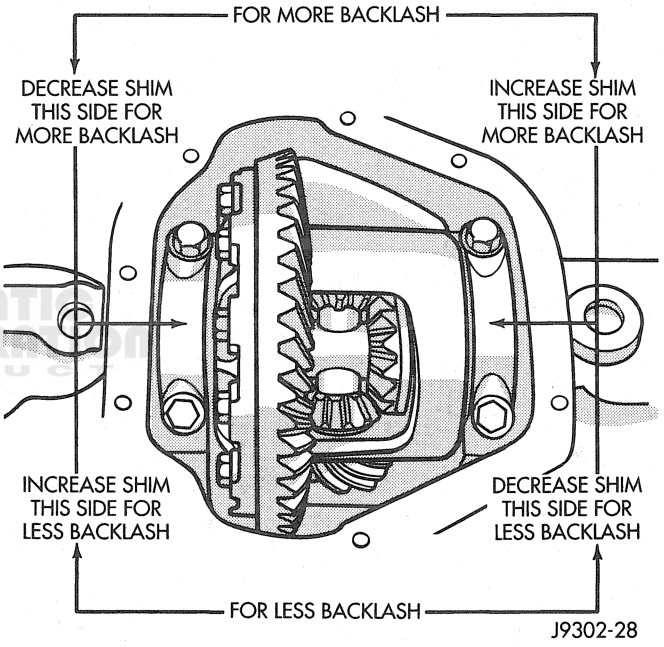
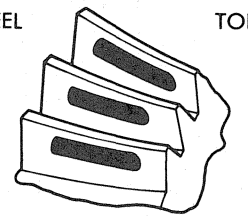
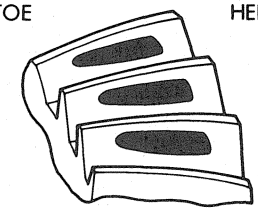
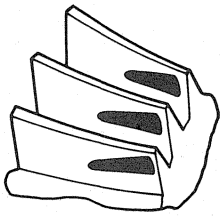
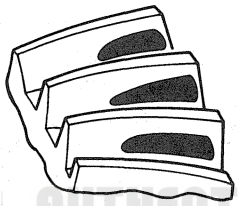
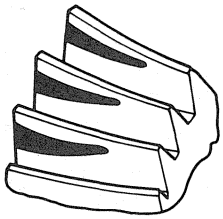
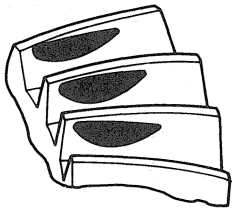
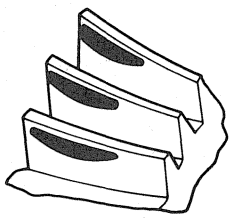
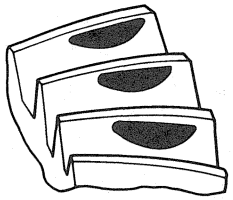
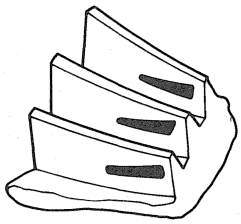
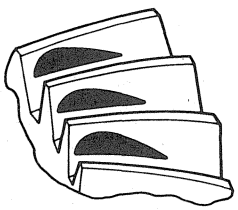


Fig. 46 Backlash Shim Adjustment

(4) Note patterns in compound. Refer to (Fig. 47) for interpretation of contact patterns and adjust accordingly.

DISASSEMBLY AND ASSEMBLY (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 47 Gear Tooth Contact Patterns

DISASSEMBLY AND ASSEMBLY (Continued)

FINAL ASSEMBLY

(1) Install the axle shafts. Refer to Axle Shaft Installation within this group.

(2) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar Silicone Rubber Sealant on the housing cover (Fig. 48). Allow the sealant to cure for a few minutes.

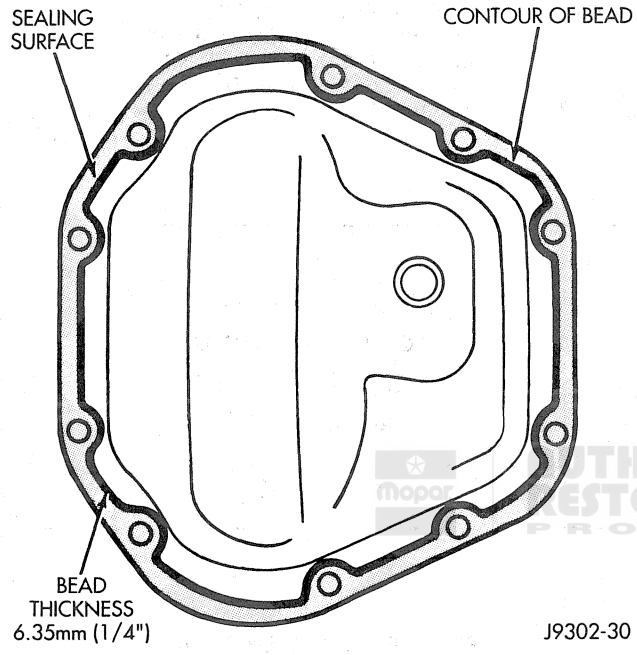


Fig. 48 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant.

(3) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(4) Refill the differential housing with the specified quantity of Mopar Hypoid Gear Lubricant.

(5) Install the fill hole plug and tighten to 34 N·m (25 ft. lbs.) torque. Axles equipped with rubber fill plug install plug into cover.

CLEANING AND INSPECTION

AXLE COMPONENTS

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing.

Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces
- Bearing cups must not be distorted or cracked
- Machined surfaces should be smooth and without any raised edges
- Raised metal on shoulders of cup bores should be removed with a hand stone
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims if necessary.

SPECIFICATIONS

MODEL 35 AXLE

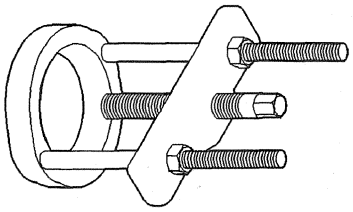
Axle Type	Semi–Floating Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lubricant Trailer Tow	Synthetic 75W–140
Lube Capacity	1.66 L (3.50 pts.)
Axle Ratio	3.07, 3.55, 3.73, 4.10
Differential	
Bearing Preload	0.1 mm (0.004 in.)
Side Gear Clearance	0–0.15 mm (0–0.006 in.)
Ring Gear	
Diameter	19.2 cm (7.562 in.)
Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	96.8 mm (3.813 in.)
Pinion Bearing Preload	
Original Bearing	1–2N·m (10–20 in. lbs.)
New Bearing	1.5–4N·m (15–35 in. lbs.)

MODEL 35 AXLE

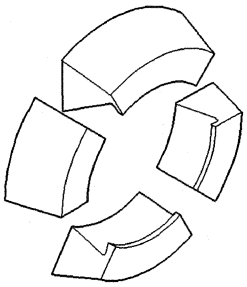
DESCRIPTION	TORQUE
Fill Hole Plug	34 N·m (25 ft. lbs.)
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	77 N·m (57 ft. lbs.)
Pinion Nut	292–427 N·m (215–315 ft. lbs.)
Ring Gear Bolt	95–122 N·m (70–90 ft. lbs.)
RWAL/ABS Sensor Bolt	24 N·m (18. ft. lbs.)

SPECIAL TOOLS

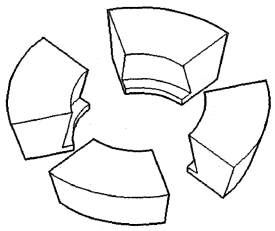
FRONT AXLE—MODEL 35



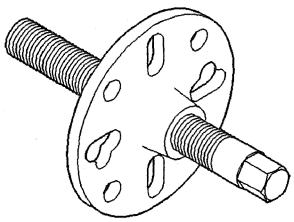
Puller—C-293-PA



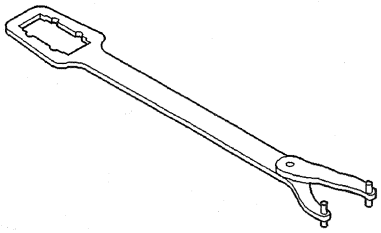
Adapter—C-293-18



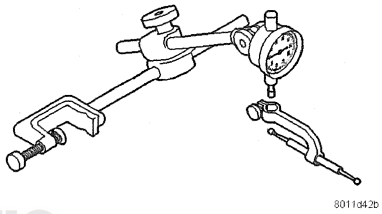
Adapter—C-293-39



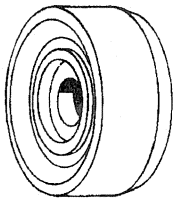
Puller—C-452



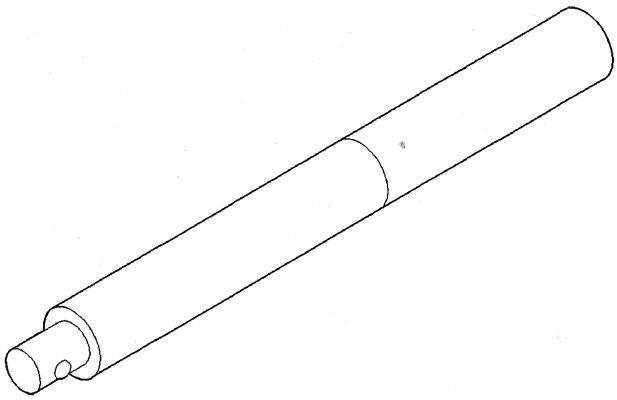
Wrench—C-3281



Dial Indicator—C-3339



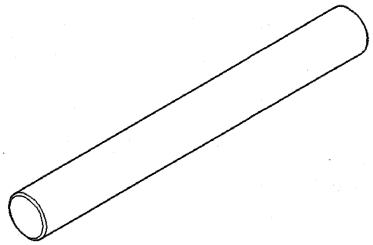
Driver—C-3716-A



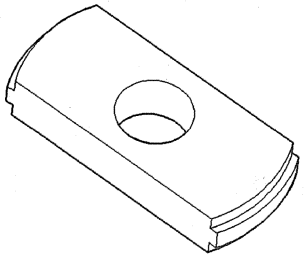
Handle—C-4171

Mopar AUTHENTIC RESTORATION PRODUCT

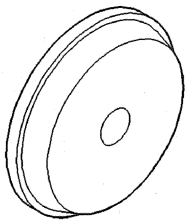
SPECIAL TOOLS (Continued)



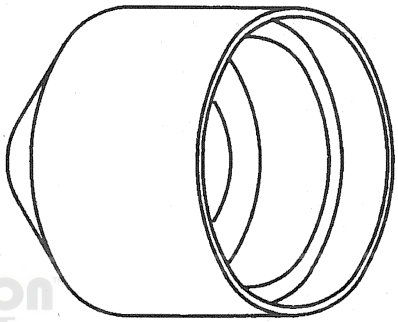
Arbor, Pinion—W-115-3



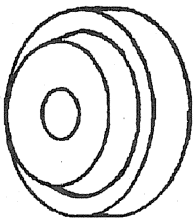
Remover—D-148



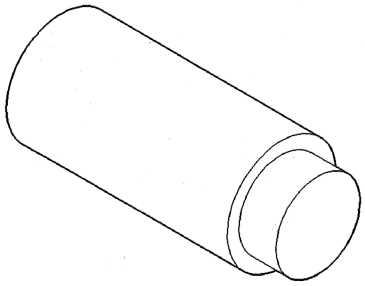
Installer—D-130



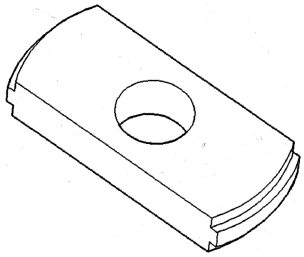
Installer—D163



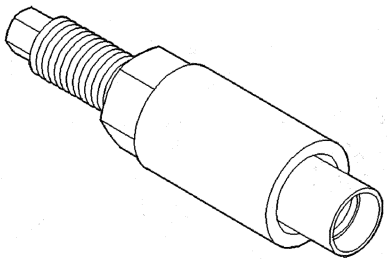
Installer—D-146



Plug—SP-3289



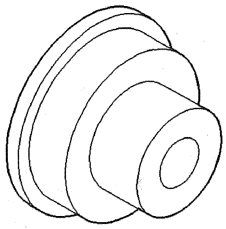
Remover—D-147



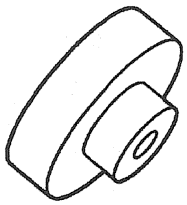
Installer—W-162-D

AUTHENTIC RESTORATION PRODUCT

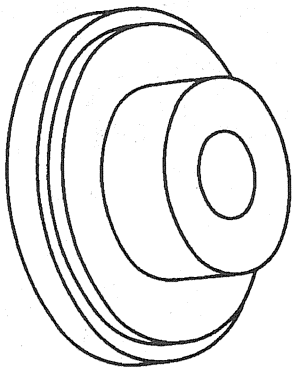
SPECIAL TOOLS (Continued)



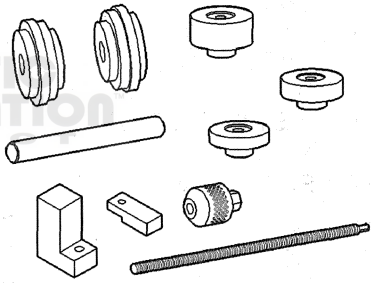
Installer—6436



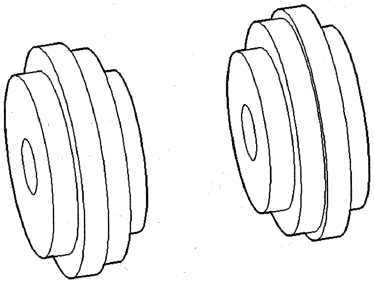
Gauge Block—6735



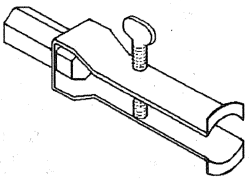
Installer—6437



Tool Set, Pinion Depth—6774



Disc, Axle Arbor—6732



Puller—7794-A

Mopar AUTHENTIC RESTORATION PRODUCT

8 1/4 AXLE

INDEX

	page
GENERAL INFORMATION	
INFORMATION	68
LUBRICANT SPECIFICATIONS	69
OPERATION	68
DIAGNOSIS AND TESTING	
NOISE DIAGNOSIS	69
SERVICE PROCEDURES	
LUBRICANT CHANGE	70
REMOVAL AND INSTALLATION	
AXLE SHAFT, SEAL AND BEARING SERVICE	71
DIFFERENTIAL SERVICE	74
DRIVE AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES	71
PINION GEAR SHAFT REMOVAL	75
PINION SEAL REPLACEMENT	73
DISASSEMBLY AND ASSEMBLY	
DIFFERENTIAL CASE DISASSEMBLY	76
DIFFERENTIAL OVERHAUL—TRAC-LOC	78
RING GEAR	77
CLEANING AND INSPECTION	
DIFFERENTIAL	82
TRAC-LOC DIFFERENTIAL	82
ADJUSTMENTS	
DIFFERENTIAL BEARING PRELOAD AND RING GEAR BACKLASH ADJUSTMENT	85
PINION DEPTH MEASUREMENT AND ADJUSTMENT	82
RING GEAR TEETH CONTACT PATTERN ANALYSIS	87
SIDE GEAR CLEARANCE MEASUREMENT AND ADJUSTMENT	86
SPECIFICATIONS	
8 1/4 AXLE	89
8 1/4 AXLE	89
SPECIAL TOOLS	
FRONT AXLE—MODEL 30	89

AUTHENTIC RESTORATION PRODUCT

GENERAL INFORMATION

INFORMATION

The housing (Fig. 1) consists of an iron differential housing with axle shaft tubes extending from either side. The tubes are welded to the housing to form a one–piece axle.

The integral type housing, hypoid gear design has the center line of the pinion set below the center line of the ring gear.

The axle has a vent used to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axle shafts are retained by C–clips in the differential side gears.

The removable cover provides a means for servicing the differential without removing the axle.

The axles have the gear ratio listed on a tag. The tag is attached to the housing cover.

The differential case is a one–piece design. The differential pinion mate shaft is retained with a threaded roll pin. Preload and back lash is adjusted by the use of threaded adjusters. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

Pinion gear depth measurement with gauge set 6575 is used when;

- The axle/differential housing is being replaced
- The original pinion depth shim pack is lost or misplaced
- Replacing the differential case
- Replacing pinion and differential bearings

OPERATION

In a conventional differential, the torque applied to the ring gear is transmitted to the axle shafts through the differential gears. During normal operation, the torque transmitted to each wheel is equal at all times. However, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

In the Trac–Lok differential, part of the ring gear torque is transmitted through clutch packs. The clutch packs contain multiple disc. The clutch will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material which is smooth.

In operation, the Trac–Lok clutches are engaged by two concurrent forces. The first being preload force exerted through Belleville spring washers. The second is from separating forces generated by the side gears (Fig. 2).

The Trac–Lok design provides the normal differential action needed for turning corners. It also provides for the transmission of equal torque to both wheels when driving straight ahead. When one wheel loses traction, the clutch packs transfer torque to the wheel having the most traction. Trac–lok differentials resist wheel spin on bumpy roads. It also provides more pulling power when one wheel loses traction.

GENERAL INFORMATION (Continued)

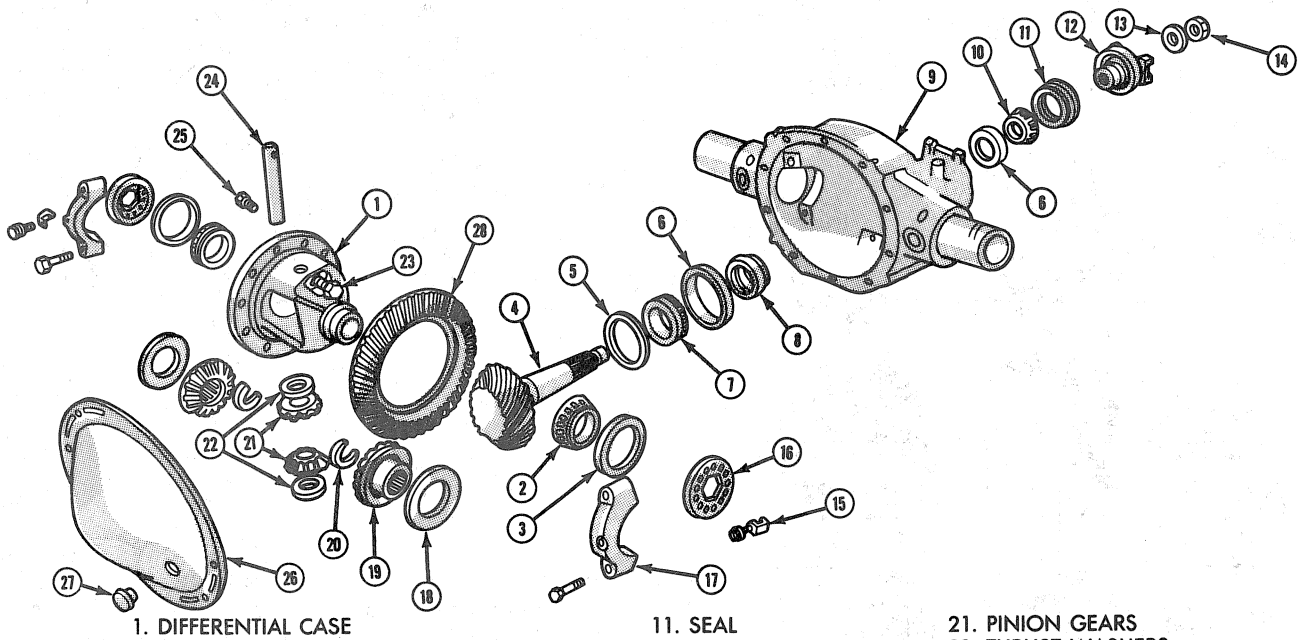


Fig. 1 Axle Differential—8 1/4

Pulling power is continuous until both wheels lose traction. If both wheels slip due to unequal traction, Trac–Lok operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin. This occurs after the Trac–Lok has transferred as much torque as possible to the non–spinning wheel.

LUBRICANT SPECIFICATIONS

Multi–purpose, hypoid gear lubricant should be used in the 8 1/4 axle. The lubricant should have MIL–L–2105C and API GL 5 quality specifications. Mopar Hypoid Gear Lubricant conforms to both of these specifications.

- The factory installed lubricant for the 8 1/4 inch rear axle is SAE 80W90 gear lubricant.
- The factory installed lubricant quantity is 67±2 fluid oz.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

DIAGNOSIS AND TESTING

NOISE DIAGNOSIS

If chatter occurs when turning corners, the most probable cause is incorrect or contaminated lubricant. Before removing the Trac–Lok unit for repair, drain, flush and refill the axle with the specified lubricant. Refer to Lubricant change in this Group.

A container of Trac–Lok Lubricant (friction modifier) should be added after.

Vehicles with a limited slip differential should be road tested by making 10 to 12 slow figure–eight turns. This maneuver will pump the lubricant through the clutch discs.

Refer to Group 0, Lubrication and Maintenance for additional information.

DIFFERENTIAL TEST

WARNING: WHEN SERVICING VEHICLES WITH A LIMITED SLIP DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A LIMITED SLIP AXLE CAN EXERT ENOUGH FORCE (IF ONE WHEEL IS IN CONTACT WITH THE SURFACE) TO CAUSE THE VEHICLE TO MOVE.

DIAGNOSIS AND TESTING (Continued)

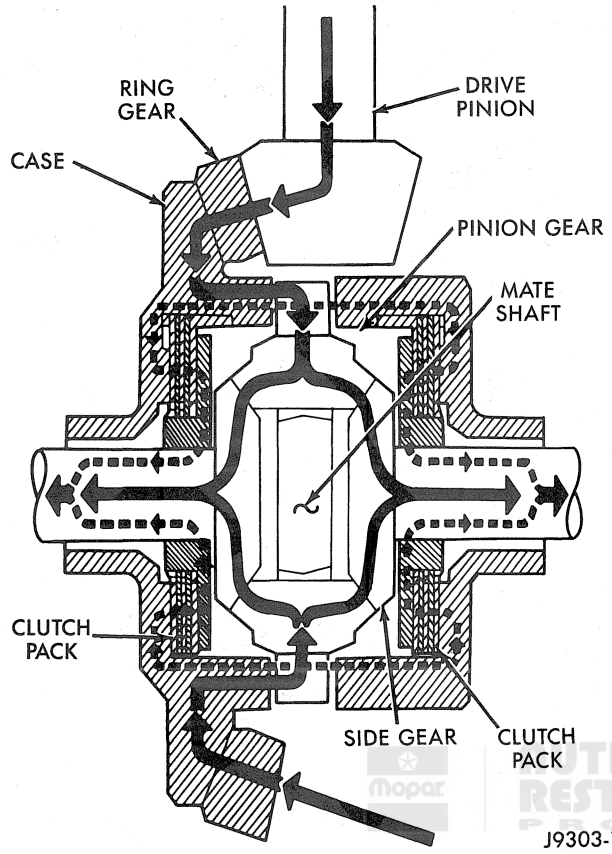


Fig. 2 Limited Slip Differential Operation—Both Wheels Driving

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Engine off, transmission in neutral, and parking brake off.

(2) Place blocks in front and rear of both front wheels.

(3) Jack up one rear wheel until it is completely off the ground.

(4) Remove wheel and bolt special tool to studs.

(5) Use torque wrench on Special Tool 6790 to rotate wheel and read rotating torque (Fig. 3).

(6) If rotating torque is less than 22 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be service.

SERVICE PROCEDURES

LUBRICANT CHANGE

The gear lubricant will drain quicker if the vehicle has been recently driven.

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

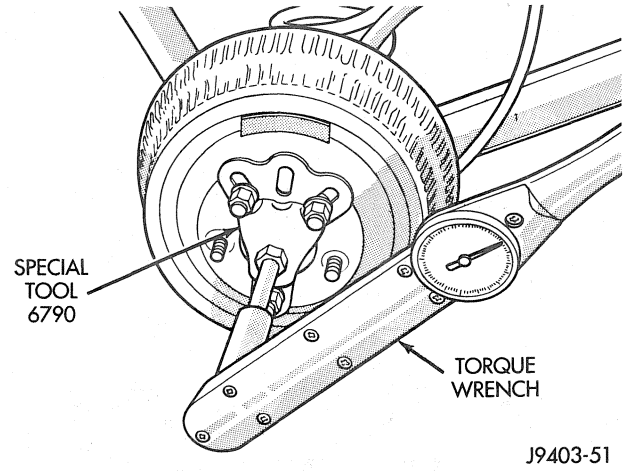


Fig. 3 Trac–Loc Test

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**

(5) Remove the sealant from the housing and cover surfaces. Use solvent to clean the mating surfaces.

(6) Apply a bead of Mopar Silicone Rubber Sealant to the housing cover (Fig. 4). Allow the sealant to cure for a few minutes.

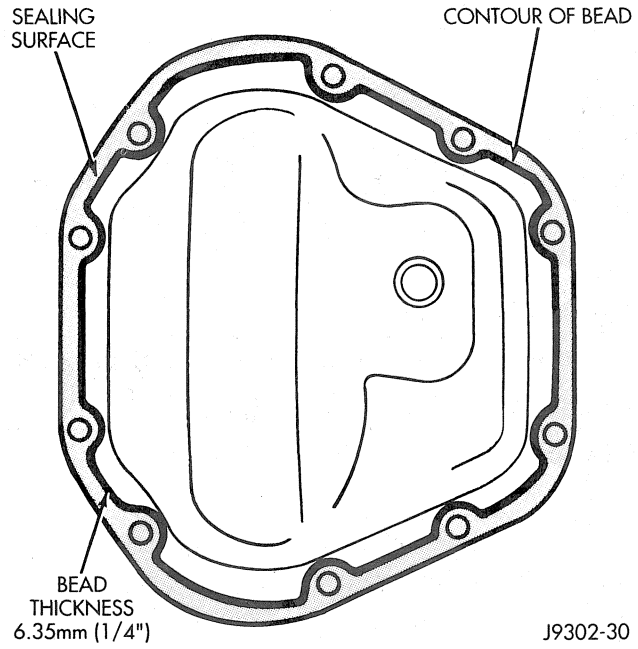


Fig. 4 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant. If not installed the sealant must be removed and another bead applied.

(7) Install the cover and any identification tag. Tighten the cover bolts in a criss–cross pattern to 47 N·m (35 ft. lbs.) torque.

SERVICE PROCEDURES (Continued)

(8) Refill the differential with Mopar Hypoid Gear Lubricant 13 mm (1/2 in.) below the fill plug hole. With Trac–Lok differentials, add a container of Mopar Hypoid Gear Lubricant Additive.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(9) Install the fill hole plug and lower the vehicle.

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES

REMOVAL

(1) Raise the vehicle. Position support stands under the frame rails slightly in front the springs.
(2) Remove the rear wheels.
(3) Mark the drive shaft yoke and axle pinion yoke for alignment reference. Disconnect the drive shaft from the axle.
(4) Disconnect the axle vent hose.
(5) Disconnect the parking brake cables at the equalizer or backing plate.
(6) Disconnect the shock absorbers from the axle brackets.
(7) Disconnect the brake hose at the axle junction block. **Do not disconnect the wheel cylinder tubing fittings.**
(8) If equipped, disconnect ABS wiring connections at the axle.
(9) Support the axle with a hydraulic jack under the differential.
(10) Remove the spring U–bolts from the plate brackets.
(11) Lower the jack enough to remove the axle.

INSTALLATION

CAUTION: Suspension components with rubber bushings should be tightened with the vehicle at normal height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur. Rubber bushings must never be lubricated.

(1) Support the axle on a hydraulic jack under the differential. Position the axle under the vehicle.
(2) Raise the axle and align the spring center bolts with the locating holes in the axle pads and plate brackets.
(3) Install the spring U–bolts through the plate brackets and tighten to 70 N·m (52 ft. lbs.) torque.
(4) Install ABS wiring connections (if equipped) at the axle.
(5) Connect the brake hose at the axle junction block.
(6) Install the shock absorbers to the axle brackets and tighten to 62 N·m (46 ft. lbs.) torque.
(7) Connect the parking brake cables at the equalizer or backing plate.
(8) Connect the vent hose to the tube fitting.
(9) Align the reference marks and connect the drive shaft to the axle yoke. Tighten the U–joint clamp bolts to 19 N·m (14 ft. lbs.) torque.
(10) Check differential lubricant and add if necessary.
(11) Install the wheel and tire.
(12) Bleed the brakes.
(13) Remove the supports and lower the vehicle.

AXLE SHAFT, SEAL AND BEARING SERVICE

CAUTION: When rear axle service is necessary, both rear wheels must be raised off the surface so that they are free to rotate. Be cautious when the tires are being rotated by the engine or by other means.

AXLE SHAFT REMOVAL

(1) Raise and support the vehicle.
(2) Remove the wheel and tire.
(3) Remove the brake drum.
(4) Clean all the foreign material from housing cover area.
(5) Loosen the housing cover bolts and drain the lubricant from the housing. Remove the housing cover.
(6) Rotate the differential case so that the pinion mate gear shaft lock screw is accessible. Remove the lock screw and the pinion mate gear shaft from the case (Fig. 5).

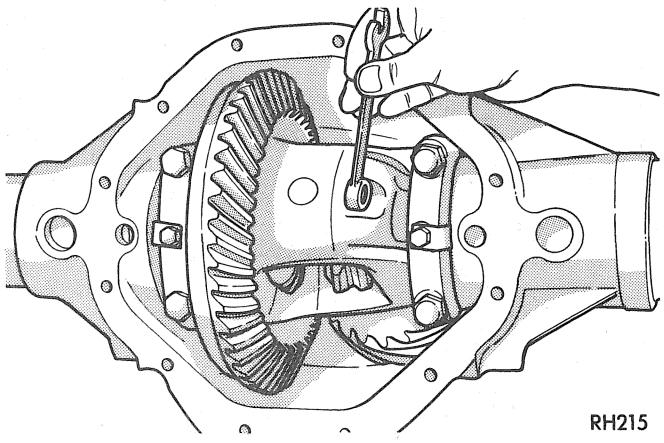


Fig. 5 Pinion Mate Shaft Lock Screw

REMOVAL AND INSTALLATION (Continued)

(7) Push the axle shaft in toward the center of the vehicle. Remove the axle shaft C–clip lock from the axle shaft (Fig. 6).

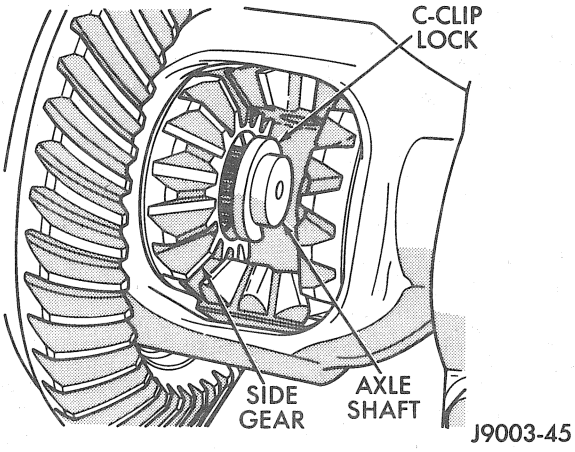


Fig. 6 Axle Shaft C-Clip Lock

(8) Remove the axle shaft. Use care to prevent damage to the axle shaft bearing, which will remain in the axle shaft tube.

(9) Inspect the axle shaft bearing contact surface area for indications of brinelling, galling, and pitting.

If any of these conditions exist, the axle shaft and bearing should be replaced. Normal bearing contact on the shaft will be a dull gray and it could appear to be lightly dented.

(10) If any of these conditions exist, the axle shaft and bearing must be replaced.

The normal appearance (from roller bearing contact) will be a dull gray surface area that could appear slightly dented.

AXLE SHAFT SEAL AND BEARING REMOVAL

(1) Remove the axle shaft seal with a small pry bar.

(2) Remove the bearing if it appears damaged or the axle shaft shows any of the conditions described above.

(3) Remove the bearing with Remover C–4167 (Fig. 7). Attach Slide Hammer 7420 and Adapter 7420–8 to the end of the removal tool.

(4) Inspect the axle shaft seal surface and tube bore for roughness and burrs. **Polish each axle shaft with No. 600 crocus cloth. This can remove slight surface damage. Do not reduce the diameter of the axle shaft seal contact surface. When polishing, the crocus cloth should be moved around the circumference of the shaft (not in–line with the shaft).**

BEARING AND SEAL INSTALLATION

Do not install the original axle shaft seal. Always install a new seal.

(1) Wipe the bore in the axle shaft tube clean.

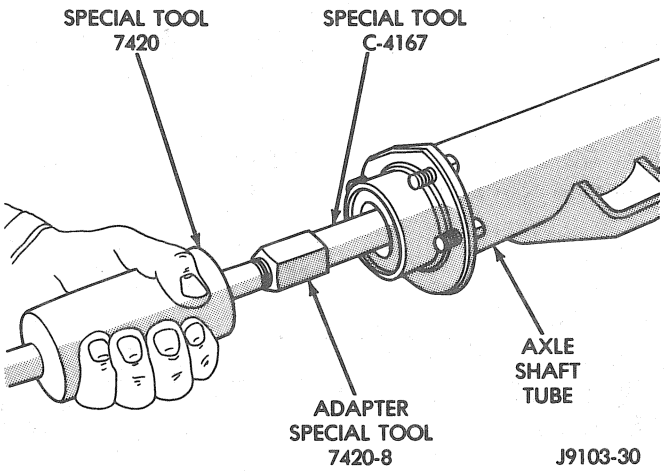


Fig. 7 Axle Shaft Bearing Removal

(2) If the original bearing is not reusable, install a new bearing. Place the axle shaft bearing on the pilot of Bearing Installer C–4198 and Handle C–4171.

CAUTION: DO NOT use the new axle shaft seal to position or seat the bearing in the axle shaft bore.

(3) Insert the bearing into the tube. Ensure that the bearing is not cocked and is seated firmly against the tube shoulder.

(4) Install the new axle shaft seal (Fig. 8) with Installer C–4198 and Handle C–4171. The flat side of the installation tool must face the seal.

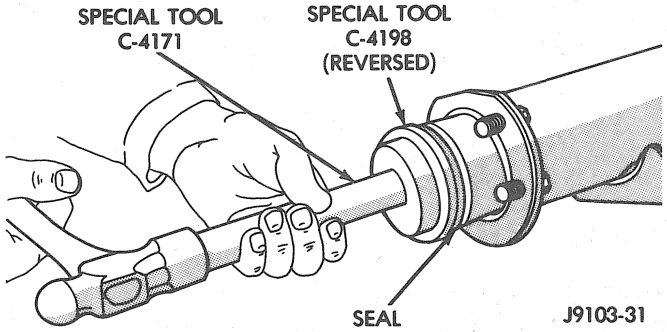


Fig. 8 Axle Shaft Seal Installation

(5) When the tool contacts the end of the tube (face), the seal will beat the correct position and depth.

AXLE SHAFT INSTALLATION

(1) Lubricate the bearing bore and seal lip. Insert the axle shaft and engage the splines with the side gear. Use care to prevent the shaft splines from damaging the axle shaft seal lip.

(2) Insert the C–clip lock in the recessed groove (Fig. 6). Push the axle shaft outward to seat the C–clip lock.

REMOVAL AND INSTALLATION (Continued)

(3) Insert the pinion gear mate shaft in the case. Install through the thrust washers and pinion gears. Align the hole in the shaft with the lock screw hole. Install the lock screw with Loctite on the threads. Tighten the screw to 11 N·m (8 ft. lbs.) torque (Fig. 5).

(4) Clean the cover and apply a bead of sealant. Refer to the Drain and Refill in this section.

(5) Install the brake drum and wheel and tire.

(6) Raise or lower the hoist until the vehicle is level.

(7) Remove the fill hole plug. Fill the differential housing with lubricant. Refer to the Specifications chart for the type and the quantity. Install the fill hole plug.

(8) Lower the vehicle and test the brakes and axle for correct operation.

PINION SEAL REPLACEMENT

CAUTION: The following procedures must be used so the correct pinion bearing preload torque is retained. If this procedure is not followed completely, it may result in premature failure of the rear axle.

REMOVAL

(1) Raise and support the vehicle.

(2) Mark the U–joint, pinion yoke, and pinion shaft for reference.

(3) Disconnect the drive shaft from the pinion yoke. Secure the driveshaft in an upright position to prevent damage to the rear U–joint.

(4) Remove the rear wheels and brake drums to prevent any drag. The drag can cause a possible false bearing preload torque measurement.

(5) Use a Newton–meter or an inch–pound torque wrench to measure the pinion bearing preload. Rotate the pinion shaft several times with the torque wrench. Note the indicated torque as the wrench is moved through several revolutions.

This measurement is very important because the bearing preload torque must be carefully re–adjusted after the new seal is installed.

(6) Retain the yoke with Wrench C–3281. Remove the pinion shaft nut and Belleville washer.

(7) Make reference marks and remove the yoke with a puller.

(8) Lower the rear of the vehicle to prevent lubricant leakage.

(9) Remove the pinion shaft seal with Puller C–748. Clean the seal contact surface in the housing bore.

INSTALLATION

(1) Examine the splines on the pinion shaft for burrs or wear.

(2) Remove any burrs and clean the shaft.

(3) Inspect the pinion yoke for cracks, worn splines and a worn seal contact surface. Repair or replace the yoke as necessary.

The outer perimeter of the seal is pre–coated with a special sealant. An additional application of sealant is not required.

(4) Install the replacement pinion shaft seal (Fig. 9) with Seal Installer C–4076A and Handle C–4735–1.

The seal is correctly installed when the seal flange contacts the face of the differential housing flange.

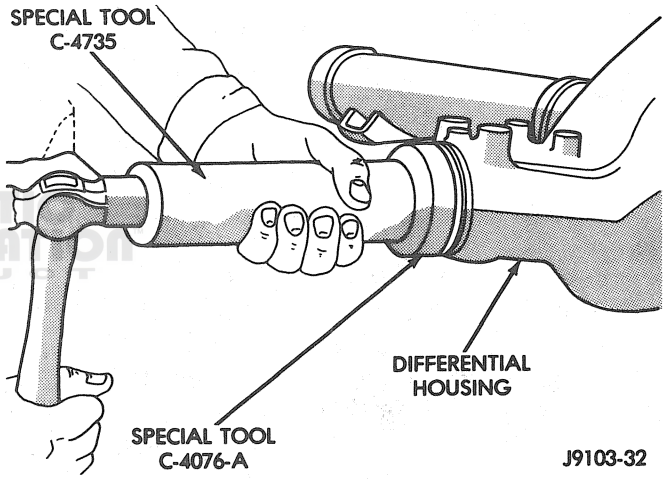


Fig. 9 Pinion Shaft Seal Installation

(5) Position the pinion yoke on the end of the shaft with the reference marks aligned.

(6) Seat the yoke on the pinion shaft with Installer C–3718 and Wrench C–3281.

(7) Remove the tools. Install the Belleville washer. The convex side of the washer must face outward.

(8) Retain the pinion yoke with Wrench C–3281. Tighten the shaft nut to 285 N·m (210 ft. lbs.) torque (Fig. 10). Rotate the pinion shaft several complete revolutions to ensure that the bearing rollers are seated.

Use a Newton–meter or an inch–pound torque wrench to measure the pinion gear bearing preload torque.

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing preload torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will have to be repeated.

REMOVAL AND INSTALLATION (Continued)

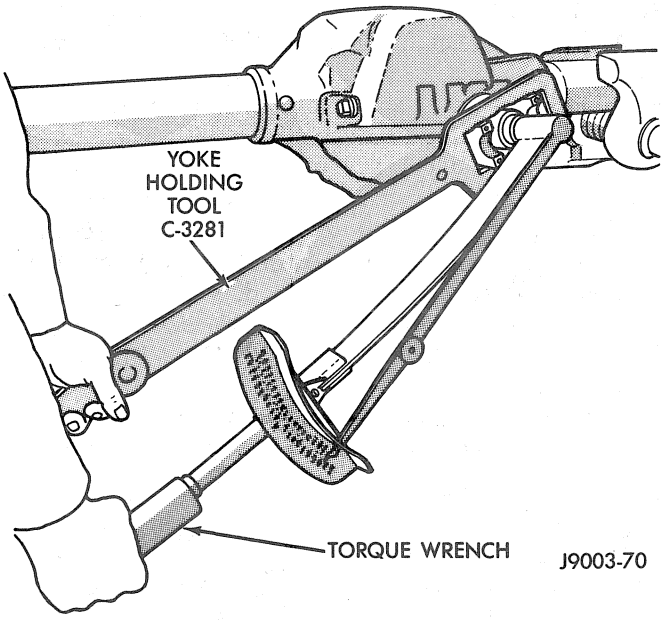


Fig. 10 Tightening Pinion Shaft Nut

(9) Continue tightening and measuring the bearing preload torque until it is the same as the original. **The bearing preload torque should never be greater than 1 N·m (10 in. lbs.) more than the recorded value.**

The bearing preload torque should be constant during a complete revolution of the pinion gear. If the preload torque varies, this indicates a binding condition. This condition must be corrected before the installation of the drive shaft.

(10) If the specified torque is not obtained, tighten the nut in small increments until the preload torque is obtained.

(11) Seal replacement is unacceptable if final nut torque is less than 285 N·m (210 ft. lbs.) torque.

(12) Install the drive shaft with the installation reference marks aligned. Tighten the U–joint yoke clamp screws to 19 N·m (14 ft. lbs. or 170 in. lbs.) torque.

(13) Install the brake drums, wheels and tires.

(14) Adjust the hoist so that the vehicle is in a level position. Check the differential housing lubricant level. If necessary, add Mopar Hypoid Gear Lubricant.

DIFFERENTIAL SERVICE

SERVICE INFORMATION

It is not necessary to remove the complete axle to service the differential.

CAUTION: When differential service is necessary, both rear wheels must be raised off the surface. They must be free to rotate.

CAUTION: Do not subject the bearings, cups, bores or journals to heat from a torch or other abuse. Permanent damage could result. Special tools are available and recommended when servicing axle.

DIFFERENTIAL CASE REMOVAL

(1) Remove the axle shafts, refer to Axle Shaft Removal.

Side play and runout checks taken during disassembly will be very useful in reassembly.

(2) Check differential side play. Position a screwdriver or pinch bar between left side of axle housing and case flange (Fig. 11). Use a prying motion to determine if any side play exists. There should be no side play.

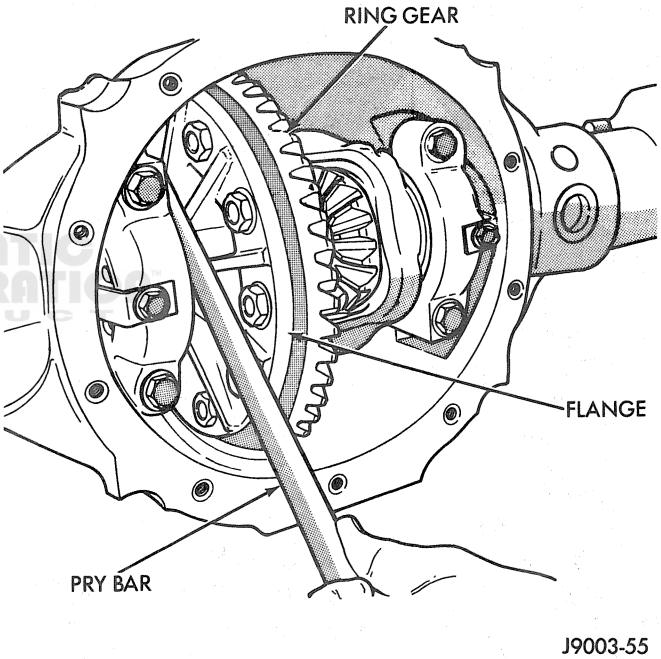


Fig. 11 Differential Case Side Play Test

Side play resulting from bearing races being loose on case hubs require replacement of the differential case. Otherwise, use threaded adjuster to remove the side play before measuring the ring gear runout.

(3) Eliminate any side play in the differential case. Attach Dial Indicator to Pilot Stud C–3288B. Place the indicator plunger at a rightangle (90°) to the ring gear (Fig. 12). The plunger should exert a slight force against the gear face.

(4) Measure runout by turning the ring gear several complete revolutions. Observe the dial indicator pointer. Mark the ring gear and the differential case at the areas of maximum runout. The ring gear runout should not exceed 0.13 mm (0.005 inch). If the runout exceeds 0.13 mm (0.005 in.), a damaged differential case could be the cause.

REMOVAL AND INSTALLATION (Continued)

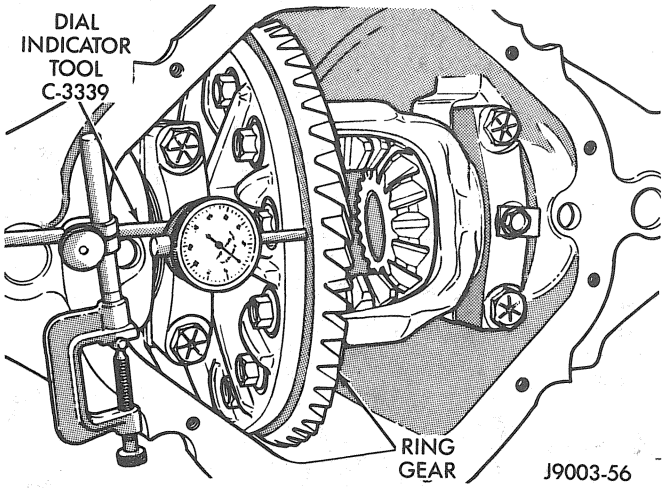


Fig. 12 Ring Gear Runout Measurement

Marking the differential case will be very useful later during differential case runout measurement.

(5) Mark the differential housing and differential bearing caps for installation reference (Fig. 13).

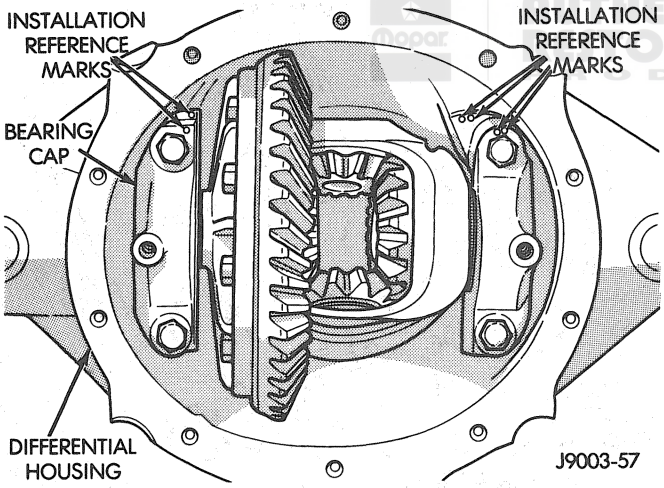


Fig. 13 Housing & Caps Marked For Installation Reference

(6) Remove the bearing threaded adjuster lock from each bearing cap. Loosen the bolts, but do not remove the bearing caps.

(7) Loosen the threaded adjusters with Wrench C–4164 (Fig. 14).

(8) Hold the differential case in place. Remove the bearing caps, adjusters and differential case (Fig. 15).

Each differential bearing cup and threaded adjuster must be kept with their respective bearing.

DIFFERENTIAL CASE INSTALLATION

(1) Apply a coating of hypoid gear lubricant to the differential bearings, bearing cups and threaded adjusters. A dab of grease can be used to keep the adjusters in position. Carefully position the assembled differential case in the housing.

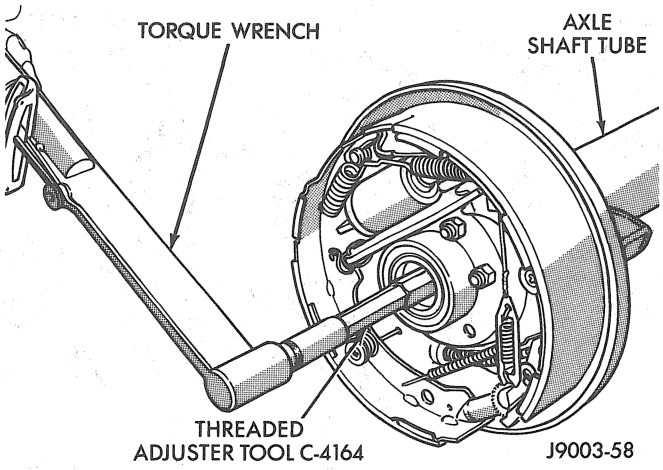


Fig. 14 Threaded Adjuster Tool

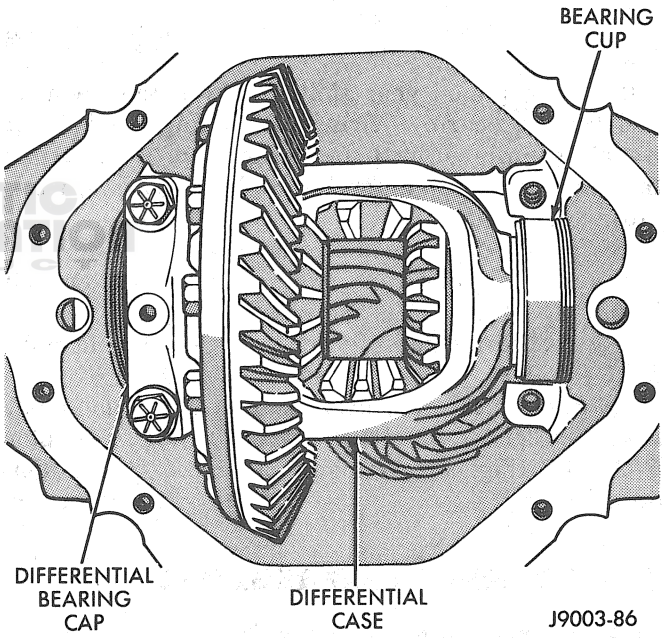


Fig. 15 Differential Bearing Cap Removed

(2) Observe the reference marks and install the differential bearing caps at their original locations (Fig. 16).

(3) Install the bearing cap bolts (Fig. 16). Tighten the upper bolts to 14 N·m (10 ft. lbs.) torque. Tighten the lower bolts finger–tight until the bolt head is lightly seated.

PINION GEAR SHAFT REMOVAL

(1) Remove the pinion gear nut and washer. Use Puller C–452 and Wrench C–3281 to remove the pinion gear yoke.

REMOVAL AND INSTALLATION (Continued)

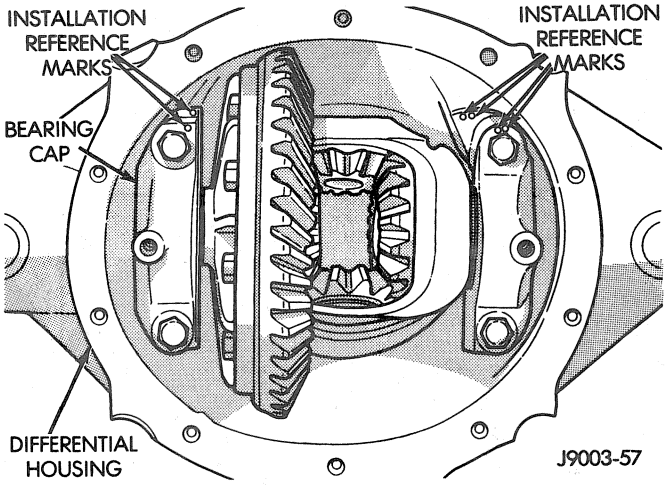


Fig. 16 Bearing Caps & Bolts

(2) Use Puller C–748 to remove pinion seal and discard seal.

(3) Force pinion gear shaft out the front bearing and remove bearing. **This will damage the front bearing rollers and bearing cup. The front bearing and cup must be replaced.** Discard collapsible spacer.

(4) Remove the front and rear bearing cups.

- Front bearing cup use Remover C–4345 and Handle C–4171
- Rear bearing cup use Remover C–4307 and Handle C–4171

(5) Remove the rear bearing from the pinion shaft with Puller C–293PA (J–29721) and Adapter C–293–42 (Fig. 17). Remove and record the pinion depth shims.

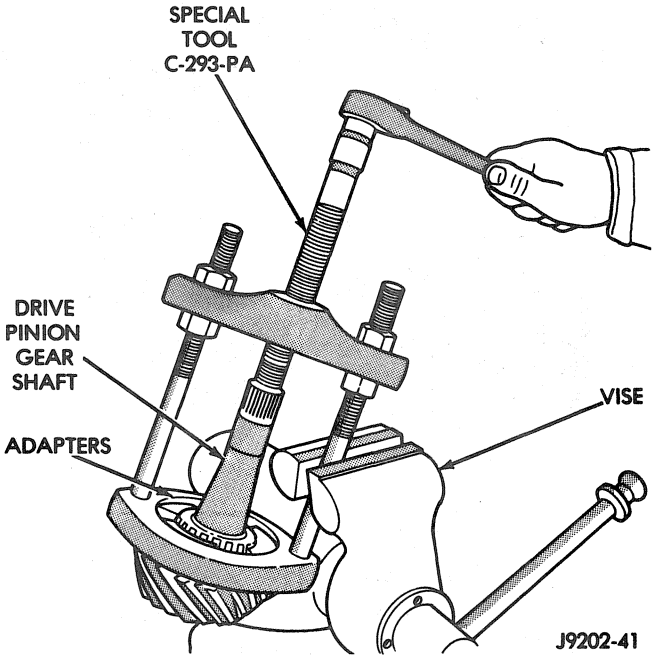


Fig. 17 Inner Bearing Removal

DISASSEMBLY AND ASSEMBLY

DIFFERENTIAL CASE DISASSEMBLY

(1) Rotate side gears until pinion gears are located at the differential case opening. Remove gears.

(2) Remove side gears and thrust washers.

(3) Remove differential bearings from the case hubs with Puller C–293PA, Adapter C–293–48 and Plug SP–3289 (Fig. 18).

DIFFERENTIAL CASE ASSEMBLY

(1) Lubricate all the differential case components with gear lubricant.

(2) Place the thrust washers on the differential side gears. Position the gears in the differential case counter bores.

If replacement side gears or thrust washers are used, refer to Differential Side Gear Clearance Measurement And Adjustment (Fig. 19).

(3) Position the thrust washers on the differential pinion gears. Mesh the pinion gears with the side

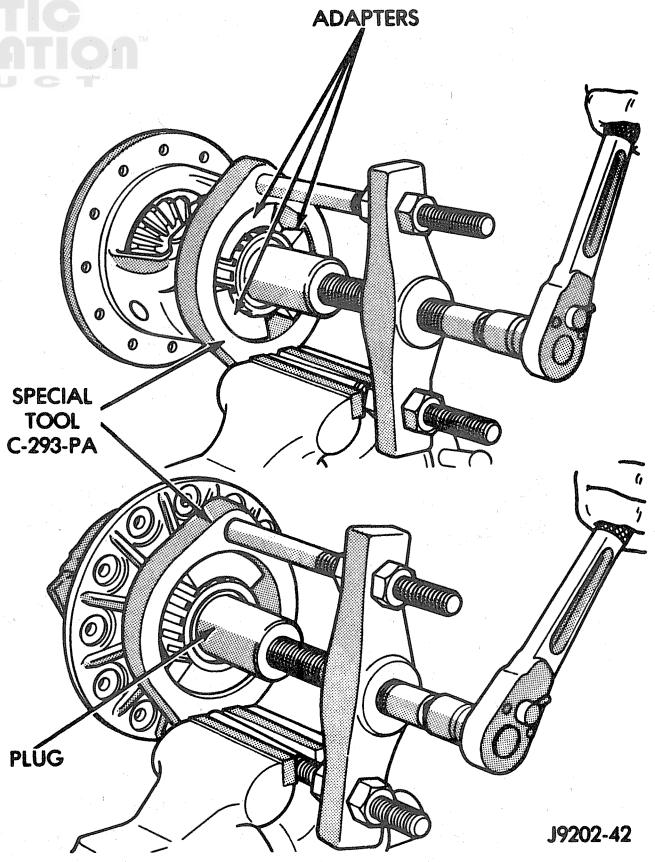


Fig. 18 Differential Bearing Removal

gears. **Ensure that the pinion gears are exactly 180 degrees opposite each other.**

DISASSEMBLY AND ASSEMBLY (Continued)

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
	→ 0.040
REPLACEMENT WASHER THICKNESS	− 0.037
NEW SIDE GEAR CLEARANCE	0.003

J9203-31

Fig. 19 Side Gear Calculations

(4) Rotate the side gears to align the pinion gears and thrust washers. Align these components with the mate shaft bores in the case.

(5) If ring gear was removed, clean all contact surfaces. Use an Arkansas stone or fine file to remove any sharp areas from the chamfered inside diameter.

(6) If removed, heat ring gear with a heat lamp or by immersing in a hot fluid. The temperature should not exceed 149° C (300° F). **Do not use a torch to heat the ring gear.**

(7) Position heated rear gear on case. Use two equally spaced Pilot Studs C–3288B to align the gear with the flange holes (Fig. 20).

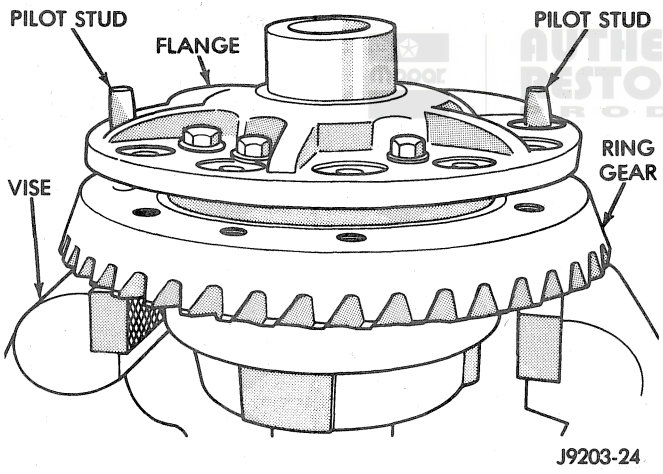


Fig. 20 Case–To–Ring Gear Alignment

(8) Install replacement ring gear bolts (with left hand threads). Alternately and evenly tighten each bolt to 95 N·m (70 ft. lbs.) torque.

CAUTION: When installing a differential bearing, never apply force to the bearing cage because bearing damage will result.

(9) Install a differential bearing on each hub with Installer C–4340 and Handle C–4171 (Fig. 21).

RING GEAR

Do not remove the ring gear from case unless the runout must be measured.

(1) Clamp the case with the ring gear bolts facing upward. Use a vise equipped with soft jaws (brass).

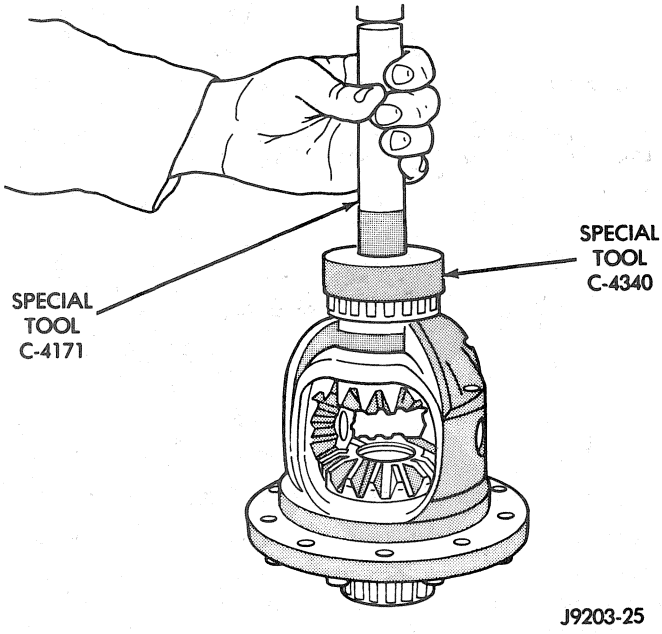


Fig. 21 Differential Bearing Installation

(2) Remove and discard **left–hand** threaded ring gear bolts. Use a hammer and a brass drift to force ring gear loose from the case pilots. Remove the ring gear.

CASE FLANGE RUNOUT MEASUREMENT

(1) If the ring gear runout exceeded 0.13 mm (0.005 inch), case flange runout should be measured. Install the case with bearing cups and threaded adjusters close to their original position.

(2) Install the bearing caps and bolts. Tighten the bolts lightly. Use Wrench C–4164 (Fig. 22) to thread both adjusters inward. Remove all side play.

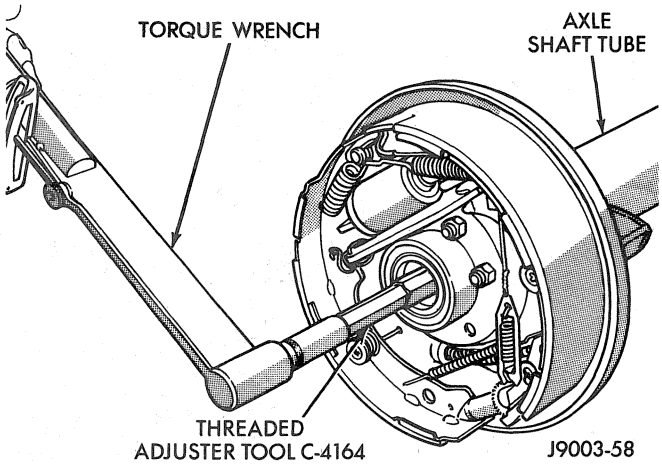


Fig. 22 Threaded Adjuster Tool

(3) Attach Dial Indicator to measure the flange runout. The plunger should contact the ring squarely between the outer edge and gear attaching bolt holes (Fig. 23).

DISASSEMBLY AND ASSEMBLY (Continued)

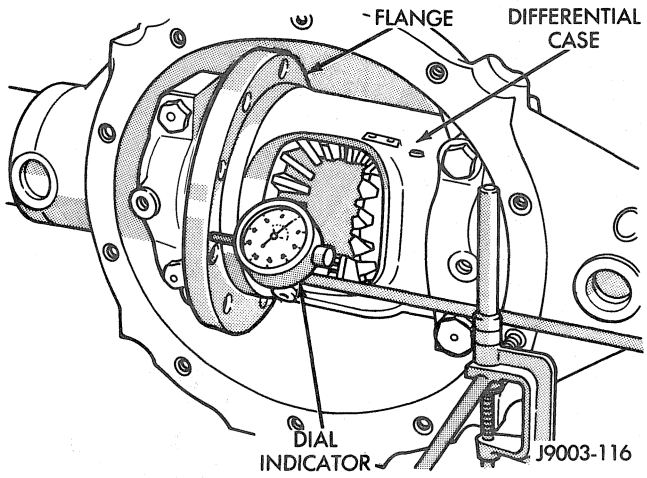


Fig. 23 Case Flange Runout Measurement

(4) Rotate the differential case several times. Observe the dial indicator pointer. Mark the area of maximum flange runout. The differential case flange runout must not exceed 0.08 mm (0.003 inch). If runout exceeds this amount replace differential case.

To reduce excessive ring gear runout, position gear runout mark 180 degrees opposite flange runout mark.

(5) Remove differential bearing cap bolts. Remove differential case from differential housing.

DIFFERENTIAL OVERHAUL—TRAC-LOC

The Trac–Lok differential components are illustrated in (Fig. 24). Refer to this illustration during repair service.

DISASSEMBLY

Service to the Trac–Lok differential requires the use of Tool Set C–4487 (J–23781). Refer to Model 35 Axle section in this Group for Differential Removal and Installation.

(1) Clamp one axle shaft in a vise equipped with soft jaws (Fig. 25).

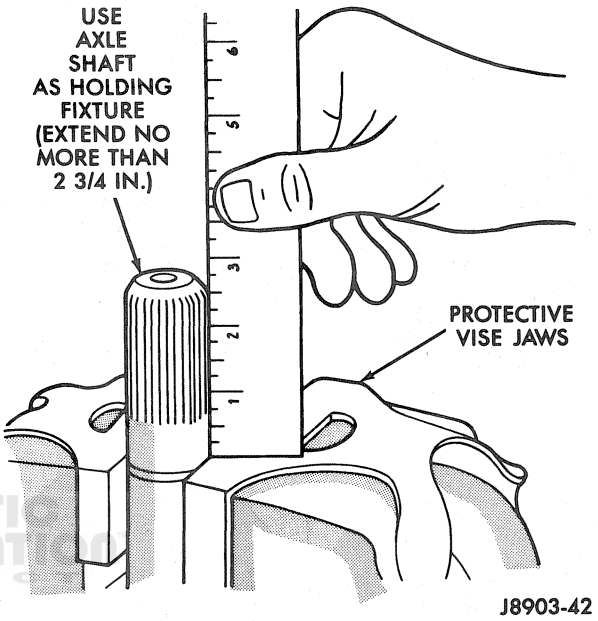


Fig. 25 Axle Shaft As Holding Fixture

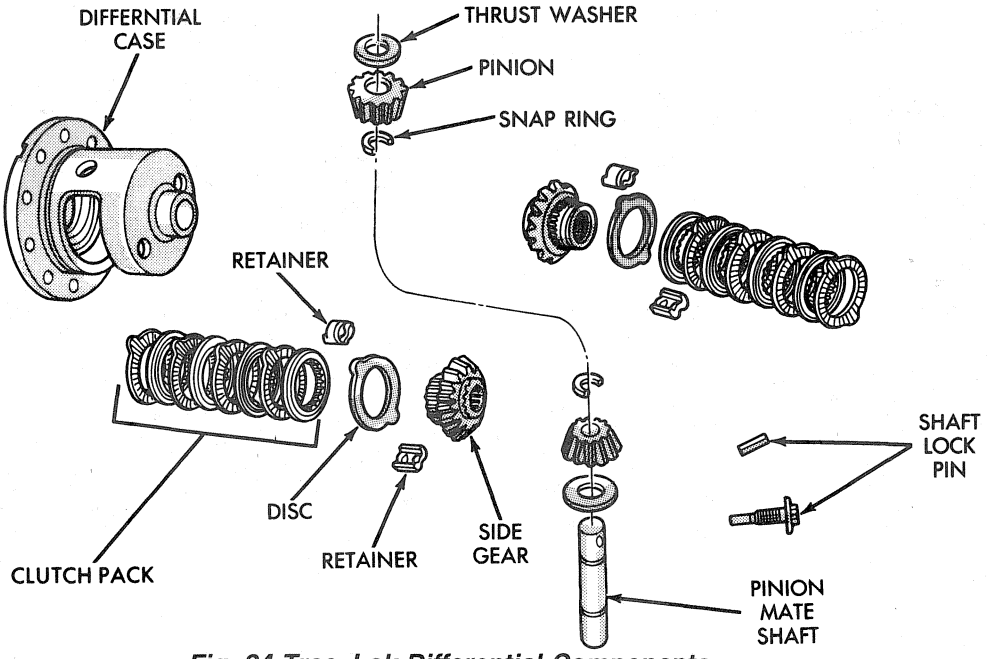


Fig. 24 Trac–Lok Differential Components

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Position the differential case on the axle shaft (Fig. 26). Place shop towels under the differential to avoid damage during removal of the ring gear (Fig. 26).

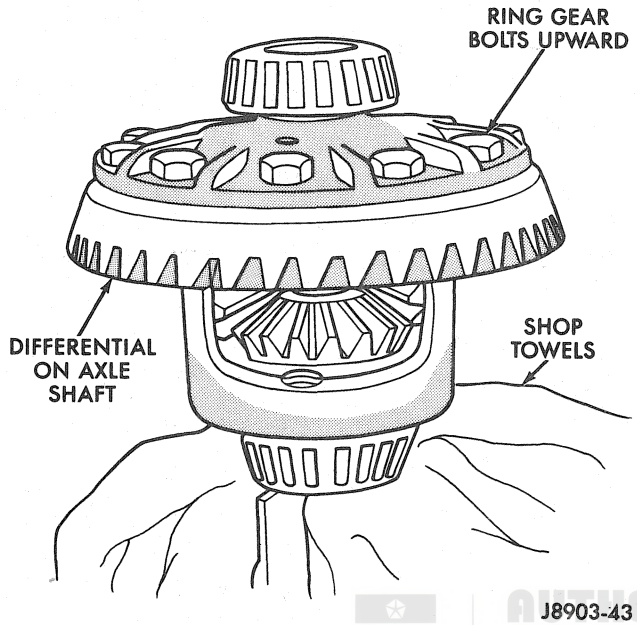


Fig. 26 Differential Case On Shaft

(3) Remove and discard the ring gear bolts. Tap the ring gear with a rawhide or plastic mallet and remove (Fig. 27).

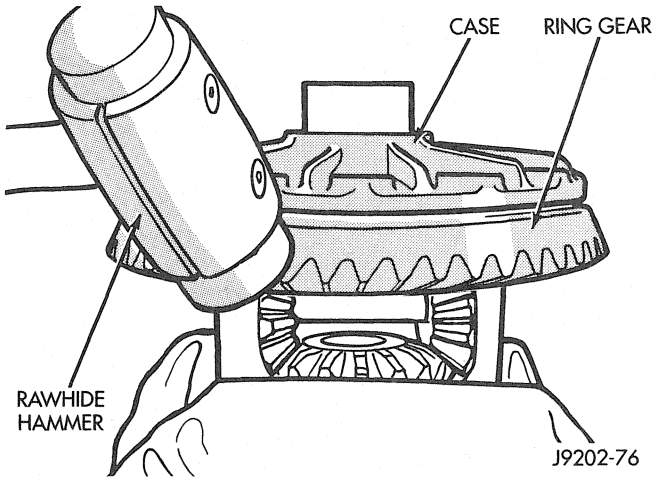


Fig. 27 Ring Gear Removal

(4) Remove the pinion gear mate shaft lock screw (Fig. 28).

(5) Remove the pinion gear mate shaft with a drift and hammer (Fig. 29).

(6) Install and lubricate Step Plate C–4487–1 (Fig. 30).

(7) Assemble Threaded Adapter C–4487–3 into top side gear. Thread forcing Screw C–4487–2 into adapter until it becomes centered in adapter plate.

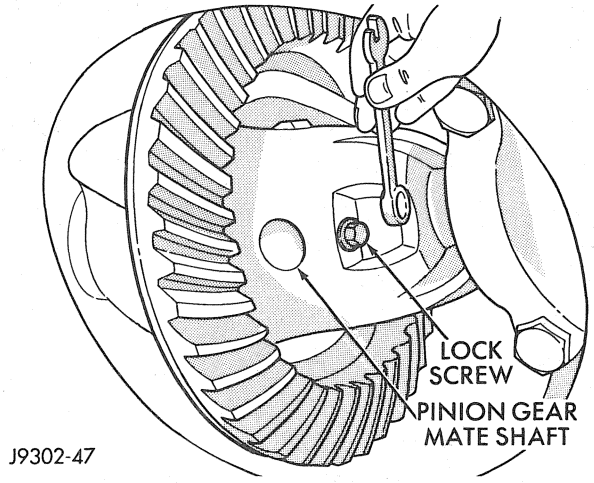


Fig. 28 Mate Shaft Lock Screw

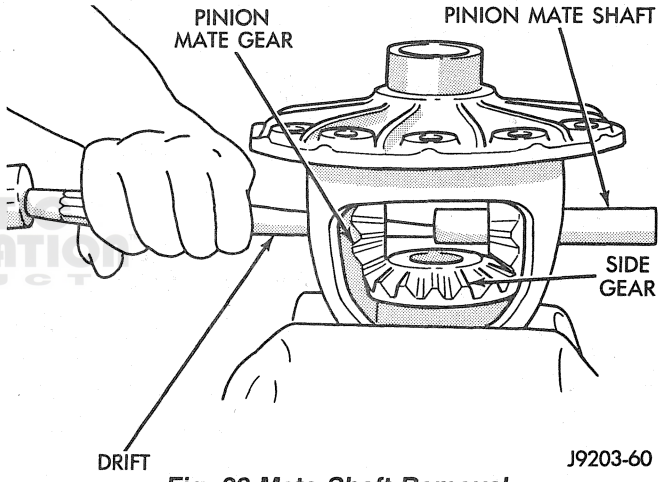


Fig. 29 Mate Shaft Removal

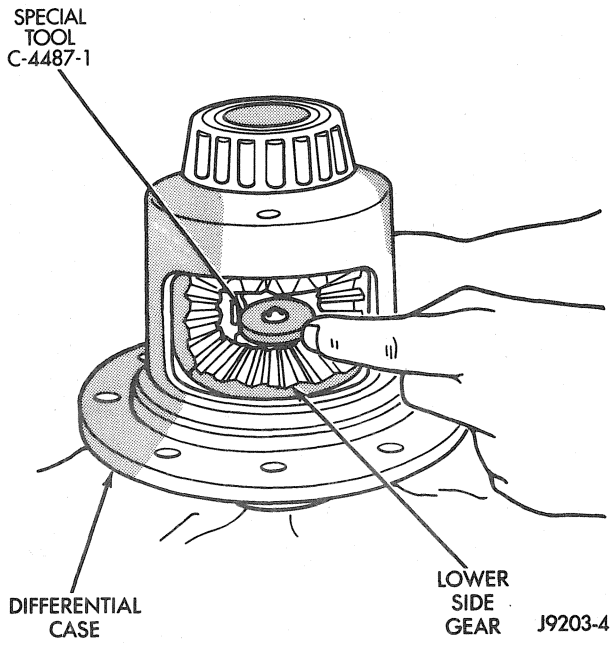


Fig. 30 Step Plate Tool Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Position a small screwdriver in slot of Threaded Adapter C–4487–3 (Fig. 31) to prevent adapter from turning.

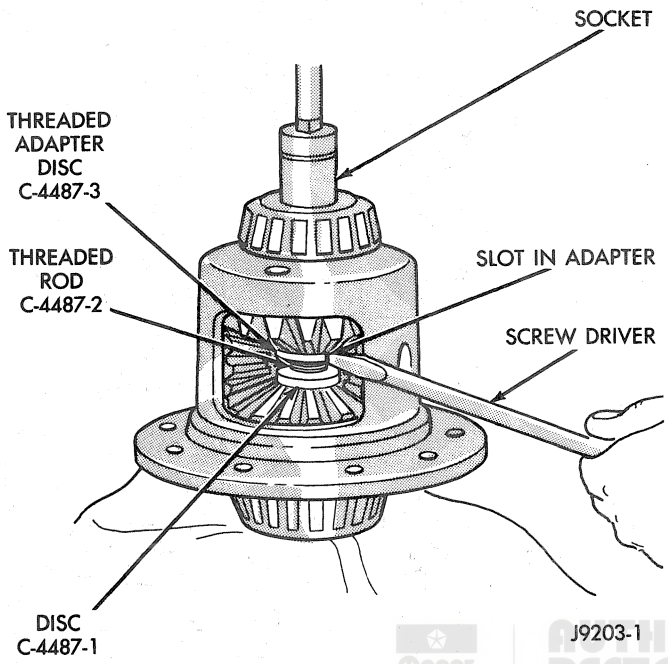


Fig. 31 Threaded Adapter Installation

(9) Tighten forcing screw tool enough to relieve clutch pack tension. Remove both pinion thrust washers (Fig. 32).

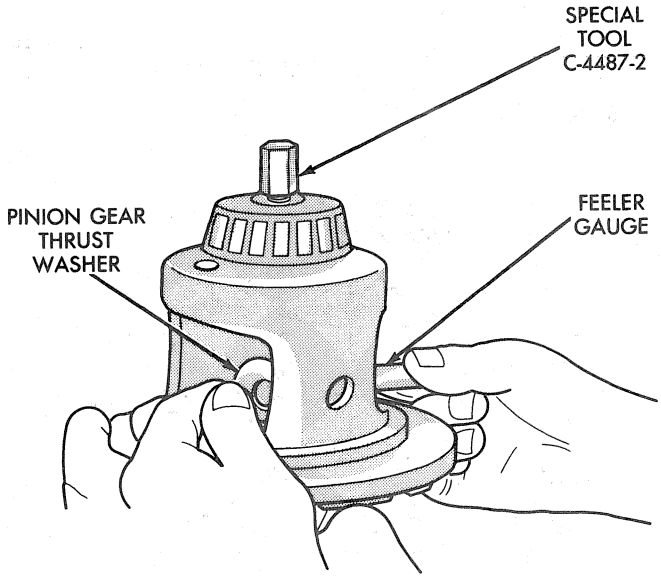


Fig. 32 Remove Pinion Thrust Washer

(10) Loosen the forcing screw tool until the clutch pack tension is relieved.

(11) Insert Turning Bar C–4487–4 in case. Rotate case with tool until pinion gears can be removed (Fig. 33).

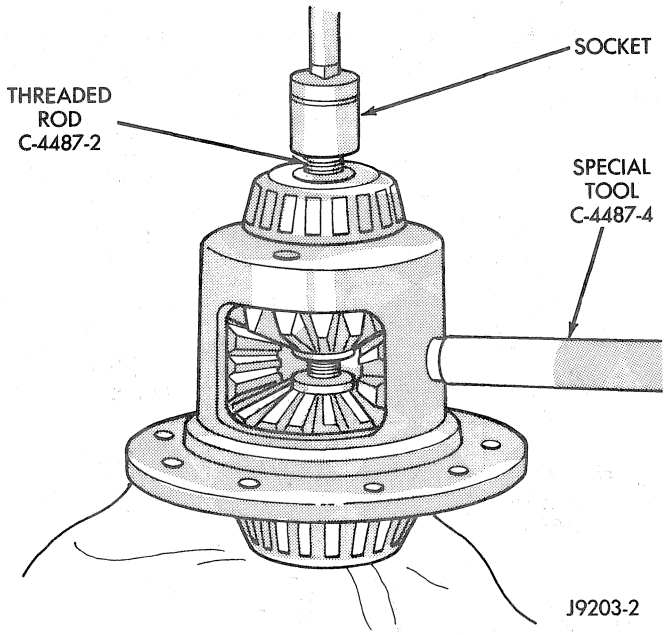


Fig. 33 Pinion Gear Removal

(12) Remove top side gear and clutch pack. Keep plates in correct order during removal (Fig. 34).

(13) Remove case from fixture. Remove remaining clutch pack.

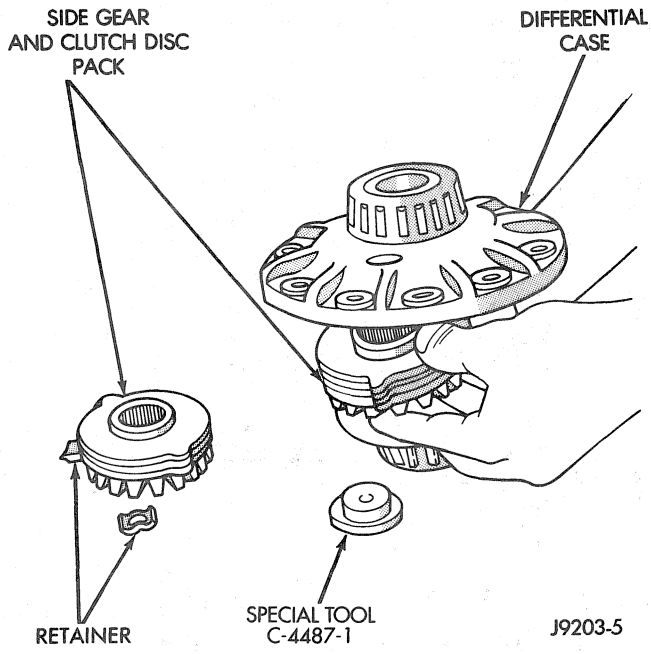


Fig. 34 Side Gear & Clutch Disc Removal

(14) Remove clutch pack retaining clips. Mark each clutch pack for installation reference.

ASSEMBLY

(1) The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both

DISASSEMBLY AND ASSEMBLY (Continued)

packs must be replaced. Lubricate each component with gear lubricant before assembly and installation.

(2) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 35).

(3) Position assembled clutch disc packs on the side gear hubs.

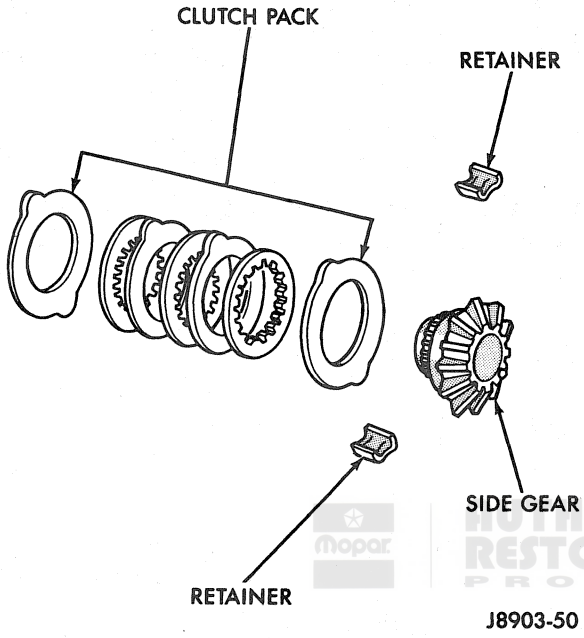


Fig. 35 Clutch Disc Pack

(4) Position case on axle fixture.

(5) Install clutch pack and side gear in lower bore (Fig. 36). Be sure clutch pack retaining clips remain in position and are seated in the case pockets.

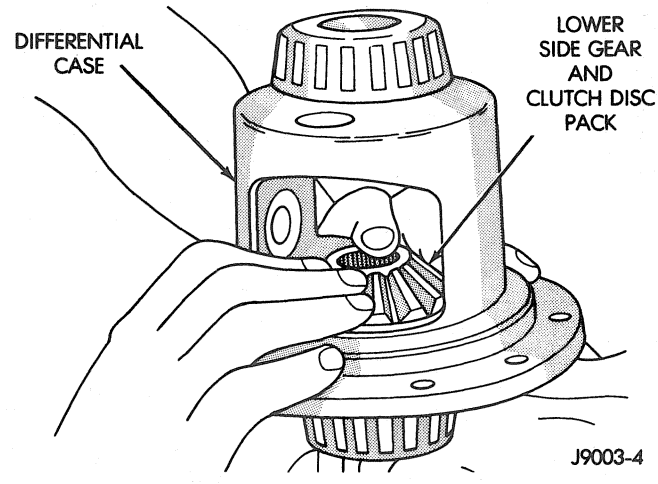


Fig. 36 Clutch Discs & Lower Side Gear Installation

(6) Install lubricated Step Plate C–4487–1 on first clutch pack (Fig. 37).

(7) Install the upper side gear and clutch disc pack (Fig. 37).

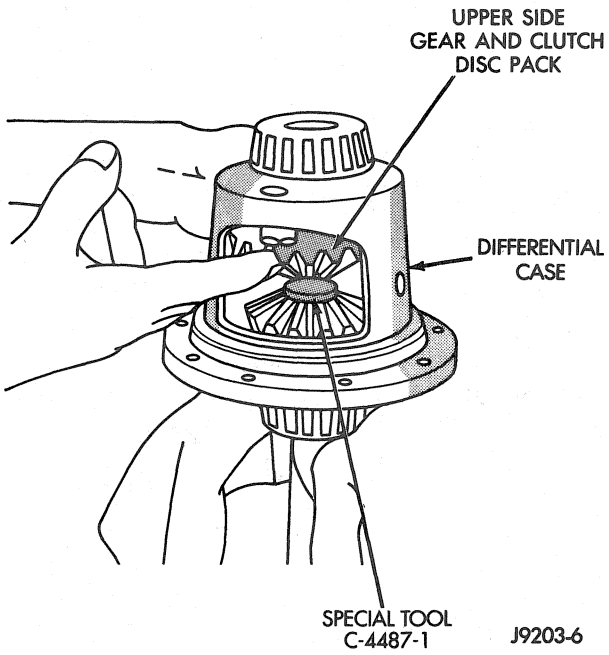


Fig. 37 Upper Side Gear & Clutch Disc Pack Installation

(8) Hold assembly in position. Insert Threaded Adapter C–4487–3 into top side gear, insert forcing Screw C–4487–2.

(9) Tighten forcing screw tool to compress clutch discs.

(10) Install pinion gears. Rotate case with Turning Bar C–4487–4. Make sure holes of pinion mate gears are aligned with case.

(11) Tighten forcing screw to compress the Belleville plates. Lubricate and install pinion gear thrust washers with a small screwdriver.

(12) Install pinion gear mate shaft (align holes in shaft and case).

(13) Install the pinion mate shaft lock screw finger tight.

If replacement gears and thrust washers were installed, it is not necessary to measure the gear back lash. Correct fit is due to close machining tolerances during manufacture.

(14) Invert the differential case and start two ring gear bolts. This will provide case–to–ring gear bolt hole alignment.

(15) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 38).

(16) Lubricate all differential components with hypoid gear lubricant.

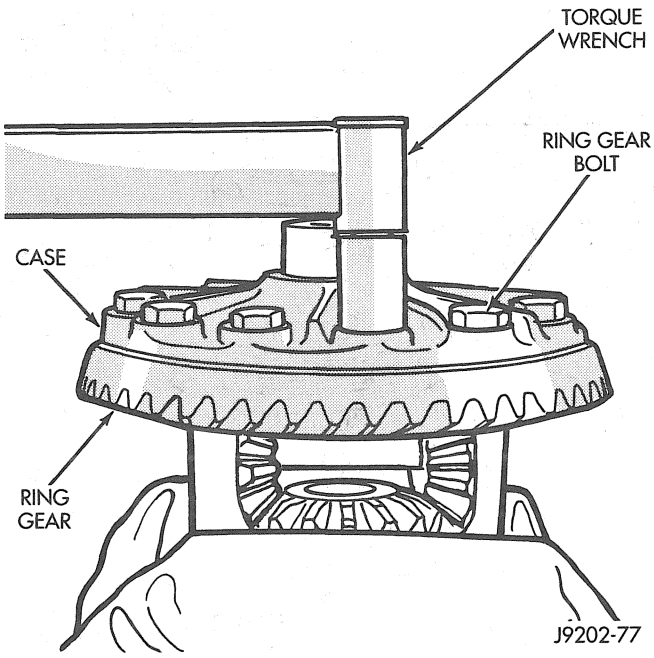


Fig. 38 Ring Gear Bolt Installation

CLEANING AND INSPECTION

DIFFERENTIAL

CLEANING/INSPECTION

(1) Clean all differential components in cleaning solvent. Allow the bearings to either air dry or dry them with a lint–free cloth. Dry the other components with compressed air.

(2) Examine each component for wear or damage.

(3) Replace shims, bearings and cups as a set only. Replace bearings and cups if either is galled, worn, cracked, or damaged.

(4) Inspect the differential side and pinion gears. Replace any gear that is worn, cracked or chipped.

(5) Inspect differential case and replace case if cracked or damaged.

Polish each axle shaft sealing surface with No. 600 crocus cloth. This can remove slight surface damage. Do not reduce the diameter of the axle shaft seal contact surface. When polishing, the crocus cloth should be moved around the circumference of the shaft (not in–line with the shaft).

When replacing a drive pinion gear bearing, always replace the bearing and cup as a matched set.

(6) Inspect the axle shaft C–clip locks for cracks or excessive wear. Replace them if necessary.

(7) Test each threaded adjuster to determine if it rotates freely.

(8) If an adjuster binds, repair the damaged threads or replace the adjuster.

TRAC-LOC DIFFERENTIAL

CLEANING/INSPECTION

(1) Clean all components in cleaning solvent. Dry components with compressed air.

(2) Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged.

(3) Inspect side and pinion gears. Replace any gear that is worn, cracked, chipped or damaged.

(4) Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

Plates and disc with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes. Add remaining Friction Modifier to differential after assembly.

ADJUSTMENTS

PINION DEPTH MEASUREMENT AND ADJUSTMENT

(1) Use pinion gear adjustment gauge set 6575 (Fig. 39) and continue the assembly:

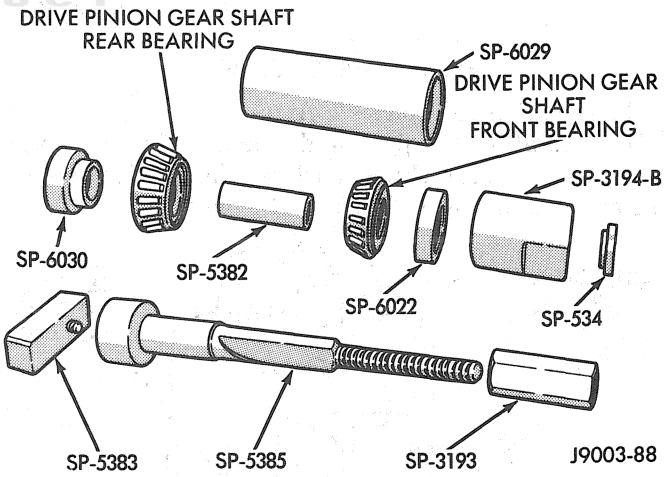


Fig. 39 Axle Adjustment Tools—8 1/4

(2) Install front (outer) bearing cup use Installer D–130 and Handle C–4171.

(3) Install rear (inner) bearing cup use Installer C–4308 and Handle C–4171.

Assemble tools as described;

- Position Spacer SP–6030 over Shaft SP–5385
- Position pinion rear bearing on shaft
- Position tools with bearing in the housing
- Install Sleeve SP–5382
- Install pinion front bearing
- Install Spacer SP–6022
- Install Sleeve SP–3194B, Washer SP–534 and Nut SP–3193

ADJUSTMENTS (Continued)

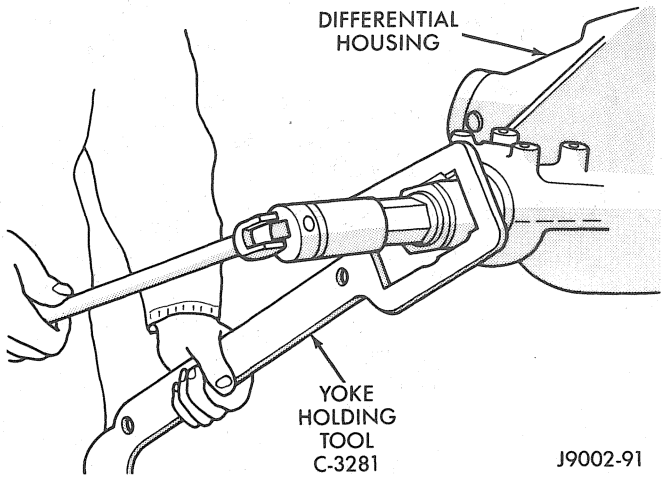


Fig. 40 Seating Pinion Bearings

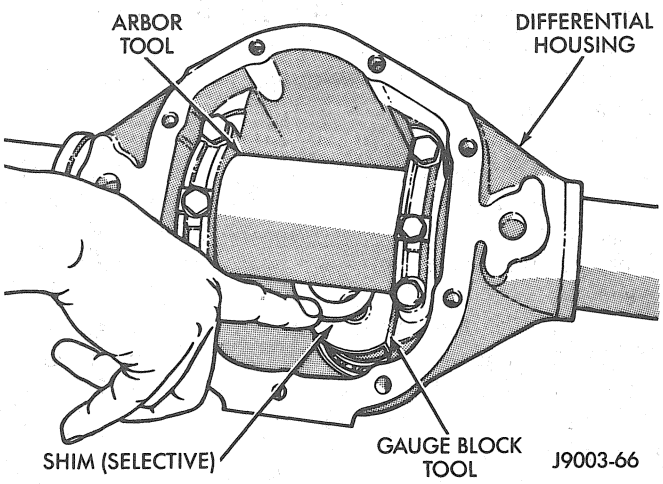


Fig. 41 Depth Shim(s) Selection

(4) Prevent compression sleeve tool from turning with Wrench C–3281. Tighten the nut to seat the pinion bearings in the housing (Fig. 40). Allow the sleeve to turn several times during the tightening to prevent brinelling the bearing cups or bearings.

Depth shim(s) are positioned between the pinion gear rear bearing and pinion gear. The required thickness of the depth shim(s) is determined according to the following information.

(5) Loosen the compression nut tool. Lubricate the pinion gear front and rear bearings with gear lubricant. Re–tighten the compression nut tool to 1 to 3 N·m (15 to 25 in. lbs.) torque. Rotate the pinion gear several complete revolutions to align the bearing rollers.

(6) Install Gauge Block SP–5383 at the end of SP–5385. Install Cap Screw SP–536 and tighten.

(7) Position Arbor SP–6029 in the differential housing (Fig. 41).

(8) Center the tool. Place a piece of 0.002 in. shim stock at each end of the arbor tool. Install the bearing caps on the arbor tool. Tighten the cap bolts to 14 N·m (10 ft. lbs.) torque.

(9) Trial fit depth shim(s) between the arbor tool and gauge block tool (Fig. 41). **The depth shim(s) fit must be snug but not tight (drag friction of a feeler gauge blade).**

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

J8902-46

ADJUSTMENTS (Continued)

Depth shims are available in 0.001–inch increments from 0.020 in. to 0.038 in.

(10) Note the etched number on the face of the pinion gear. The numbers represent thousands–of–an–inch deviation from the standard. If the number is – (negative), add that value to the required thickness of the depth shim(s). If the number is + (positive), subtract that value from the thickness of the depth shim(s). If the number is 0, no change is necessary.

(11) Remove tools from differential housing.

(12) Position depth shim(s) on the pinion gear. Install rear bearing with Installer C–4040 (Fig. 42). Be sure the contact surfaces are clean and without foreign particles.

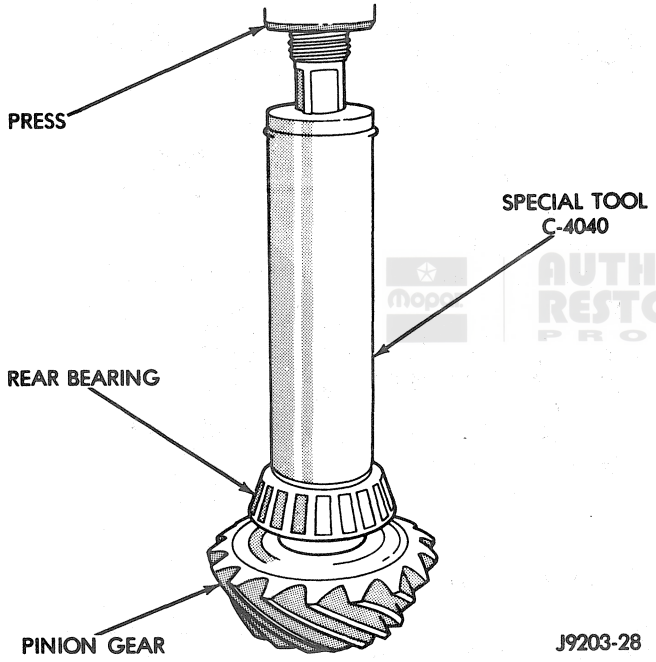


Fig. 42 Shaft Rear Bearing Installation

(13) Lubricate pinion gear front and rear bearings with gear lubricant.

(14) Install pinion gear into the housing. Install new collapsible spacer at the end of the pinion gear. Install pinion gear front bearing.

(15) Install pinion yoke with Remover/Installer C–3718 and Wrench C–3281 (Fig. 43).

It is necessary to use the tools (above) to correctly seat the front bearing on the drive pinion gear shaft (Fig. 43).

CAUTION: Use care to prevent collapsing preload collapsible spacer during installation of the yoke and seating the front bearing.

(16) Remove yoke and tools from the pinion gear.

(17) Install the pinion seal with Seal Installer C–4076A and Handle C–4735–1 (Fig. 44).

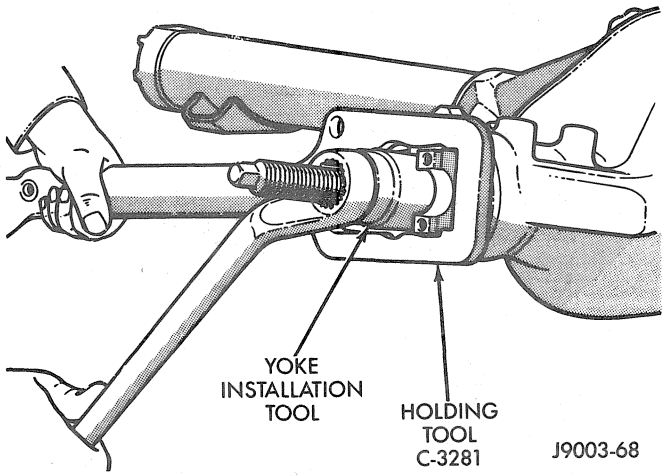


Fig. 43 Pinion Yoke Installation

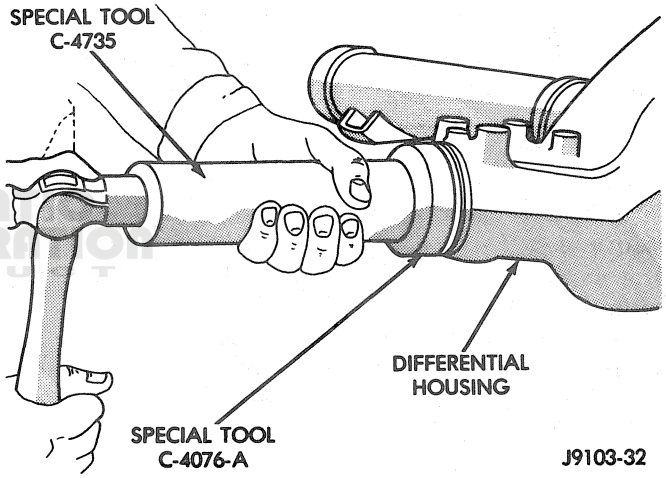


Fig. 44 Pinion Gear Seal Installation

The outer perimeter of the seal is pre–coated with a special sealant. An additional application of sealant is not required.

(18) Install pinion yoke with Remover/Installer C–3718 and Wrench C–3281.

(19) Remove the tools. Install the Belleville washer. The convex side of the washer must face outward. Install the pinion nut.

(20) Retain pinion yoke with Wrench C–3281. Initially tighten the pinion gear shaft nut enough to remove the bearing end play. While tightening, rotate the pinion shaft to ensure the bearing rollers are correctly seated.

(21) Tighten the pinion nut (Fig. 45) to 285 N·m (210 ft. lbs.) torque (minimum).

(22) Remove the tools from the shaft. Rotate the pinion several revolutions to seat the bearing rollers.

ADJUSTMENTS (Continued)

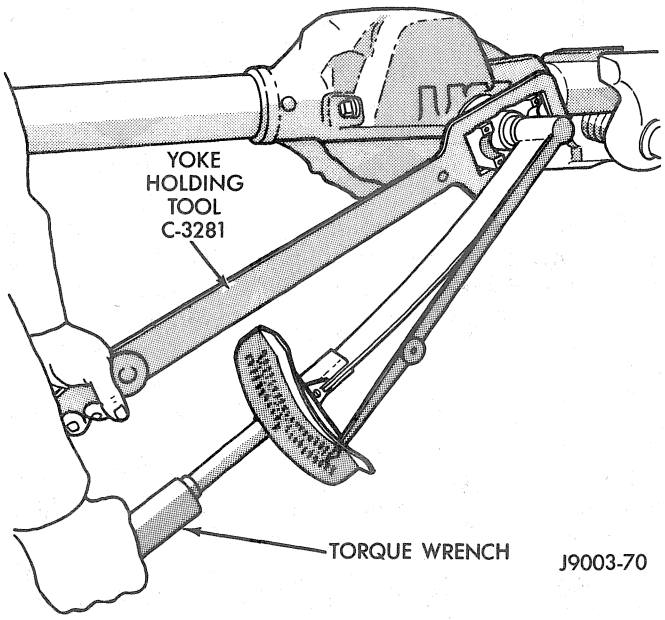


Fig. 45 Tightening Pinion Gear Nut

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing preload torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will have to be repeated.

(23) Measure pinion bearing preload torque by rotating pinion shaft with a Newton–meter or an inch–pound torque wrench. The correct bearing preload torque is 1 to 2 N·m (10 to 20 in. lbs.). This torque value is with replacement bearings and pinion nut tightened with a minimum of 285 N·m (210 ft. lbs.) torque (Fig. 46).

When using original pinion rear bearing and a replacement front bearing. The correct preload torque is 1 N·m (10 in. lbs.) in addition to the torque measured and recorded during disassembly.

The bearing preload torque should be constant during a complete revolution of the pinion gear shaft. If preload torque varies during rotation of the shaft, there is an internal binding that must be corrected before final assembly.

(24) If the specified torque is not obtained, tighten the nut in small increments until the preload torque is obtained.

The differential will be unacceptable for use if the final nut torque is less than 285 N·m (210 ft. lbs.) torque. If the preload torque is not within the specified range this is also unacceptable.

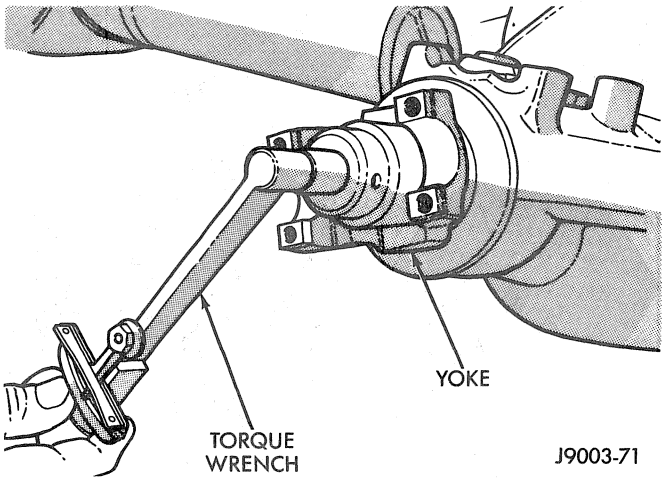


Fig. 46 Bearing Preload Torque Measurement

DIFFERENTIAL BEARING PRELOAD AND RING GEAR BACKLASH ADJUSTMENT

The following limitations must be considered when adjusting the differential:

- The maximum ring gear backlash variation is 0.003 in. (0.076 mm).
- Mark the gears so the same teeth are meshed during all backlash measurements.
- Maintain the specified threaded–adjuster torque while adjusting.
- Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free–play and ring gear noise.
- Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free–play and ring gear noise.

The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. Ensure accurate bearing cup responses to the adjustments. Maintain the gear teeth engaged (meshed) as marked. The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth. Do this five to ten times each time the threaded adjusters are adjusted.

(1) Use Wrench C–4164 to adjust each threaded adjuster inward (Fig. 47) until the differential bearing free–play is eliminated. Allow some ring gear backlash (approximately 0.01 in. / 0.25 mm) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

(2) Install Dial Indicator (Fig. 48). Position the plunger against the drive side of a ring gear tooth. Measure the backlash at 4 positions (90 degrees apart) around the ring gear. Locate and mark the area of minimum backlash.

ADJUSTMENTS (Continued)

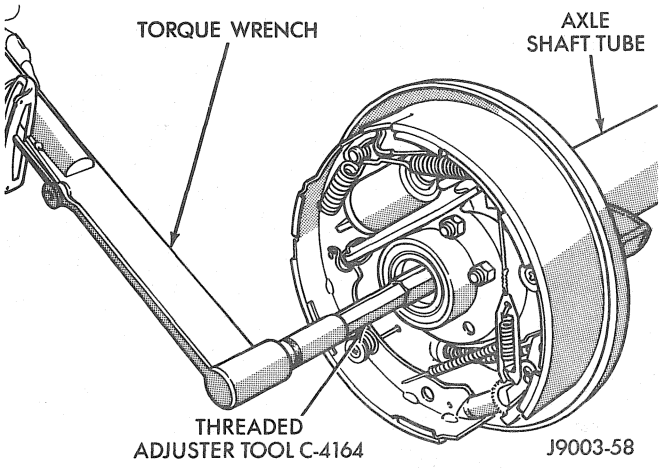


Fig. 47 Threaded Adjuster Tool

(3) Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.

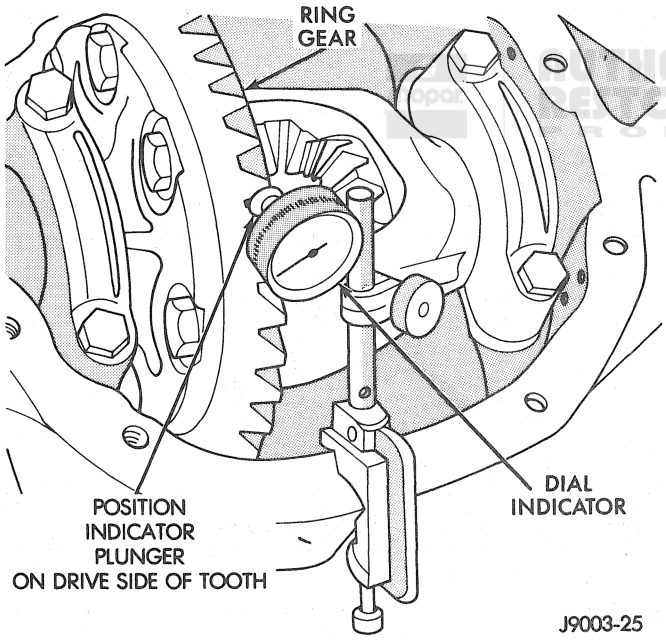


Fig. 48 Ring Gear Backlash Measurement

(4) Loosen the right–side, tighten the left–side threaded adjuster. Obtain backlash of 0.003 to 0.004 inch (0.076 to 0.102 mm) with each adjuster tightened to 14 N·m (10 ft. lbs.) torque. Seat the bearing cups with the procedure described above.

(5) Tighten the differential bearing cap bolts to 136 N·m (100 ft. lbs.) torque.

(6) Use Wrench C–4164 to tighten the right–side threaded adjuster to 95 N·m (70 ft. lbs.) torque. Seat the bearing cups with the procedure described above. Continue to tighten the right–side adjuster and seat bearing cups until the torque remains constant at 95 N·m (70 ft. lbs.)

(7) Measure the ring gear backlash. The range of backlash is 0.005 to 0.008 in. (0.127 to 0.203 mm).

Continue increasing the torque at the right–side threaded adjuster until the specified backlash is obtained.

The left–side threaded adjuster torque should have approximately 95 N·m (70 ft. lbs.) torque. If the torque is considerably less, the complete adjustment procedure must be repeated.

(8) Tighten the left–side threaded adjuster until 95 N·m (70 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.

(9) Install the threaded adjuster locks. Ensure the lock finger is engaged with the adjuster hole. Tighten the lock screws to 10 N·m (90 in. lbs.) torque.

SIDE GEAR CLEARANCE MEASUREMENT AND ADJUSTMENT

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

(1) Install the axle shafts and C–clip locks and pinion mate shaft. If necessary, refer to the installation located within this group.

(2) Measure each side gear clearance. Insert a matched pair of feeler gauge blades between the gear and differential housing on opposite sides of the hub (Fig. 49).

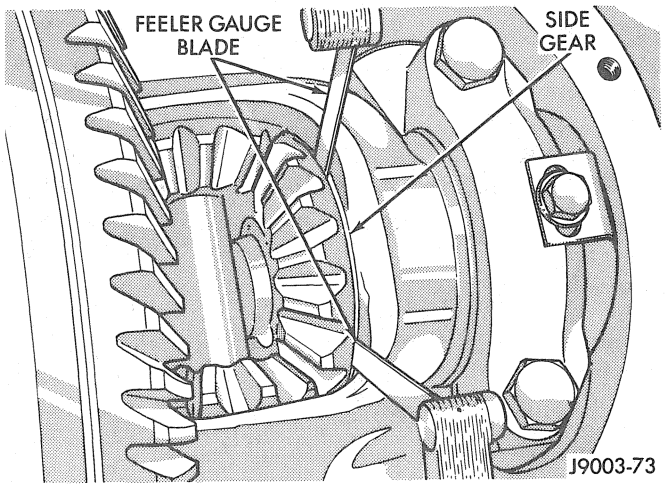


Fig. 49 Side Gear Clearance Measurement

(3) If side gear clearances is no more than 0.005 inch. Determine if the shaft is contacting the pinion gear mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of the axle shaft is not contacting the pinion gear mate shaft, the side gear clearance is acceptable.

ADJUSTMENTS (Continued)

(4) If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer (Fig. 50).

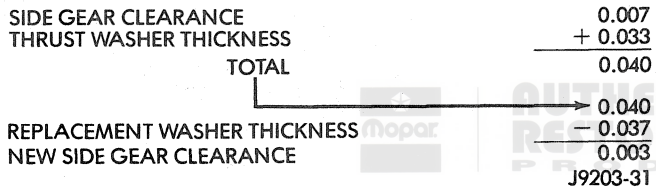


Fig. 50 Side Gear Calculations

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C–clip lock is preventing the side gear from sliding on the axle shaft.

(5) If there is no side gear clearance, remove the C–clip lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re–install the thrust washer. Assemble the differential case without the C–clip lock installed and re–measure the side gear clearance.

(6) Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C–clip lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.

(7) If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.

(8) If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

RING GEAR TEETH CONTACT PATTERN ANALYSIS

The ring gear teeth contact patterns will show if the pinion gear depth shim (s) have the correct thickness. It will also show if the ring gear back lash has been adjusted correctly. The backlash must be maintained within the specified limits until the correct teeth contact patterns are obtained.

- Excessive backlash is corrected by moving the ring gear teeth closer to the pinion gear teeth
- Insufficient backlash is corrected by moving the ring gear away from the pinion gear

(1) Apply yellow ferrous (iron) oxide compound to both sides of ring gear teeth.

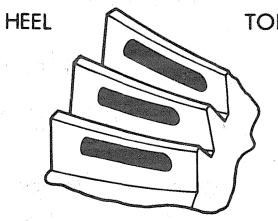
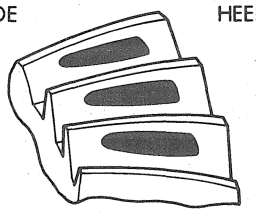
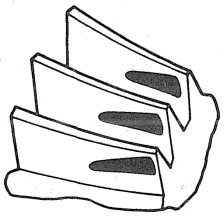
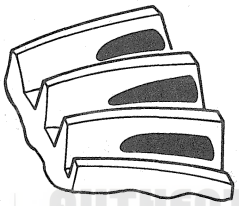
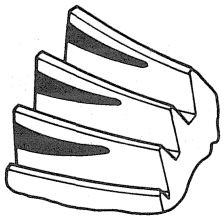
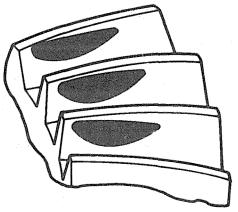
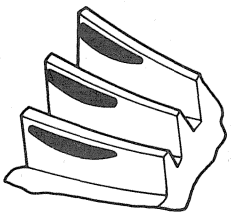
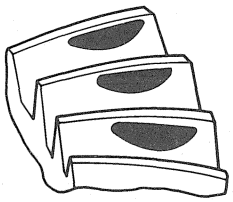
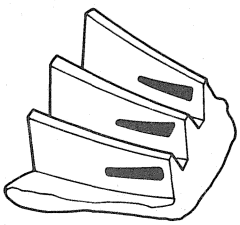
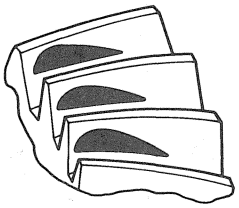
(2) Rotate the ring gear one complete revolution in both directions.

(3) Note patterns in compound. Refer to (Fig. 51) for interpretation of contact patterns and adjust accordingly.

(4) Install the axle shafts. Refer to Axle Shaft Installation within this group.

(5) Install the housing cover. Refill the differential with lubricant. Refer to Axle Shaft Installation.

ADJUSTMENTS (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
		DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 51 Gear Teeth Contact Patterns

SPECIFICATIONS

8 1/4 AXLE

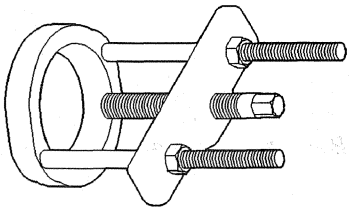
Axle Type . . . . . .Semi–floating, hypoid
Lubricant . . . . . .SAE 75W–90
Lube Capacity . . . . . .2.08 L (4.4 pts.)
Axle Ratios 3.07 3.55 4.10
Differential
Side Gear Clearance . . . . . .0.12 mm (0.005 in.)
Case Flange Runout . . . . . .0.07 mm (0.003 in.)
Bearing Preload . . . . . .95 N·m (70 ft. lbs.)
Ring Gear
Diameter . . . . . .20.95 cm (8.25 in.)
Backlash . . . . . .0.12–0.20 mm (0.005–0.008 in.)
Runout . . . . . .0.127 mm (0.005 in.)
Pinion Bearing
Preload . . . . . .1–2 N·m (10–20 in.lbs.)

8 1/4 AXLE

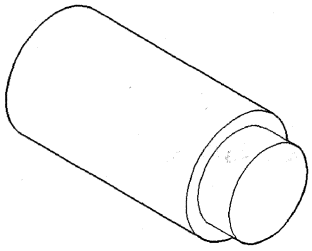
DESCRIPTION	TORQUE
Diff. Cover Bolt	47 N·m (35 ft. lbs.)
Bearing Cap Bolt	95 N·m (70 ft. lbs.)
Pinion Nut	285 N·m (210 ft. lbs.)
Ring Gear Bolt	95 N·m (70 ft. lbs.)
RWAL/ABS Sensor Bolt	24 N·m (18. ft. lbs.)

SPECIAL TOOLS

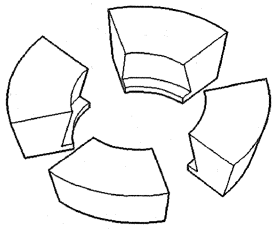
FRONT AXLE—MODEL 30



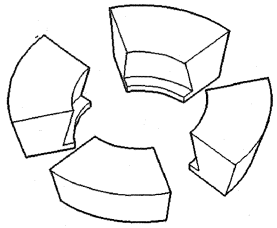
C-293-PA Puller



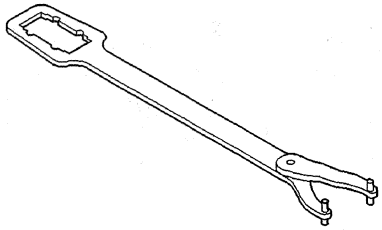
C-293-3 Extension



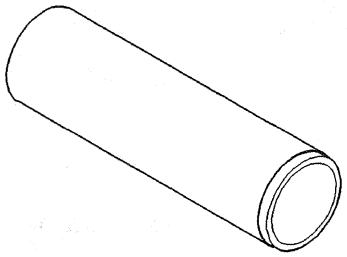
C-293-37 Adapter



C-293-47 Adapter

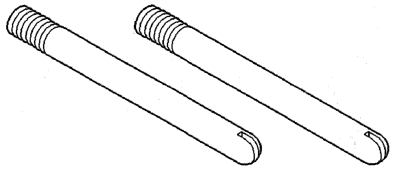


C-3281 Wrench

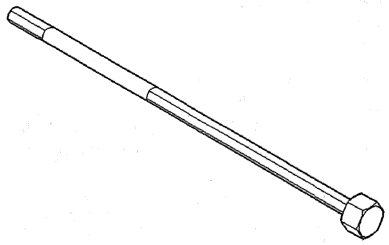


C-3096-A Installer

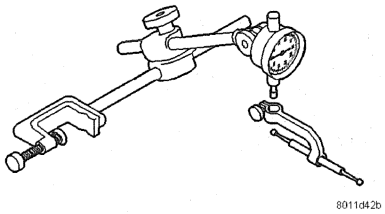
SPECIAL TOOLS (Continued)



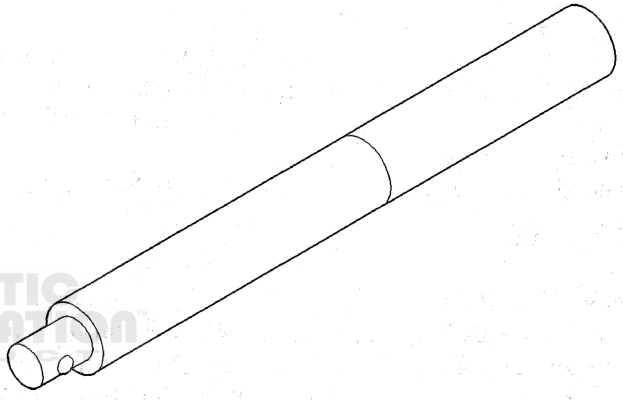
C-3288-B Pilots



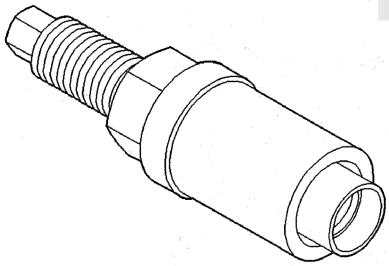
C-4164 Threaded Adjuster Wrench



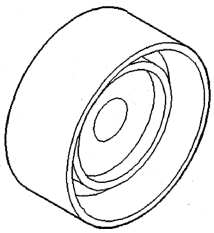
C-3339 Dial Indicator



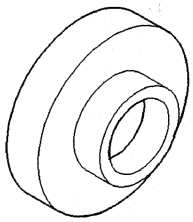
C4171 Driver Handle



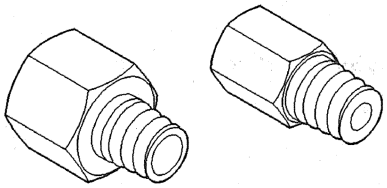
C-3718 Yoke Installer



C-4213 Bearing Installer

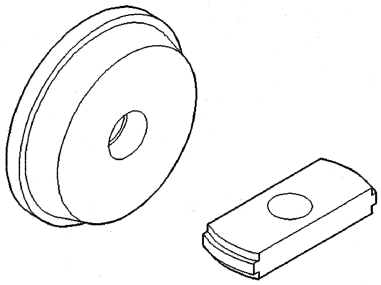


C-4109–A Alternate Pinion Shaft Seal Installer

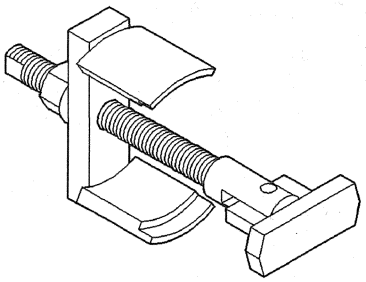


C-4226 Bearing/Seal Installer

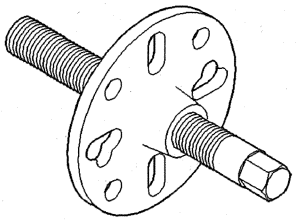
SPECIAL TOOLS (Continued)



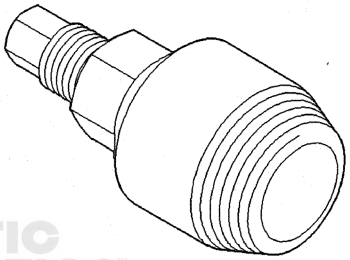
C-4306 Bearing Cup Remover Set



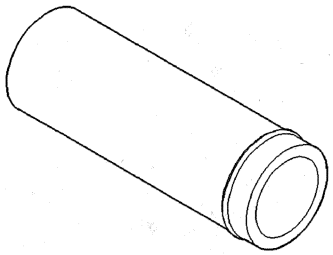
C-4828 Axle Shaft Bearing Remover



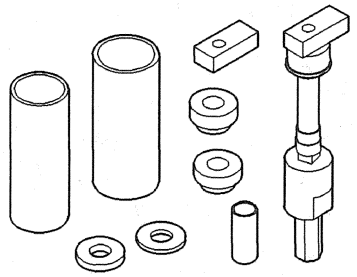
C-452 Yoke Remover



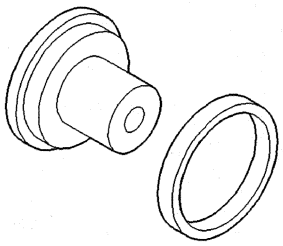
C-748 Pinion Shaft Seal Remover



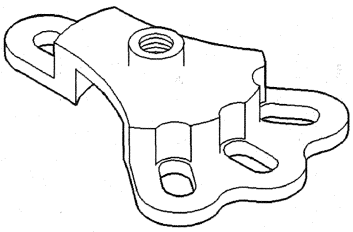
C4735 Pinion Shaft Seal Installer Drive Handle



C-758-D6 Pinion Height Adjust Gauge Set



C-4826 Axle Bearing and Seal Installer



6790 Puller Hub

BRAKES

CONTENTS

	page		page
ANTILOCK BRAKES	31	BASE BRAKE SYSTEM	1

BASE BRAKE SYSTEM

INDEX

	page		page
SPECIAL TOOLS		DISC ROTOR MACHINING	12
BASE BRAKES	30	MASTER CYLINDER	11
GENERAL INFORMATION		**REMOVAL AND INSTALLATION**	
BRAKE SYSTEM	2	BRAKE PEDAL	14
SERVICE WARNINGS & CAUTIONS	2	BRAKE SUPPORT PLATE	21
DESCRIPTION AND OPERATION		COMBINATION VALVE	15
BRAKE HOSES AND LINES	6	DISC BRAKE CALIPER	16
BRAKE PEDAL	2	DISC BRAKE ROTOR	19
COMBINATION VALVE	4	DISC BRAKESHOE	17
FRONT DISC BRAKES	4	DRUM BRAKESHOES	19
MASTER CYLINDER	4	MASTER CYLINDER	15
PARKING BRAKE	5	PARKING BRAKE LEVER	22
POWER BRAKE BOOSTER	3	POWER BRAKE BOOSTER	15
REAR DRUM BRAKE	5	REAR PARKING BRAKE CABLE	21
RED BRAKE WARNING LAMP	2	STOP LAMP SWITCH	14
STOP LAMP SWITCH	2	WHEEL CYLINDER	20
DIAGNOSIS AND TESTING		**DISASSEMBLY AND ASSEMBLY**	
BASE BRAKE SYSTEM	6	DISC BRAKE CALIPER	24
BRAKE DRUM	11	MASTER CYLINDER RESERVOIR	23
BRAKE FLUID CONTAMINATION DETECTION PROCEDURE	11	WHEEL CYLINDER	25
BRAKE LINE AND HOSES	11	**CLEANING AND INSPECTION**	
COMBINATION VALVE	9	CALIPER	26
DISC BRAKE ROTOR	10	REAR DRUM BRAKE	27
MASTER CYLINDER/POWER BOOSTER TEST	9	WHEEL CYLINDER	27
RED BRAKE WARNING LAMP	9	**ADJUSTMENTS**	
STOP LAMP SWITCH	9	PARKING BRAKE CABLE TENSIONER	29
SERVICE PROCEDURES		REAR DRUM BRAKE	28
BRAKE BLEEDING	12	STOP LAMP SWITCH	27
BRAKE DRUM MACHINING	13	**SPECIFICATIONS**	
BRAKE FLUID LEVEL	11	BRAKE COMPONENTS	30
BRAKE LINE	13	BRAKE FLUID	29
		TORQUE CHART	30

GENERAL INFORMATION

BRAKE SYSTEM

Power assist front disc and rear drum brakes are standard equipment. Disc brake components consist of single piston calipers and ventilated rotors. Rear drum brakes are dual shoe units with cast brake drums.

The parking brake mechanism is lever and cable operated. The cables are attached to levers on the rear drum brake secondary shoes. The parking brakes are operated hand lever.

A 205 mm dual diaphragm vacuum power brake booster is used for all applications. All models have a two-piece master cylinder with plastic reservoir.

All models are equipped with a combination valve. The valve contains a pressure differential valve and switch and a fixed rate rear proportioning valve.

Factory brakelining on all models consists of an organic base material combined with metallic particles. The lining does not contain asbestos.

SERVICE WARNINGS & CAUTIONS

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF ASBESTOS FIBERS FROM BRAKE COMPONENTS. IF A SUITABLE VACUUM CLEANER IS NOT AVAILABLE, CLEANING SHOULD BE DONE WITH A WATER DAMPENED CLOTH. DO NOT SAND, OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DISPOSE OF ALL RESIDUE CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS TO MINIMIZE EXPOSURE TO YOURSELF AND OTHERS. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean the system components. These fluids damage rubber cups and seals. Use only fresh brake fluid or Mopar brake cleaner to clean or flush brake system components. These are the only cleaning materials recommended. If system contamination is suspected, check the fluid for dirt, discoloration, or separation into distinct layers. Drain and flush the system with new brake fluid if contamination is suspected.

CAUTION: Use Mopar brake fluid, or an equivalent quality fluid meeting SAE/DOT standards J1703 and DOT 3. Brake fluid must be clean and free of contaminants. Use fresh fluid from sealed containers only to ensure proper antilock component operation.

Use Mopar multi-mileage or high temperature grease to lubricate caliper slide surfaces, drum brake pivot pins, and shoe contact points on the backing plates. Use multi-mileage grease or GE 661 or Dow 111 silicone grease on caliper bushings and slide pins to ensure proper operation.

DESCRIPTION AND OPERATION

BRAKE PEDAL

A suspended-type brake pedal is used, the pedal pivots on a shaft mounted in the pedal support bracket. The bracket is attached to the dash and instrument panels.

The brake pedal is a serviceable component. The pedal, pivot pin, sleeve, pedal bushings and spacers/washers are all replaceable parts. The pedal bracket can also be replaced when necessary.

STOP LAMP SWITCH

The stop lamp switch is a plunger-type, the switch plunger is actuated directly by the brake pedal.

The switch internal contacts are open when the brake pedal is in the released position. Brake application moves the pedal away from the switch allowing the plunger to extend. As the plunger extends, the switch internal contacts close completing the circuit to the stop lamps.

The switch is retained in the bracket by a clip. The clip has tangs that seat in the threads of the switch plunger barrel.

RED BRAKE WARNING LAMP

A red warning lamp is used for the service brake portion of the hydraulic system. The lamp is located in the instrument panel.

The red warning light alerts the driver if a pressure differential exists between the front and rear hydraulic systems. The light also alerts the driver when the parking brakes are applied.

DESCRIPTION AND OPERATION (Continued)

POWER BRAKE BOOSTER

The booster assembly consists of a housing divided into separate chambers by two internal diaphragms. The outer edge of each diaphragm is attached to the booster housing. The diaphragms are connected to the booster primary push rod.

Two push rods are used in the booster. The primary push rod connects the booster to the brake pedal. The secondary push rod connects the booster to the master cylinder to stroke the cylinder pistons.

The atmospheric inlet valve is opened and closed by the primary push rod. Booster vacuum supply is through a hose attached to an intake manifold fitting at one end and to the booster check valve at the other. The vacuum check valve in the booster housing is a one-way device that prevents vacuum leak back.

Power assist is generated by utilizing the pressure differential between normal atmospheric pressure and a vacuum. The vacuum needed for booster operation is taken directly from the engine intake manifold. The entry point for atmospheric pressure is through a filter and inlet valve at the rear of the housing (Fig. 1).

The chamber areas forward of the booster diaphragms are exposed to vacuum from the intake manifold. The chamber areas to the rear of the diaphragms, are exposed to normal atmospheric pressure of 101.3 kilopascals (14.7 pounds/square in.).

Brake pedal application causes the primary push rod to open the atmospheric inlet valve. This exposes the area behind the diaphragms to atmospheric pressure. The resulting pressure differential provides the extra apply pressure for power assist.

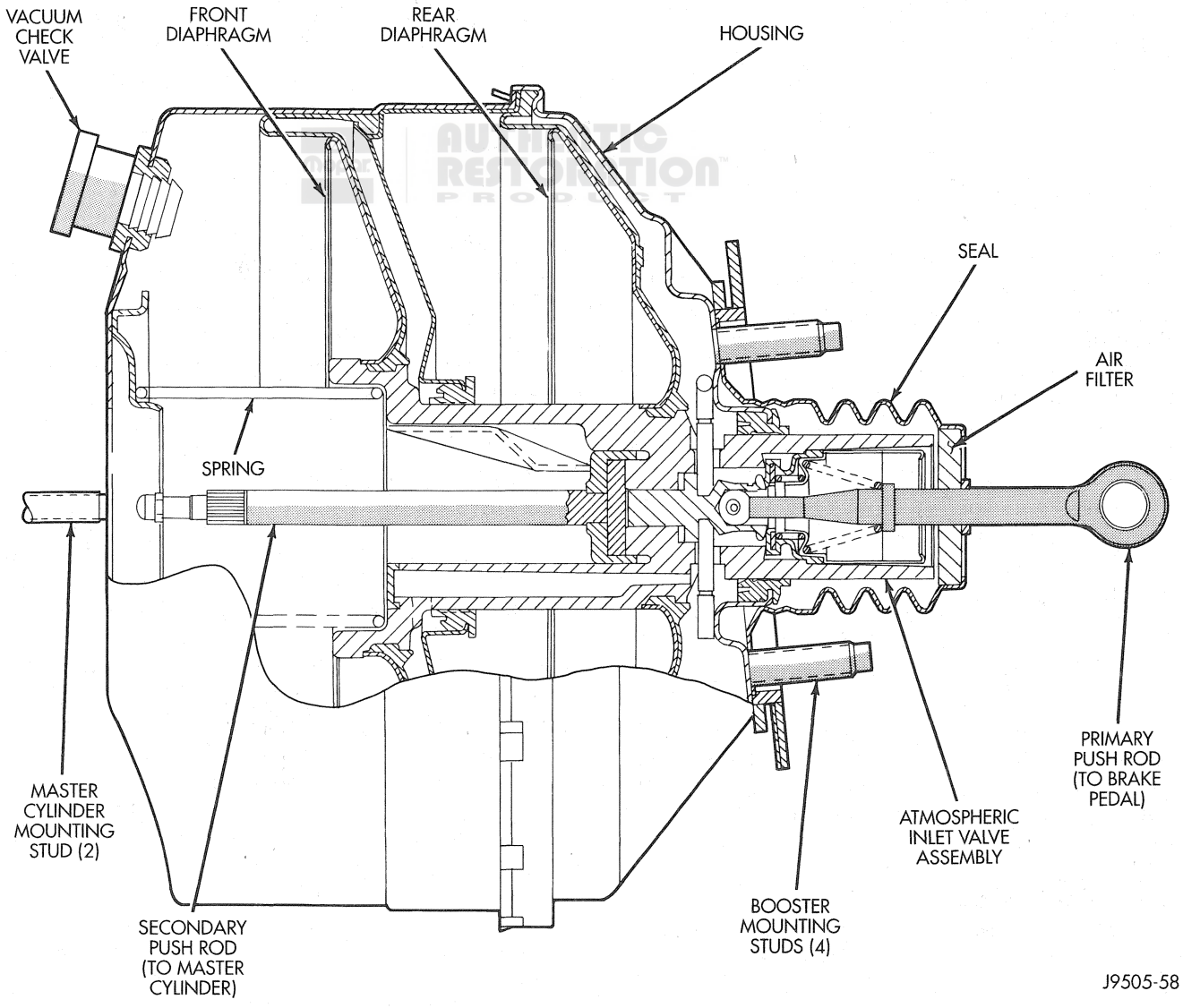


Fig. 1 Power Brake Booster

DESCRIPTION AND OPERATION (Continued)

MASTER CYLINDER

The master cylinder has a removable nylon reservoir (Fig. 2). The cylinder body is made of aluminum and contains a primary and secondary piston assembly. The cylinder body including the piston assemblies are not serviceable. If diagnosis indicates an internal problem with the cylinder body, it must be replaced as an assembly. The reservoir and grommets are the only replaceable parts on the master cylinder.

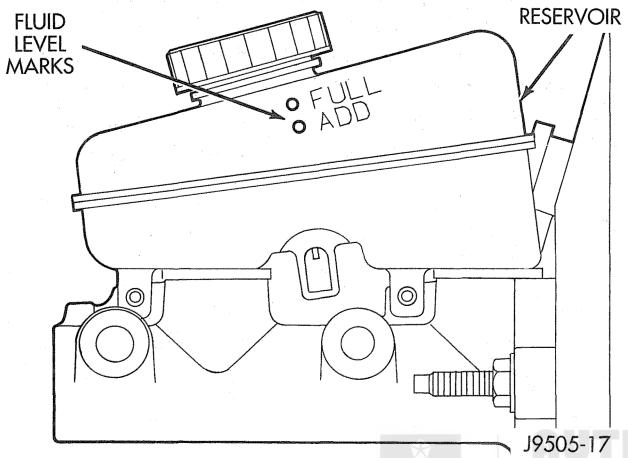


Fig. 2 Master Cylinder

COMBINATION VALVE

The combination valve contains a pressure differential valve and switch and a rear brake proportioning valve. The valve is not repairable. It must be replaced if diagnosis indicates this is necessary.

The pressure differential switch is connected to the brake warning light. The switch is actuated by movement of the switch valve. The switch monitors fluid pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs are made.

The rear proportioning valve is used to balance front-rear brake action. The valve allows normal fluid flow during moderate effort brake stops. The valve only controls (meters) fluid flow during high effort brake stops.

FRONT DISC BRAKES

The calipers are a single piston type. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

When the brake are applied fluid pressure is exerted against the caliper piston. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal (Fig. 3).

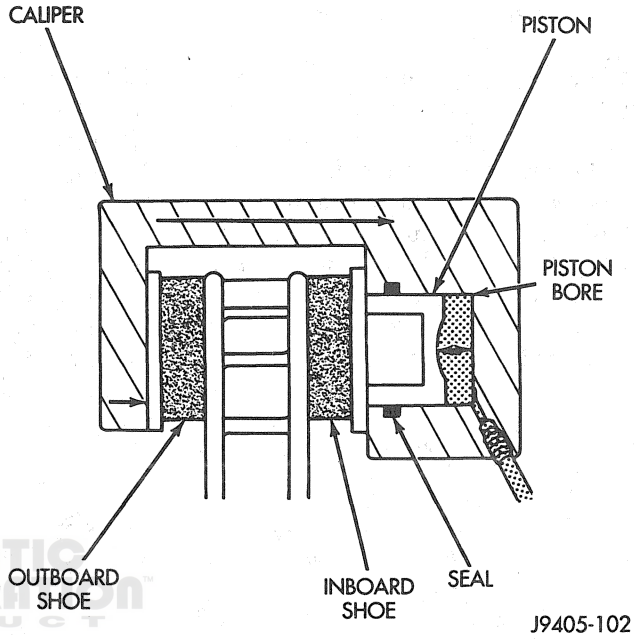


Fig. 3 Brake Caliper Operation

Fluid pressure applied to the piston is transmitted directly to the inboard brakeshoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brakeshoe lining into contact with the outer surface of the disc brake rotor.

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brakeshoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seal controls the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seal is deflected outward by fluid pressure and piston movement (Fig. 4).

DESCRIPTION AND OPERATION (Continued)

When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston.

The amount of piston retraction is determined by brakelining wear. Generally the amount is just enough to maintain contact between the piston and inboard brakeshoe.

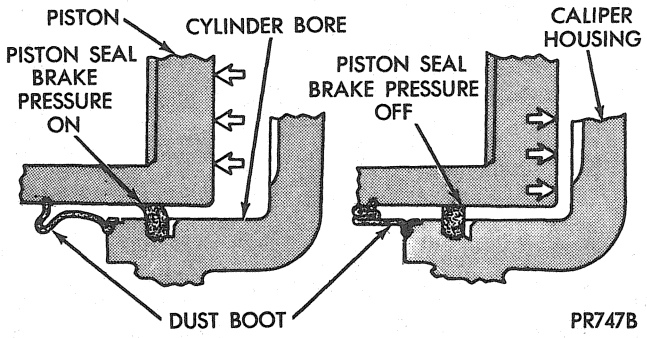


Fig. 4 Lining Wear Compensation By Piston Seal

REAR DRUM BRAKE

The two rear brake sizes are available on this vehicle, 9 inch and 10 inch. Both sizes are basically the same (Fig. 5). They both brake systems use a leading shoe (primary) and trailing shoe (secondary). The mounting hardware is similar but not interchangeable.

When the brake pedal is depressed hydraulic pressure pushes the rear brake wheel cylinder pistons outward. The wheel cylinder push rods then push the brake shoes outward against the brake drum. When the brake pedal is released return springs attached to the brake shoes pull the shoes back to there original position.

PARKING BRAKE

Parking brake adjustment is controlled by a cable tensioner mechanism. The cable tensioner, once adjusted at the factory, should not need further adjustment under normal circumstances. Adjustment may be required if a new tensioner, or cables are installed, or disconnected.

PARKING BRAKE OPERATION

A hand operated lever in the passenger compartment is the main application device. The cable tensioner is connected directly to the hand lever. The tensioner rod is attached to the equalizer which is the connecting point for the rear cables (Fig. 6).

The rear cables are connected to the actuating lever on each secondary brakeshoe. The levers are attached to the brakeshoes by a pin either pressed into, or welded to the lever. A clip is used to secure the pin in the brakeshoe. The pin allows each lever to pivot independently of the brakeshoe.

To apply the parking brakes, the hand lever is pulled upward. This pulls the rear brakeshoe actuating levers forward, by means tensioner and cables. As the actuating lever is pulled forward, the parking brake strut (which is connected to both shoes), exerts a linear force against the primary brakeshoe. This action presses the primary shoe into contact with the drum. Once the primary shoe contacts the drum, force is exerted through the strut. This force is transferred through the strut to the secondary brakeshoe causing it to pivot into the drum as well.

A gear type ratcheting mechanism is used to hold the lever in an applied position. Parking brake

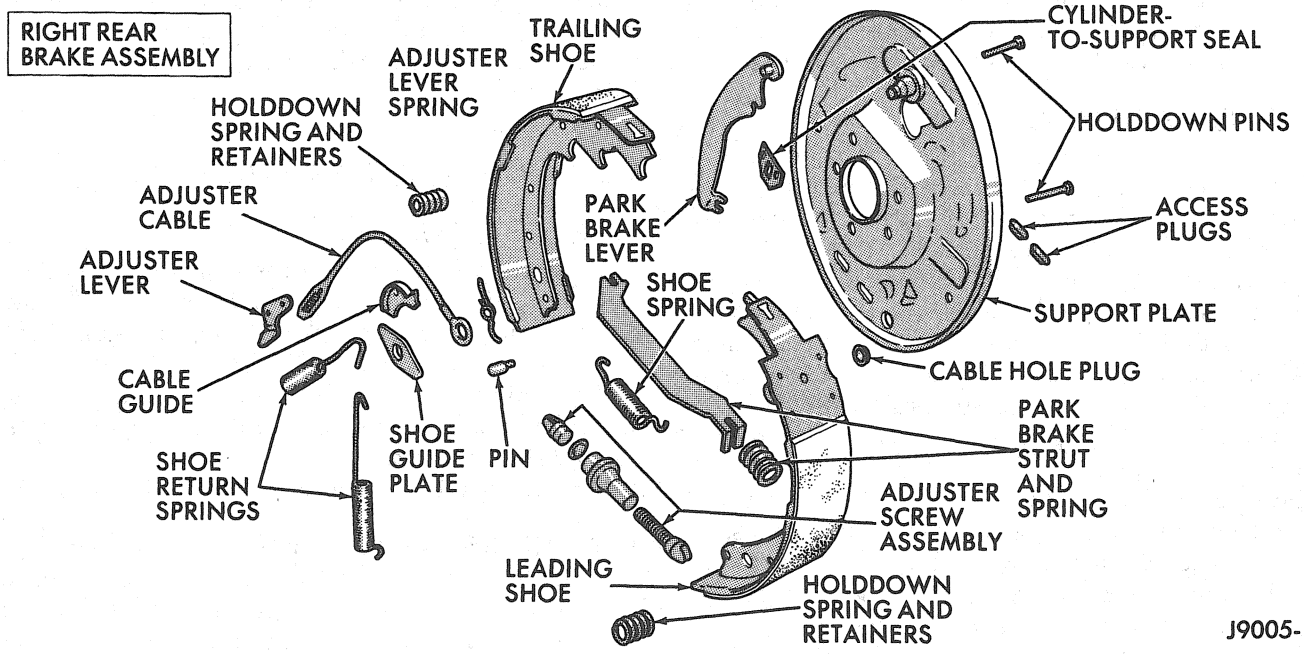


Fig. 5 9 Inch Brake Components

DESCRIPTION AND OPERATION (Continued)

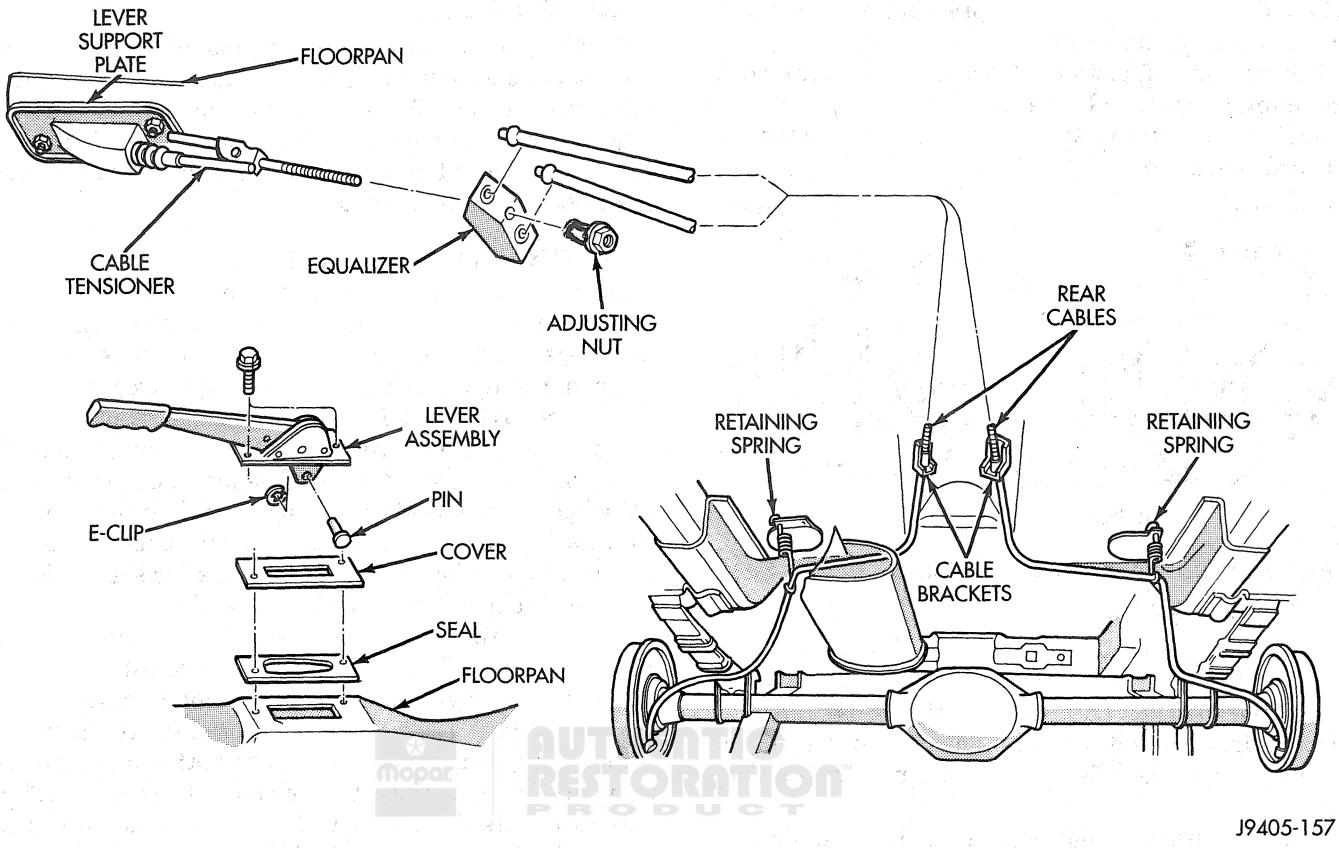


Fig. 6 Parking Brake Components

release is accomplished by the hand lever release button.

A parking brake switch is mounted on the parking brake lever and is actuated by movement of the lever. The switch, which is in circuit with the red warning light in the dash, will illuminate the warning light whenever the parking brakes are applied.

BRAKE HOSES AND LINES

Flexible rubber hose is used at both front brakes and at the rear axle junction block. Inspect the hoses whenever the brake system is serviced, or whenever the vehicle is in for service.

Inspect the hoses for surface cracking, scuffing, or worn spots. Also check brake hose installation. Faulty installation can result in kinked, twisted hoses, or contact with the wheels and tires or other chassis components. Replace any brake hose immediately if the fabric casing of the hose is exposed due to cracks or abrasions.

The steel brake lines should be inspected periodically for evidence of corrosion, twists, kinks, leaks, or other damage. Heavily corroded lines will eventually rust through causing leaks. In any case, corroded or damaged brake lines should be replaced.

Factory replacement brake lines and hoses are recommended to ensure quality. Care should be taken to make sure that brake line and hose mating surfaces are clean and free from nicks and burrs. Also remember that right and left brake hoses are not interchangeable.

Use new copper seal washers at all caliper connections. Be sure brake line connections are properly made (not cross threaded) and tightened to recommended torque.

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM

Base brake components consist of the brakeshoes, calipers, wheel cylinders, brake drums, rotors, brakelines, master cylinder, booster, and parking brake components.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

(1) Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, tramp, and a condition similar to grab.

DIAGNOSIS AND TESTING (Continued)

(2) If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.

(3) Inspect brake fluid level and condition. Note that the front disc brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**

(a) If fluid level is abnormally low, look for evidence of leaks at calipers, wheel cylinders, brakelines, and master cylinder.

(b) If fluid appears contaminated, drain out a sample. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals and cups will also have to be replaced after flushing. Use clean brake fluid to flush the system.

(4) Check parking brake operation. Verify free movement and full release of cables and pedal. Also note if vehicle was being operated with parking brake partially applied.

(5) Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.

(6) If components checked appear OK, road test the vehicle.

ROAD TESTING

(1) If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.

(2) Check brake pedal response with transmission in Neutral and engine running. Pedal should remain firm under constant foot pressure.

(3) During road test, make normal and firm brake stops in 25-40 mph range. Note faulty brake operation such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak. The leak point could be at a brakeline, fitting, hose, or caliper/wheel cylinder. Internal leakage in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

If leakage is severe, fluid will be evident at or around the leaking component. However, internal leakage in the master cylinder may not be physically evident.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up, worn lining, rotors, or drums are the most likely causes.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, thin brake drums or substandard brake lines and hoses can also cause a spongy pedal. The proper course of action is to bleed the system, or replace thin drums and suspect quality brake lines and hoses.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster or check valve could also be faulty.

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation, or out of round brake drums. Other causes are loose wheel bearings or calipers and worn, damaged tires.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brakeshoe release. Drag can be minor or severe enough to overheat the linings, rotors and drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and drums from the overheat-cool down process. In most cases, the rotors, drums, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors and drums to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

Common causes of brake drag are:

- Seized or improperly adjusted parking brake cables.
- Loose/worn wheel bearing.
- Seized caliper or wheel cylinder piston.
- Caliper binding on corroded bushings or rusted slide surfaces.
- Loose caliper mounting bracket.

DIAGNOSIS AND TESTING (Continued)

- Drum brakeshoes binding on worn/damaged support plates.
- Misassembled components.

If brake drag occurs at all wheels, the problem may be related to a blocked master cylinder return port, or faulty power booster (binds-does not release).

BRAKE FADE

Brake fade is a usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty adapter/caliper slide surfaces
- Improper brakeshoes
- Damaged rotor

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE GRAB OR PULL

Rear grab or pull is usually caused by improperly adjusted or seized parking brake cables, contaminated lining, bent or binding shoes and support plates, or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder, proportioning valve, or RWAL valve could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and/or replacement will be necessary.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brakeshoes in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors and drums can become so scored that replacement is necessary.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components. However, calipers that bind on the slide surfaces can generate a thump or clunk noise. In addition, worn out, improperly adjusted, or improperly assembled rear brakeshoes can also produce a thump noise.

BRAKELINING CONTAMINATION

Brakelining contamination is mostly a product of leaking calipers or wheel cylinders, worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibra-

DIAGNOSIS AND TESTING (Continued)

tion and wheel tramp and generate shudder during brake operation. A tire with internal damage such as a severe bruise, cut, or ply separation can cause pull and vibration.

STOP LAMP SWITCH

NOTE: For fuse and wiring location and color refer to Group 8W.

The stop lamp switch has a 12 volt feed circuit from the fuse block. Verify fuse is OK, then check the feed from the fuse block to the switch. If the switch has 12 volts depress the brake pedal and check for voltage to the stop lamp circuit. If no voltage is present the switch must be replaced. If the switch does not have 12 volts from the fuse block check for continuity between the fuse block the switch and repair as necessary.

RED BRAKE WARNING LAMP

The red brake warning light will illuminate under the following conditions:

- for 2-3 seconds at startup as part of normal bulb check
- when parking brakes are applied
- low pedal caused by leak in front/rear brake hydraulic circuit

If the red light remains on after startup, first verify that the parking brakes are fully released. Then check pedal action and fluid level. A red light plus low pedal indicates the pressure differential switch and valve have been actuated due to a system leak.

On models with ABS brakes, the amber warning light only illuminates when an ABS malfunction has occurred. The ABS light operates independently of the red warning light.

For addition information refer to Group 8W.

MASTER CYLINDER/POWER BOOSTER TEST

(1) Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding.

(2) Stop engine and shift transmission into Neutral.

(3) Pump brake pedal until all vacuum reserve in booster is depleted.

(4) Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away master cylinder is faulty (internal leakage).

(5) Start engine and note pedal action it should falls away slightly under light foot pressure then holds firm. If no pedal action is discernible, power booster or vacuum check valve is faulty.

(6) Rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and immediately stop turn off ignition to stop engine.

(7) Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, booster is faulty.

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

(2) Remove check valve and valve seal from booster.

(3) Use a hand operated vacuum pump for test.

(4) Apply 15-20 inches vacuum at large end of check valve (Fig. 7).

(5) Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve is faulty and should be replaced.

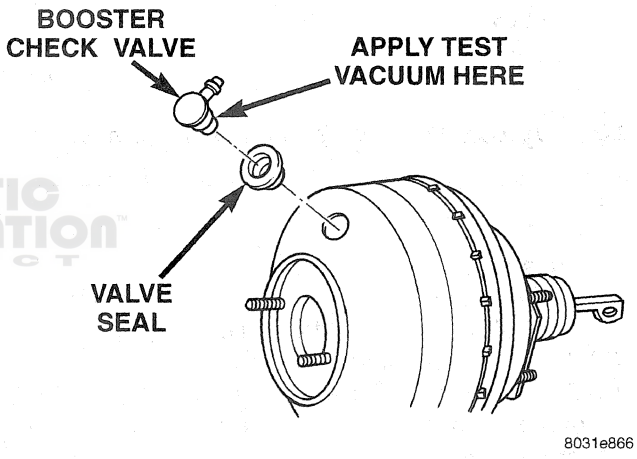


Fig. 7 Vacuum Check Valve And Seal

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 8).

(2) Start and run engine at curb idle speed for one minute.

(3) Clamp hose shut between vacuum source and check valve.

(4) Stop engine and observe vacuum gauge.

(5) If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm or check valve is faulty.

COMBINATION VALVE

Metering Valve

Metering valve operation can be checked visually and with the aid of a helper. Observe the metering valve stem while a helper applies and releases the brakes. If the valve is operating correctly, the stem will extend slightly when the brakes are applied and retract when the brakes are released. If the valve is

DIAGNOSIS AND TESTING (Continued)

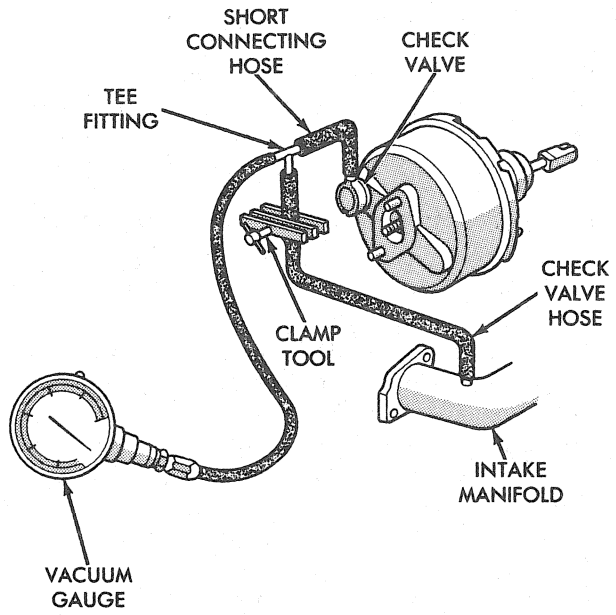


Fig. 8 Typical Booster Vacuum Test Connections

faulty, replace the entire combination valve as an assembly.

Pressure Differential Switch

(1) Have helper sit in drivers seat to apply brake pedal and observe red brake warning light.

(2) Raise vehicle on hoist.

(3) Connect bleed hose to a rear wheel cylinder and immerse hose end in container partially filled with brake fluid.

(4) Have helper press and hold brake pedal to floor and observe warning light.

(a) If warning light illuminates, switch is operating correctly.

(b) If light fails to illuminate, check circuit fuse, bulb and wiring. Repair as necessary and repeat test steps.

(5) If warning light still fails to illuminate, check brakelight and parking brake switches and wiring with test lamp. Repair or replace parts as necessary and test differential pressure switch operation again.

(6) If warning light still does not illuminate, switch is faulty. Replace combination valve assembly, bleed brake system and verify proper switch and valve operation.

DISC BRAKE ROTOR

The rotor braking surfaces should not be refinished unless necessary.

Light surface rust and scale can be removed with a lathe equipped with dual sanding discs. The rotor surfaces can be restored by machining in a disc brake lathe if surface scoring and wear are light.

Replace the rotor under the following conditions:

- severely scored
- tapered
- hard spots
- cracked
- below minimum thickness

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brakeshoe contact surface. Replace the rotor if worn below minimum thickness, or if machining would reduce thickness below the allowable minimum.

Rotor minimum thickness is usually specified on the rotor hub. The specification is either stamped or cast into the hub surface.

ROTOR RUNOUT

Check rotor lateral runout with dial indicator C-3339 (Fig. 9). Excessive lateral runout will cause brake pedal pulsation and rapid, uneven wear of the brakeshoes. Position the dial indicator plunger approximately 25.4 mm (1 in.) inward from the rotor edge.

NOTE: Be sure wheel bearing has zero end play before checking rotor runout.

Maximum allowable rotor runout is 0.102 mm (0.004 in.).

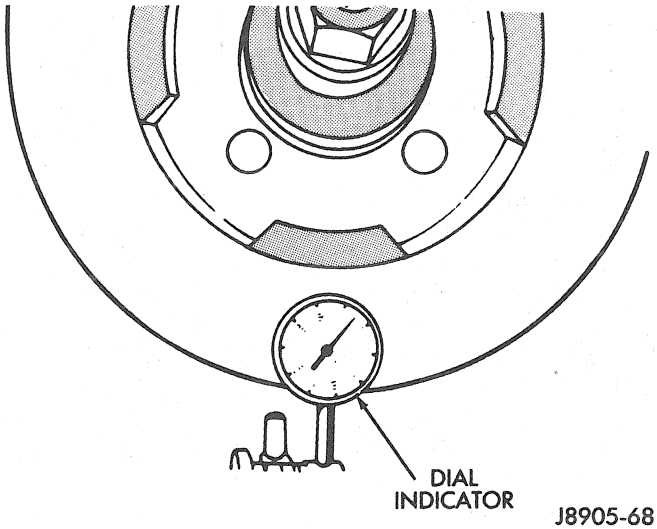


Fig. 9 Checking Rotor Runout And Thickness Variation

ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at 6-to-12 points around the rotor face (Fig. 10).

Position the micrometer approximately 25.4 mm (1 in.) from the rotor outer circumference for each measurement.

DIAGNOSIS AND TESTING (Continued)

Thickness should not **vary** by more than 0.013 mm (0.0005 in.) from point-to-point on the rotor. Machine or replace the rotor if necessary.

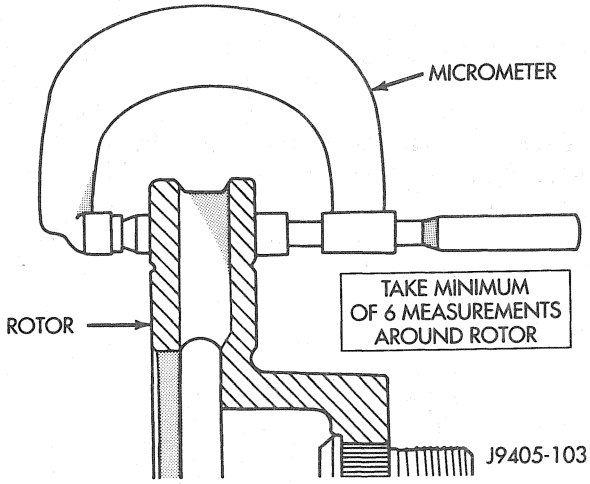


Fig. 10 Measuring Rotor Thickness

BRAKE DRUM

The maximum allowable diameter of the drum braking surface is stamped or cast into the drum outer edge. Generally, a drum can be machined to a maximum of 1.52 mm (0.060 in.) oversize. Always replace the drum if machining would cause drum diameter to exceed the size limit indicated on the drum.

BRAKE DRUM RUNOUT

Measure drum diameter and runout with an accurate gauge. The most accurate method of measurement involves mounting the drum in a brake lathe and checking variation and runout with a dial indicator.

Variations in drum diameter should not exceed 0.076 mm (0.003 in.). Drum runout should not exceed 0.20 mm (0.008 in.) out of round. Machine the drum if runout or variation exceed these values. Replace the drum if machining causes the drum to exceed the maximum allowable diameter.

BRAKE LINE AND HOSES

Flexible rubber hose is used at both front brakes and at the rear axle junction block. Inspect the hoses whenever the brake system is serviced, at every engine oil change, or whenever the vehicle is in for service.

Inspect the hoses for surface cracking, scuffing, or worn spots. Replace any brake hose immediately if the fabric casing of the hose is exposed due to cracks or abrasions.

Also check brake hose installation. Faulty installation can result in kinked, twisted hoses, or contact with the wheels and tires or other chassis components. All of these condition can lead to scuffing, cracking and eventual failure.

The steel brake lines should be inspected periodically for evidence of corrosion, twists, kinks, leaks, or other damage. Heavily corroded lines will eventually rust through causing leaks. In any case, corroded or damaged brake lines should be replaced.

Factory replacement brake lines and hoses are recommended to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that brake line and hose mating surfaces are clean and free from nicks and burrs. Also remember that right and left brake hoses are not interchangeable.

Use new copper seal washers at all caliper connections. Be sure brake line connections are properly made (not cross threaded) and tightened to recommended torque.

BRAKE FLUID CONTAMINATION DETECTION PROCEDURE

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil contamination.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit and all hydraulic fluid hoses.

SERVICE PROCEDURES

BRAKE FLUID LEVEL

Always clean the master cylinder reservoir and cap before adding fluid. This will prevent dirt from falling in the reservoir and contaminating the brake fluid.

The reservoir has a ADD and a FULL mark on the side (Fig. 11) fill to the FULL mark.

MASTER CYLINDER

A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

BLEEDING PROCEDURE

(1) Mount master cylinder in vise.

(2) Attach bleed tubes to cylinder outlet ports. Then position each tube end in matching reservoir fluid compartment (Fig. 12).

(3) Fill reservoir with fresh brake fluid.

SERVICE PROCEDURES (Continued)

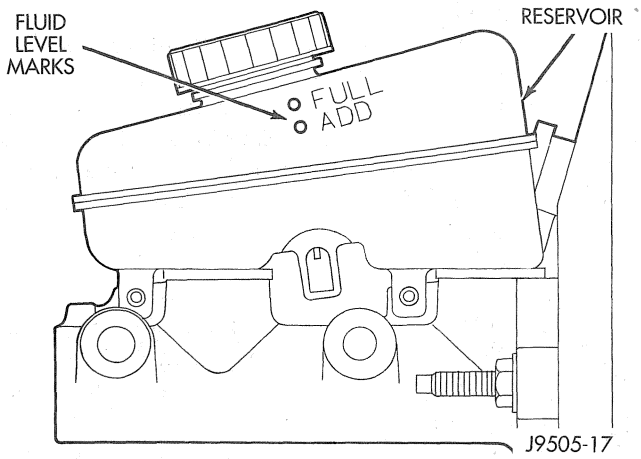


Fig. 11 Master Cylinder Fluid Level

(4) Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

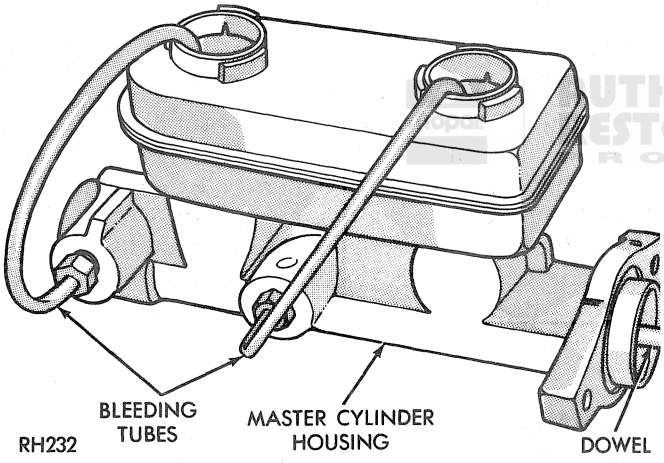


Fig. 12 Master Cylinder Bleeding

BRAKE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

The Brakes should be bled in sequence. First the right rear wheel then the left rear wheel. Then move to the front brakes and bleed the right front wheel then the left front wheel.

MANUAL BLEEDING

(1) Remove reservoir filler caps and fill reservoir with Mopar, or equivalent quality DOT 3 brake fluid.

(2) If calipers, or wheel cylinders were overhauled, open all caliper and wheel cylinder bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.

(3) Attach one end of bleed hose to bleed screw and insert opposite end in glass container partially filled with brake fluid (Fig. 13). Be sure end of bleed hose is immersed in fluid.

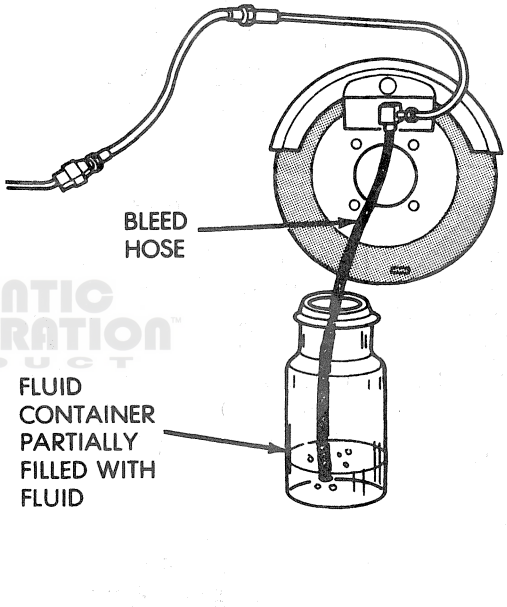


Fig. 13 Typical Fluid Container And Bleed Hose Setup

(4) Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.

DISC ROTOR MACHINING

Rotor braking surfaces can be sanded or machining in a disc brake lathe.

The lathe must machine both sides of the rotor simultaneously with dual (two) cutter heads (Fig. 14). Equipment capable of machining only one side at a time will produce a tapered rotor.

The lathe should also be equipped with a grinder attachment or dual sanding discs for final cleanup or light refinishing (Fig. 14).

If the rotor surfaces only need minor cleanup of rust, scale, or minor scoring, use abrasive discs to

SERVICE PROCEDURES (Continued)

clean up the rotor surfaces. However, when a rotor is scored or worn, machining with cutting tools will be required.

CAUTION: Do not machine the rotor if it will cause the rotor to fall below minimum allowable thickness.

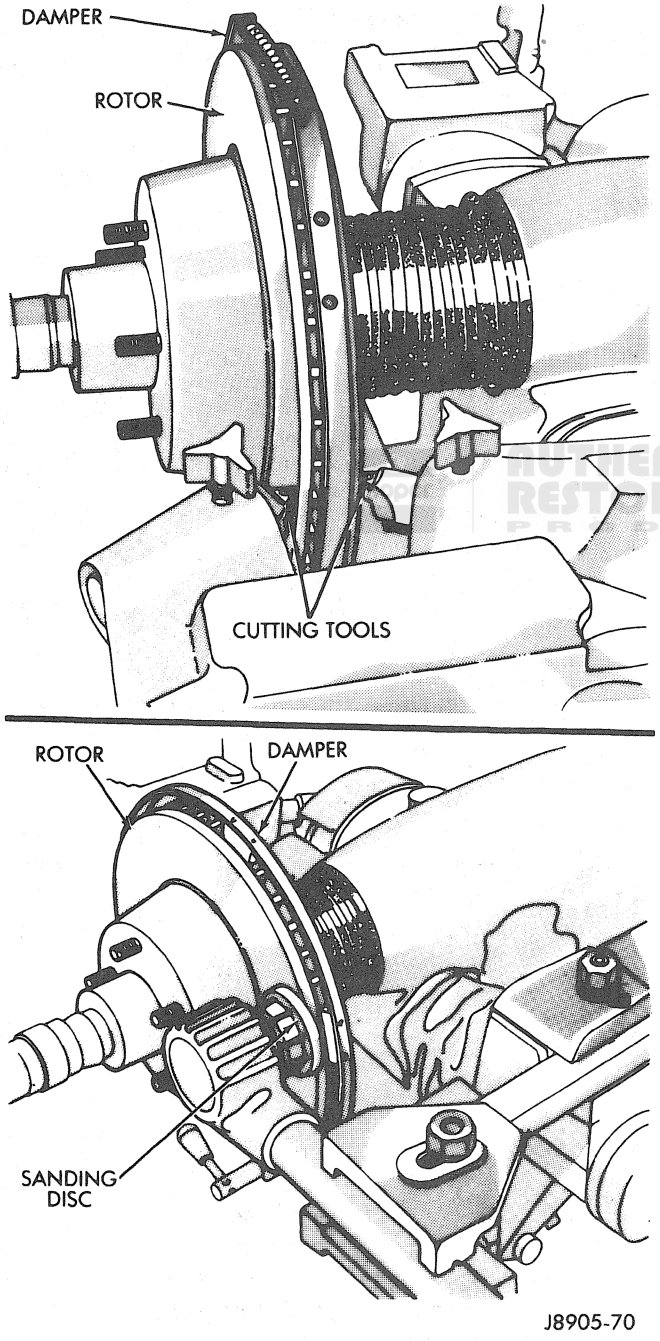


Fig. 14 Rotor Refinishing

BRAKE DRUM MACHINING

The brake drums can be machined on a drum lathe when necessary. Initial machining cuts should be limited to 0.12 - 0.20 mm (0.005 - 0.008 in.) at a time as heavier feed rates can produce taper and surface variation. Final finish cuts of 0.025 to 0.038 mm (0.001 to 0.0015 in.) are recommended and will generally provide the best surface finish.

Be sure the drum is securely mounted in the lathe before machining operations. A damper strap should always be used around the drum to reduce vibration and avoid chatter marks.

The maximum allowable diameter of the drum braking surface is stamped or cast into the drum outer edge. Always replace the drum if machining would cause drum diameter to exceed the size limit indicated on the drum.

BRAKE LINE

Mopar preformed metal brake line is recommended and preferred for all repairs. However, double-wall steel line can be used for emergency repair when factory replacement parts are not readily available.

Special, heavy duty tube bending and flaring equipment is required to prepare double wall brake line. Special bending tools are needed to avoid kinking or twisting metal brake line. In addition, special flaring tools are needed to provide the inverted-type, double flare required on metal brake lines.

FLARING PROCEDURE

(1) Cut off damaged tube with Tubing Cutter.

(2) Ream cut edges of tubing to ensure proper flare.

(3) Install replacement tube nut on section of tube to be repaired.

(4) Insert tube in flaring tool. Center tube in area between vertical posts.

(5) Place gauge form A over the end of the tube.

(6) Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.

(7) Squeeze flaring tool jaws to lock tubing in place.

(8) Insert plug on gauge A in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc (Fig. 15).

(9) Tighten tool handle until plug gauge is seated on jaws of flaring tool. This will start the inverted flare.

(10) Remove the plug gauge and complete the inverted flare.

(11) Remove the flaring tools and verify that the inverted flare is correct.

REMOVAL AND INSTALLATION (Continued)

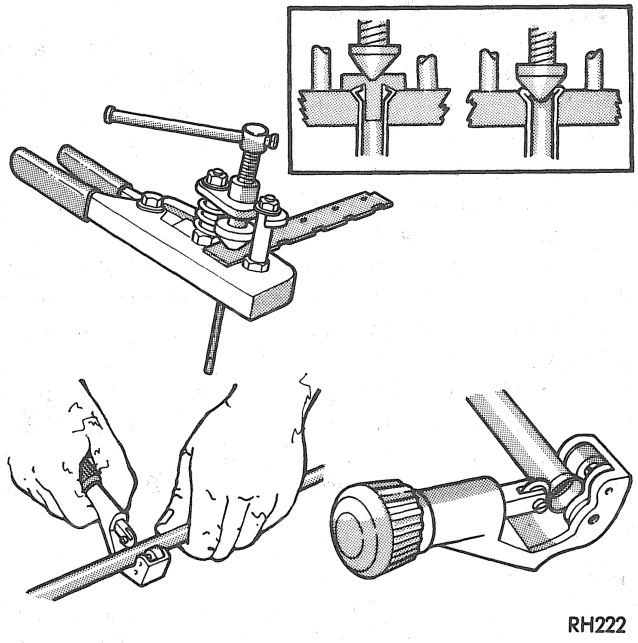


Fig. 15 Inverted Flare Tools

REMOVAL AND INSTALLATION

STOP LAMP SWITCH

The stop lamp switch is mounted in the pedal support bracket and is operated by the pedal. The switch is secured in the bracket with a retainer (Fig. 16).

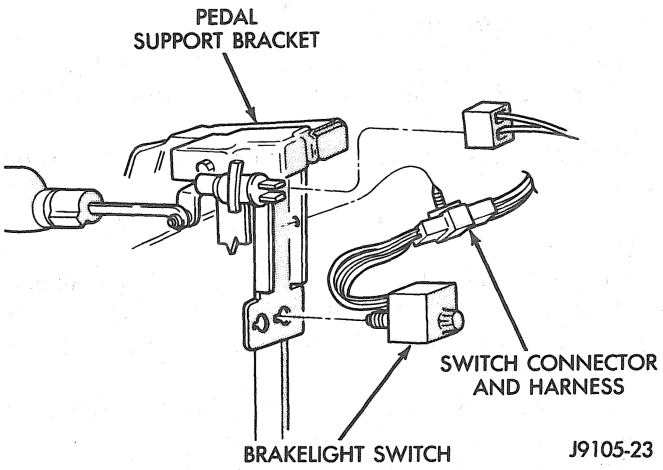


Fig. 16 Stop Lamp Switch Mounting

REMOVAL

(1) Remove steering column cover and lower trim panel for switch access, if necessary.

(2) Disconnect switch wire harness.

(3) Thread switch out of retainer, or rock switch up/down and pull it rearward out of retainer.

(4) Inspect switch retainer, if equipped. Replace retainer if worn, distorted, loose, or damaged.

INSTALLATION

(1) Insert replacement switch in retainer. Thread switch into place or rock it up/down until switch plunger touches brake pedal. Insert switch in bracket and thread clip onto plunger to secure switch.

(2) Connect switch wires.

(3) Verify switch operation and adjust switch if necessary.

(4) Install trim panels (if removed).

BRAKE PEDAL

REMOVAL

(1) Remove lower trim panel and A/C duct if necessary.

(2) Remove steering column lower trim panel and bezel.

(3) Remove necessary dash panel-to-instrument panel brace rods.

(4) Disconnect and remove brake lamp switch.

(5) Remove retainer clip securing booster push rod to pedal (Fig. 17).

(6) Remove nut securing pedal shaft in support bracket.

(7) Slide pedal shaft outward for clearance and remove brake pedal.

(8) Remove pedal bushings if they are to be replaced.

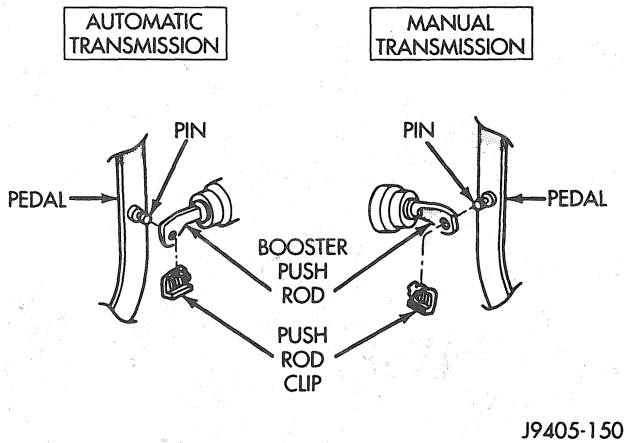


Fig. 17 Push Rod Attachment

INSTALLATION

(1) Install new bushings in pedal. Lubricate bushings and pivot pin with Mopar multi mileage grease.

(2) Position pedal, sleeve and spacer(s) in bracket and install pivot pin.

(3) Install new nut on pivot pin. **Pivot pin nut is specially formed and should not be reused. Be sure to install new nut to secure pin.**

(4) Tighten new pivot pin nut to 27 N·m (20 ft. lbs.) on models with manual transmission. Tighten

REMOVAL AND INSTALLATION (Continued)

nut to 35 N·m (26 ft. lbs.) on models with automatic transmission.

(5) Install booster push rod on pedal pin and install new retainer clip.

(6) Install and connect stop lamp switch.

(7) Install dash brace rod, if equipped.

(8) Install instrument panel and steering column trim covers.

COMBINATION VALVE

The combination valve is not repairable. The valve is serviced as an assembly only.

REMOVAL

(1) Remove air cleaner cover and hose for access to valve.

(2) Unsnap connector lock tabs and disconnect differential pressure switch wire at combination valve (Fig. 18). Do not pull switch wire to disconnect.

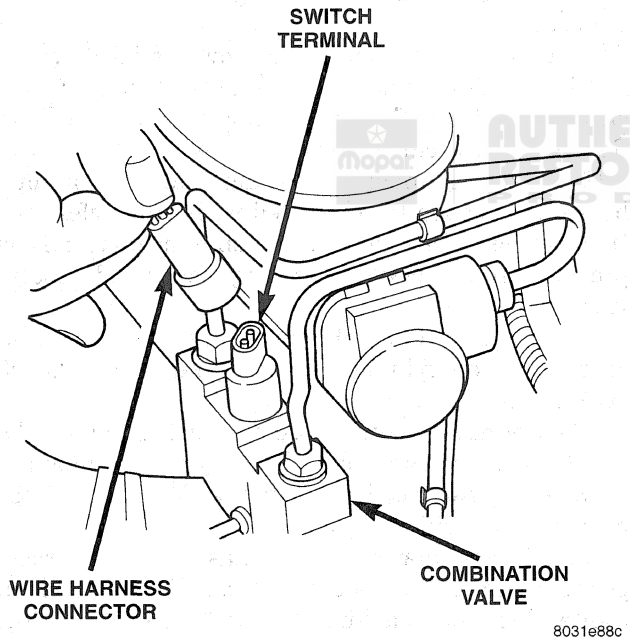


Fig. 18 Differential Pressure Switch

(3) Disconnect brakelines at combination valve (Fig. 19).

(4) Remove mounting nut and remove valve.

INSTALLATION

(1) Install valve and tighten mounting nut to 17 N·m (155 in. lbs.).

(2) Connect brakelines to replacement valve. Start line fittings by hand to avoid cross threading.

(3) Tighten brakeline fittings to 18-24 N·m (160-210 in. lbs.).

(4) Connect wire to pressure differential switch.

(5) Bleed brakes.

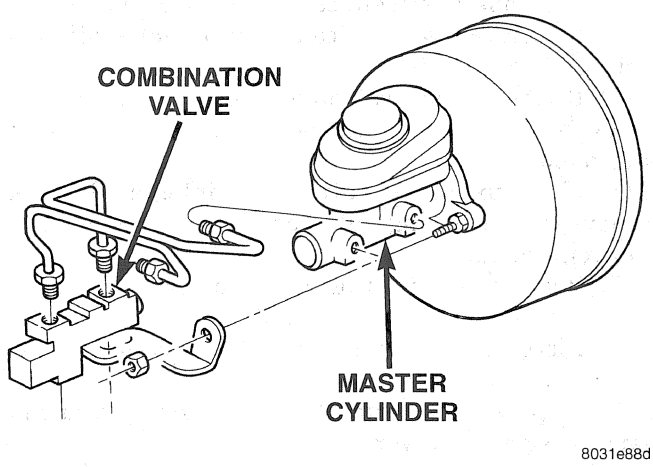


Fig. 19 Combination Valve

MASTER CYLINDER

REMOVAL

(1) Remove air cleaner hose, cover and housing.

(2) Disconnect brake lines at master cylinder and combination valve.

(3) Remove nuts attaching master cylinder to booster studs.

(4) Remove master cylinder.

(5) Remove cylinder cover and drain fluid.

(6) If master cylinder reservoir requires service, refer to reservoir replacement procedure in this section.

INSTALLATION

Bleed master cylinder on bench before installation, refer to Service Procedures.

(1) Remove protective sleeve from primary piston shank on new master cylinder.

(2) Check condition of seal at rear of cylinder body. Reposition seal if dislodged. Replace seal if cut, or torn.

(3) Clean cylinder mounting surface of brake booster.

(4) Install master cylinder onto brake booster studs.

(5) Install mounting nuts and tighten to 25 N·m (220 in. lbs.).

(6) Connect brakelines to master cylinder and combination valve.

(7) Fill and bleed brake system.

POWER BRAKE BOOSTER

REMOVAL

(1) Disconnect vent and vacuum hose from engine air cleaner cover.

(2) Remove engine air cleaner cover, filter, housing and hoses.

REMOVAL AND INSTALLATION (Continued)

(3) Disconnect brakelines at master cylinder.
(4) Disconnect wire at combination valve differential pressure switch.
(5) If combination valve does not have an integral bracket, disconnect brakelines at combination valve and remove valve.
(6) If combination valve has integral bracket, remove nut attaching valve bracket to booster studs and remove valve.
(7) Remove nuts attaching master cylinder to booster studs and remove cylinder.
(8) Disconnect vacuum hose from booster check valve.
(9) In passenger compartment, remove instrument panel lower trim cover.
(10) Remove retaining clip that secures booster push rod to brake pedal (Fig. 20).

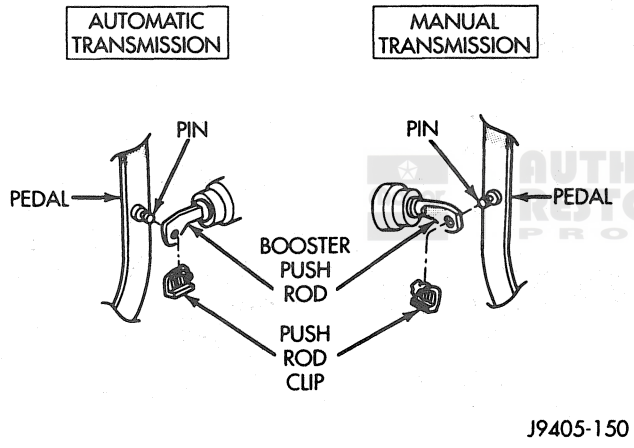


Fig. 20 Push Rod & Clip

(11) Remove nuts attaching booster to passenger compartment side of dash panel (Fig. 21).

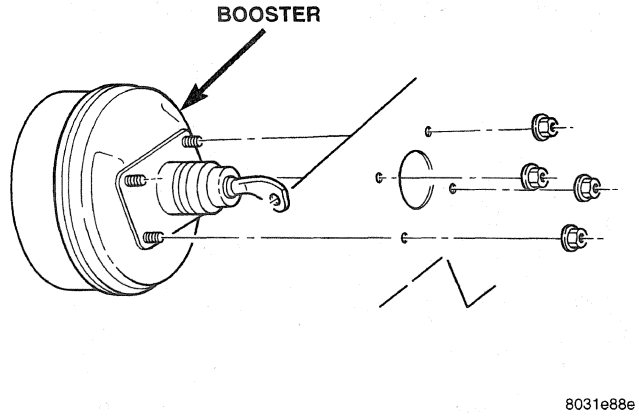


Fig. 21 Booster Mounting Nuts

(12) In engine compartment, slide booster studs out of dash panel, tilt booster upward, and remove booster from engine compartment.
(13) Remove dash seal from booster.
(14) If booster is only being removed for access to other components, cover booster front opening with clean shop towel.

INSTALLATION

(1) If original booster is being installed, test check valve with vacuum tool before booster installation. Replace check valve if it will not hold vacuum.
(2) Install dash seal on booster.
(3) Align and position booster on dash panel.
(4) In passenger compartment, install nuts that attach booster to dash panel. Tighten nuts just enough to hold booster in place.
(5) Slide booster push rod onto brake pedal. Then secure push rod to pedal pin with retaining clip.
(6) Tighten booster attaching nuts to 41 N·m (30 ft. lbs.).
(7) Install instrument panel lower trim cover.
(8) If original master cylinder is being installed, check condition of seal at rear of master cylinder. Replace seal if cut, or torn.
(9) Clean cylinder mounting surface of brake booster. Use shop towel wetted with brake cleaner for this purpose. Dirt, grease, or similar materials will prevent proper cylinder seating and could result in vacuum leak.
(10) Align and install master cylinder on booster studs. Tighten cylinder attaching nuts to 13-25 N·m (115-220 in. lbs.).
(11) Connect vacuum hose to booster check valve.
(12) Connect and secure brakelines to combination valve and master cylinder. Start all brakeline fittings by hand to avoid cross threading.
(13) If combination valve has integral bracket, position bracket on booster studs. Then install and tighten bracket attaching nuts to 13-25 N·m (115-220 in. lbs.).
(14) Connect wire to combination valve switch.
(15) Top off master cylinder fluid level and bleed brakes.
(16) Install engine air cleaner and hoses.
(17) Verify proper brake operation before moving vehicle.

DISC BRAKE CALIPER

REMOVAL

(1) Raise vehicle and remove front wheel and tire assemblies.
(2) Remove and discard brake hose mounting bolt (Fig. 22).
(3) Remove caliper mounting bolts.

REMOVAL AND INSTALLATION (Continued)

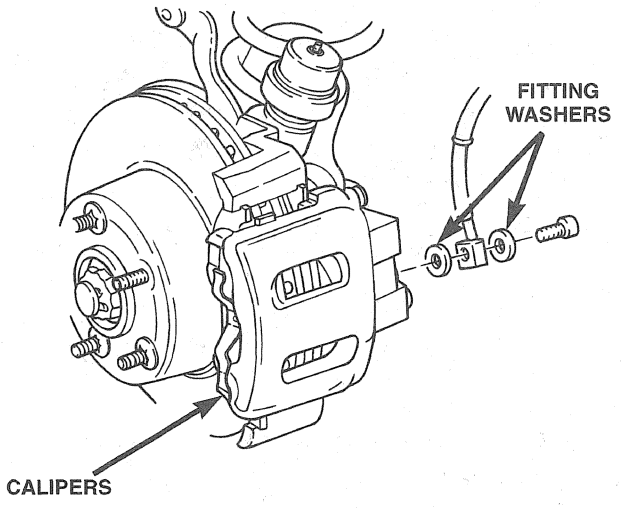


Fig. 22 Brake Hose And Bolt

(4) Rotate caliper rearward with pry tool if necessary. Then rotate caliper and brakeshoes off mounting ledges.

(5) Remove caliper from vehicle.

INSTALLATION

(1) Install brakeshoes in caliper.

(2) Connect brake hose to caliper but do not tighten fitting bolt completely at this time. **Be sure to use new gaskets on bolt to avoid leaks**

(3) Install caliper. Position mounting notches at lower end of brakeshoes on bottom mounting ledge. Then rotate caliper over rotor and seat notches at upper end of shoes on mounting ledge.

(4) Coat caliper mounting bolts with GE 661 or Dow 111 silicone grease. Then install and tighten bolts to 10-20 N·m (7-15 ft. lbs.).

CAUTION: If new caliper bolts are being installed, or if the original reason for repair was a drag/pull condition, check caliper bolt length before proceeding. If the bolts have a shank length greater than 67.6 mm (2.66 in.), they may contact the inboard brakeshoe causing a partial apply condition. Refer to Figure 14 for the required caliper bolt length.

(5) Position front brake hose clear of all chassis components and tighten caliper fitting bolt to 31 N·m (23 ft. lbs.).

CAUTION: Be sure the brake hose is not twisted or kinked at any point. Also be sure the hose is clear of all steering and suspension components. Loosen and reposition the hose if necessary.

(6) Install wheel and tire assembly.

(7) Fill master cylinder and bleed brake system.

DISC BRAKESHOE

REMOVAL

(1) Raise vehicle and remove front wheel and tire assemblies.

(2) Drain small amount of fluid from master cylinder front brake reservoir with suction gun.

(3) Bottom caliper piston in bore with C-clamp. Position clamp screw on outboard brakeshoe and clamp frame on rear of caliper. Typical C-clamp attachment is shown in (Fig. 23). **Do not allow clamp screw to bear directly on outboard shoe retainer spring. Use wood or metal spacer between shoe and clamp screw if necessary.**

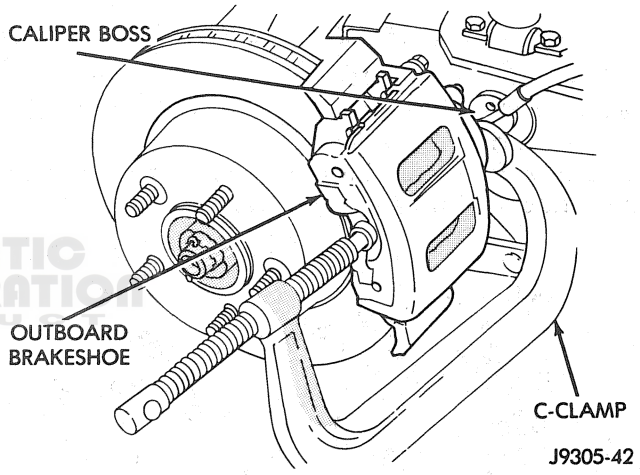


Fig. 23 Bottoming Caliper Piston With C-Clamp

(4) Remove caliper mounting bolts (Fig. 24).

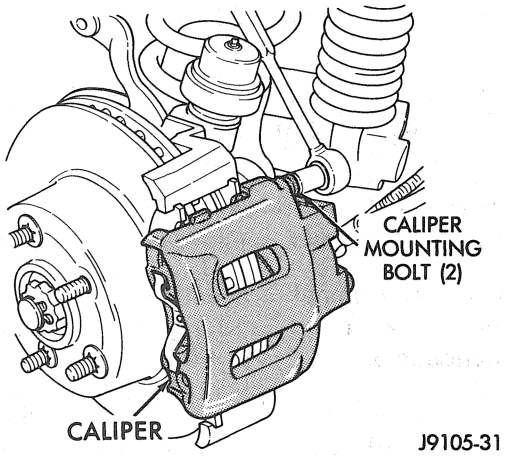


Fig. 24 Caliper Mounting Bolts

REMOVAL AND INSTALLATION (Continued)

(5) Tilt top of caliper outward with pry tool if necessary (Fig. 25) and remove caliper.

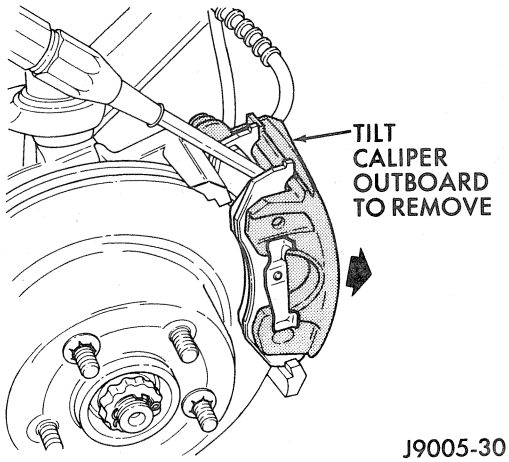


Fig. 25 Caliper Removal

(6) Remove outboard shoe by pressing one end of shoe inward to disengage shoe lug. Then rotate shoe upward until retainer spring clears caliper. Press opposite end of shoe inward to disengage shoe lug and rotate shoe up and out of caliper (Fig. 26).

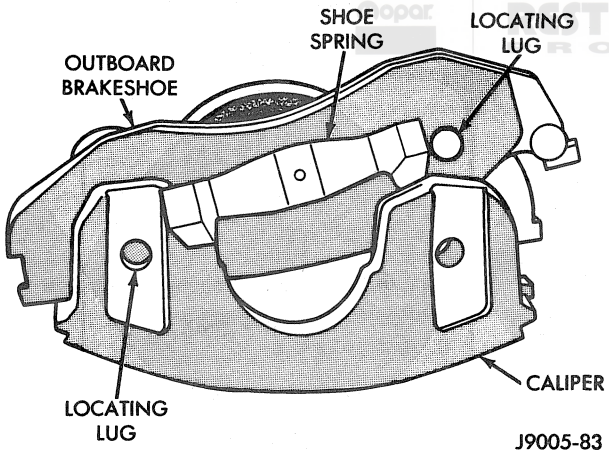


Fig. 26 Outboard Brakeshoe Removal

(7) Remove inboard shoe. Grasp ends of shoe and tilt shoe outward to release springs from caliper piston (Fig. 27). Then remove shoe from caliper.

NOTE: If original brakeshoes will be used, keep them in sets (left and right); they are not interchangeable.

(8) Secure caliper to nearby suspension part with wire.**Do not allow brake hose to support caliper weight.**

(9) Wipe caliper off with shop rags or towels. **Do not use compressed air. Compressed air can unseat dust boot and force dirt into piston bore.**

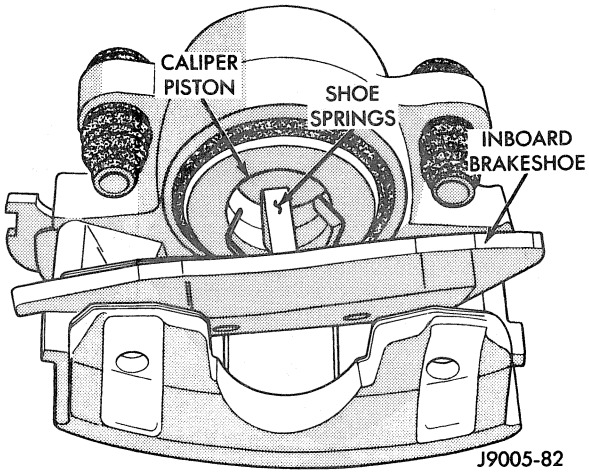


Fig. 27 Inboard Brakeshoe Removal

INSTALLATION

(1) Clean brakeshoe mounting ledge slide surfaces of steering knuckle with wire brush. Then apply light coat of Mopar multi-mileage grease to slide surfaces. Lubricate mounting bolts and bushings with GE 661 or Dow 111 silicone grease (Fig. 28).

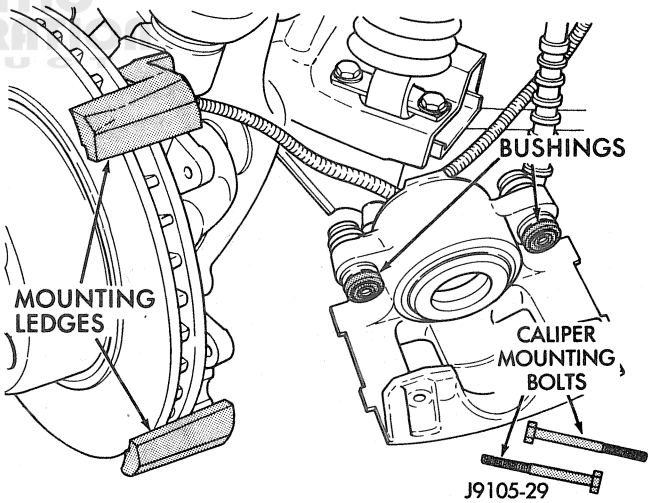


Fig. 28 Caliper Lubrication Points

(2) Install inboard shoe in caliper and verify shoe retaining springs are fully seated into the piston.

(3) Install outboard shoe in caliper by starting one end of shoe in caliper and rotating shoe downward into place. Verify shoe locating lugs and shoe spring are seated.

(4) Install caliper by position notches at lower end of brakeshoes on bottom mounting ledge. Then install caliper over rotor and seat upper ends of brakeshoes on top mounting ledge (Fig. 29).

CAUTION: Before securing the caliper, be sure the caliper brake hose is not twisted, kinked or touching any chassis components.

REMOVAL AND INSTALLATION (Continued)

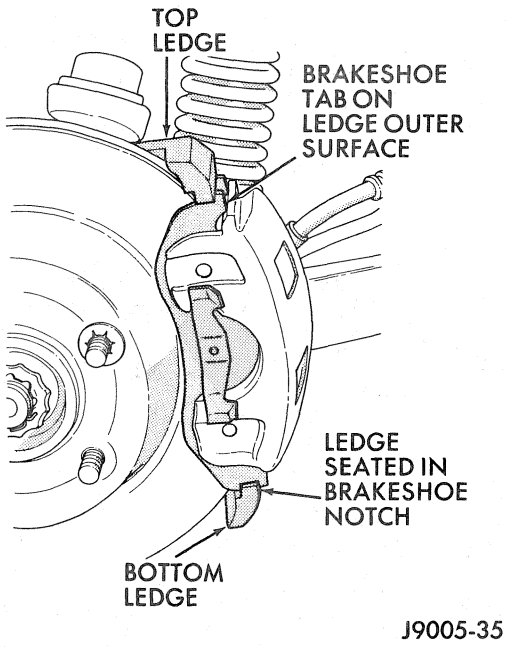


Fig. 29 Caliper Installation

(5) Install and tighten caliper mounting bolts to 10-20 N·m (7-15 ft. lbs.).

CAUTION: If new caliper bolts are being installed, or if reason for repair was a drag/pull condition, check caliper bolt length. If the bolts have a shank length greater than 67.6 mm (2.66 in.), they will contact the inboard brakeshoe causing a partial apply condition. Refer to (Fig. 30) for correct caliper bolt length.

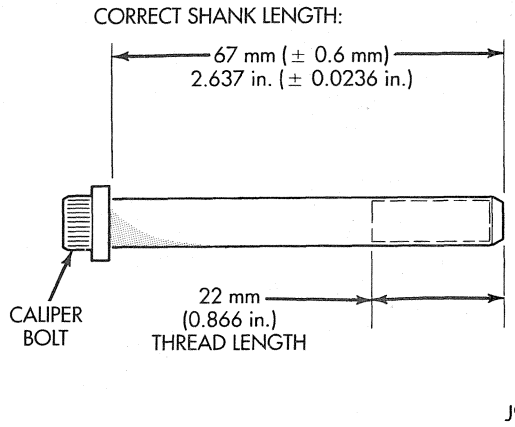


Fig. 30 Mounting Bolt Dimensions

(6) Install wheel and tire assemblies.

(7) Pump brake pedal until caliper pistons and brakeshoes are seated.

(8) Top off brake fluid level if necessary.

DISC BRAKE ROTOR

REMOVAL

(1) Remove wheel and tire assemble.

(2) Remove caliper.

(3) Remove retainers securing rotor to hub studs (Fig. 31).

(4) Remove rotor from hub.

(5) If rotor shield requires service, remove front hub and bearing assembly.

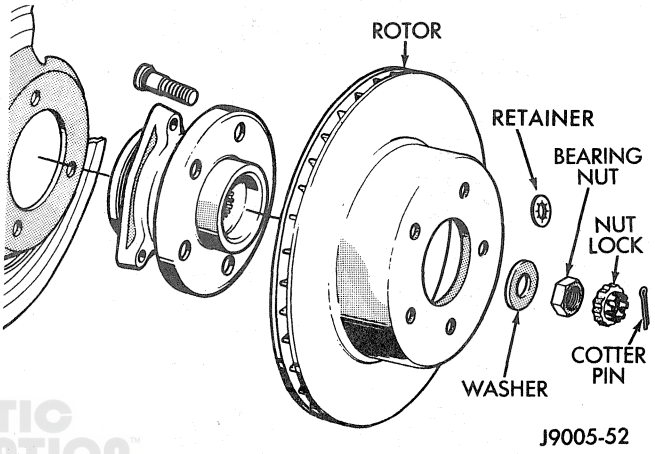


Fig. 31 Rotor & Hub

INSTALLATION

(1) If new rotor is being installed, remove protective coating from rotor surfaces with Mopar carb cleaner.

(2) Install rotor on hub.

(3) Install caliper.

(4) Install new spring nuts on wheel studs.

(5) Install wheel and tire assembly.

DRUM BRAKESHOES

REMOVAL

(1) Raise vehicle and remove rear wheels.

(2) Remove and discard spring nuts securing drums to wheel studs.

(3) Remove brake drums. If drums prove difficult to remove, retract brakeshoes. Remove access plug at the rear of backing plate and back off adjuster screw with brake tool and screwdriver.

(4) Remove U-clip and washer securing adjuster cable to parking brake lever (Fig. 32).

(5) Remove primary and secondary return springs from anchor pin with brake spring pliers.

(6) Remove hold-down springs, retainers and pins with standard retaining spring tool.

(7) Install spring clamps on wheel cylinders to hold pistons in place.

(8) Remove adjuster lever, adjuster screw and spring.

REMOVAL AND INSTALLATION (Continued)

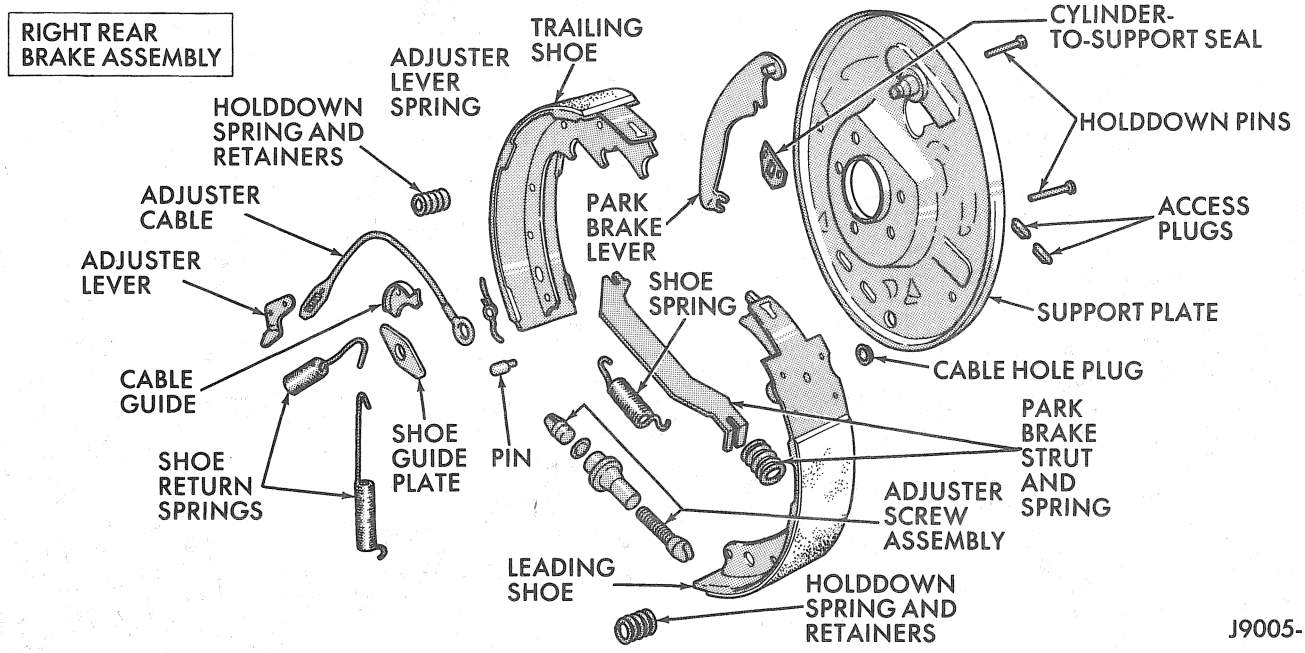


Fig. 32 Drum Brake Components—Typical

(9) Remove adjuster cable and cable guide.
(10) Remove brakeshoes and parking brake strut.
(11) Disconnect cable from parking brake lever and remove lever.

INSTALLATION

(1) Clean support plate with Mopar brake cleaner.
(2) If new drums are being installed, remove protective coating with Mopar Carb cleaner followed by final rinse with Mopar brake cleaner.
(3) Clean and lubricate anchor pin with light coat of Mopar multi-mileage grease.
(4) Apply Mopar multi-mileage grease to brakeshoe contact surfaces of support plate (Fig. 33).

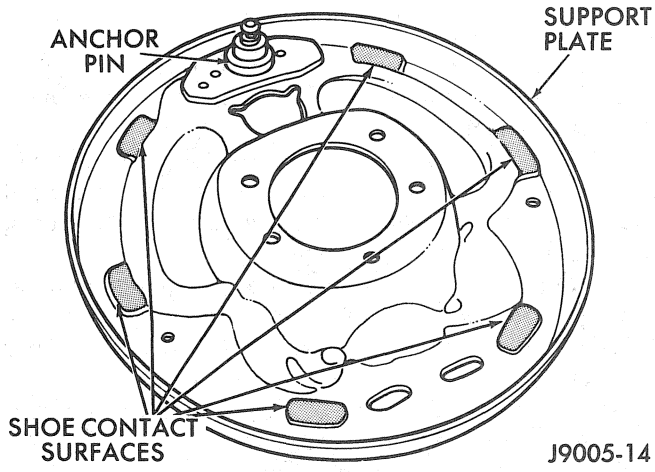


Fig. 33 Shoe Contact Surfaces

(5) Lubricate adjuster screw threads and pivot with Mopar spray lube.
(6) Attach parking brake lever to secondary brakeshoe. Use new washer and U-clip to secure lever.
(7) Remove wheel cylinder clamps.
(8) Attach parking brake cable to lever.
(9) Install brakeshoes on support plate. Secure shoes with new hold-down springs, pins and retainers.
(10) Install parking brake strut and spring.
(11) Install guide plate and adjuster cable on anchor pin.
(12) Install primary and secondary return springs.
(13) Install adjuster cable guide on secondary shoe.
(14) Lubricate and assemble adjuster screw.
(15) Install adjuster screw, spring and lever and connect to adjuster cable.
(16) Adjust shoes to drum.
(17) Install wheel/tire assemblies and lower vehicle.
(18) Verify firm brake pedal before moving vehicle.

WHEEL CYLINDER

REMOVAL

(1) Remove wheel and tire assembly.
(2) Remove brake drum.
(3) Disconnect wheel cylinder brakeline.
(4) Remove brakeshoe return springs and move shoes out of engagement with cylinder push rods.
(5) Remove cylinder attaching bolts and remove cylinder from support plate.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Apply bead of Mopar silicone sealer around cylinder mounting surface of support plate.
(2) Install cylinder mounting bolts and tighten to correct torque.
(3) Connect brake line to cylinder.
(4) Install brakeshoe return spring.
(5) Install brake drum.
(6) Install wheel and tire assembly.
(7) Bleed brake system.

BRAKE SUPPORT PLATE

REMOVAL

(1) Remove wheel and tire assembly and brake drum.
(2) Remove brakeshoe assembly.
(3) Remove parking brake cable from parking brake lever.
(4) Compress parking brake cable retainer tabs with a hose clamp (Fig. 34). Then push retainer and cable through and out of support plate.

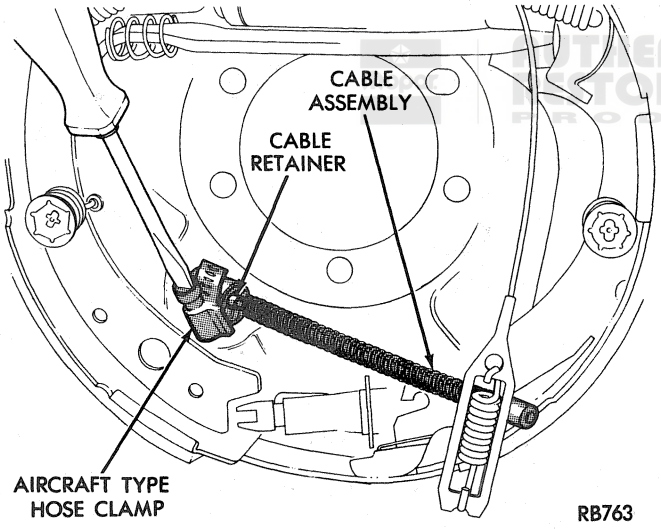


Fig. 34 Parking Brake Cable Removal

(5) Disconnect brake line at wheel cylinder.
(6) Remove wheel cylinder from support plate.
(7) Remove axle shaft, refer to Group 3 for procedures.
(8) Remove bolts attaching support plate to axle and remove support plate.

INSTALLATION

(1) Apply bead of Mopar silicone sealer around axle mounting surface of support plate.
(2) Install support plate on axle flange. Tighten attaching bolts to 47-81 N·m (35-60 ft. lbs.).
(3) Apply bead of Mopar silicone sealer around wheel cylinder mounting surface and install wheel cylinder.
(4) Install brakeline in wheel cylinder.
(5) Install parking brake cable in support plate.
(6) Install axle shaft, refer to Group 3 for procedure.
(7) Connect parking brake cable to lever on secondary shoe and install brakeshoes on support plate.
(8) Adjust brakeshoes to drum with brake gauge.
(9) Install brake drum and wheel and tire assembly.
(10) Bleed brake system.

REAR PARKING BRAKE CABLE

REMOVAL

(1) Raise vehicle and loosen equalizer nuts until rear cables are slack.
(2) Disengage cable from equalizer and remove cable clip and spring (Fig. 35).
(3) Remove rear wheel and brake drum.
(4) Remove secondary brakeshoe and disconnect cable from lever on brakeshoe.
(5) Compress cable retainer with worm drive hose clamp (Fig. 36) and remove cable from backing plate.

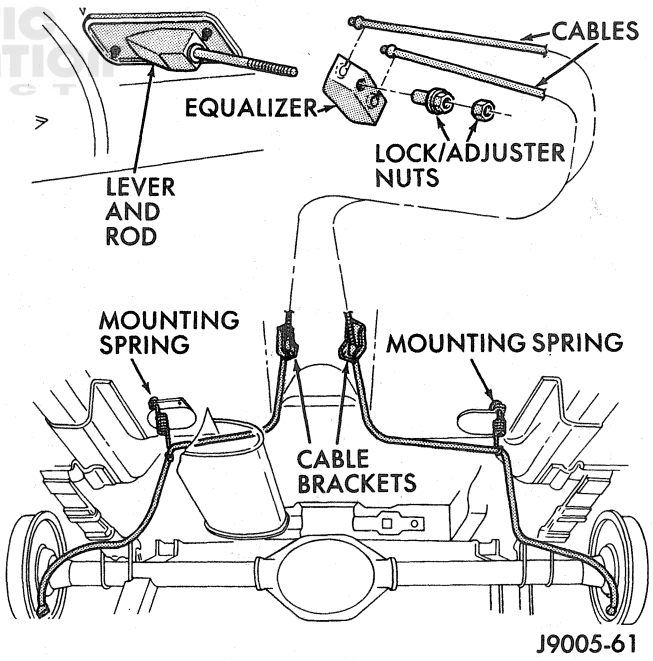


Fig. 35 Parking Brake Cables

INSTALLATION

(1) Install new cable in backing plate. Be sure cable retainer is seated.
(2) Attach cable to lever on brakeshoe and install brakeshoe on backing plate.
(3) Adjust brakeshoes to drum with brake gauge.
(4) Install brake drum and wheel.
(5) Engage cable in equalizer and install equalizer nuts.
(6) Adjust parking brakes.

REMOVAL AND INSTALLATION (Continued)

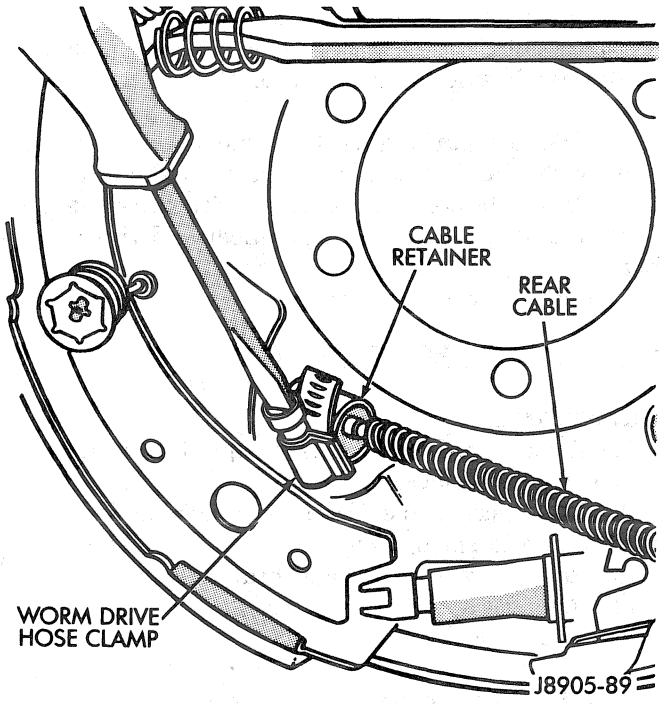


Fig. 36 Cable Retainer

PARKING BRAKE LEVER

The center console must be removed to service the parking brake lever. Refer to Group 23 Interior Components for service procedures.

REMOVAL

(1) Release parking brakes.
(2) Raise vehicle.
(3) Remove adjusting nut from tensioner rod at the equalizer (Fig. 37). Then secure equalizer and rear cables to chassis with wire.
(4) Remove nuts attaching lever support plate to underside of floorpan. Then move plate aside.
(5) Lower vehicle.
(6) Disconnect parking brake switch wire at switch (Fig. 38).
(7) Remove parking brake lever assembly from floorpan.
(8) Remove tensioner cover and boot.
(9) Remove E-clip and pin that connect tensioner to lever arm (Fig. 39).
(10) Remove lever attaching screws from floorpan.
(11) Remove lever assembly.
(12) Parking brake switch can be serviced at this time.

INSTALLATION

(1) Assemble lever and tensioner components. Be sure E-clip is fully seated in pin.
(2) Verify that tensioner boot is properly seated in cover.

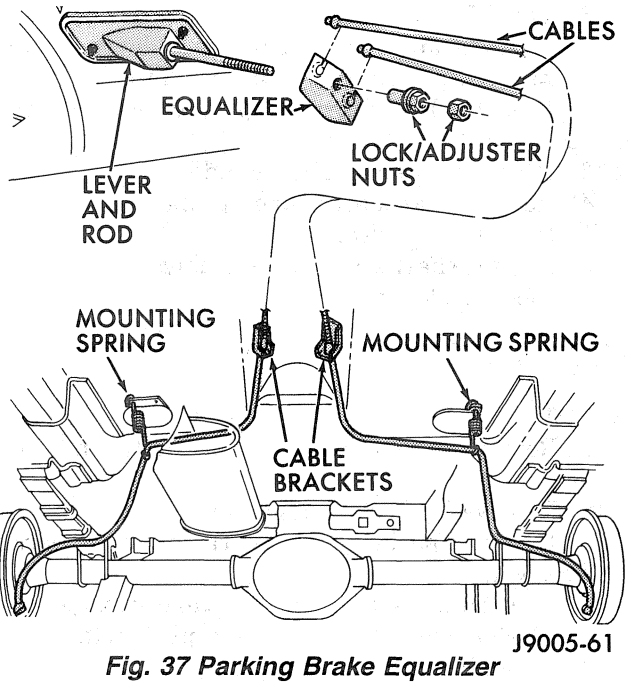


Fig. 37 Parking Brake Equalizer

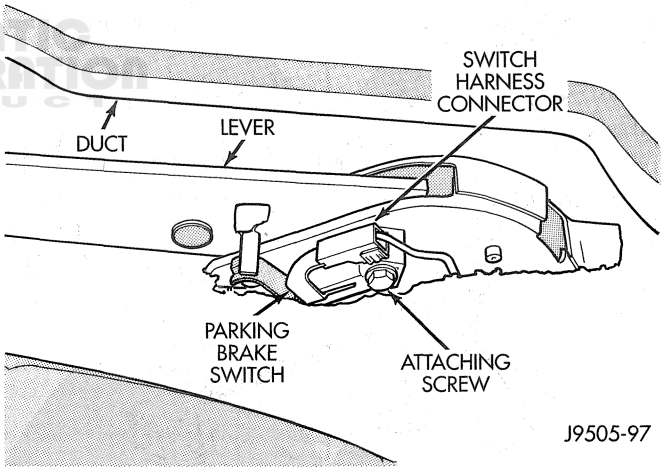


Fig. 38 Parking Brake Switch

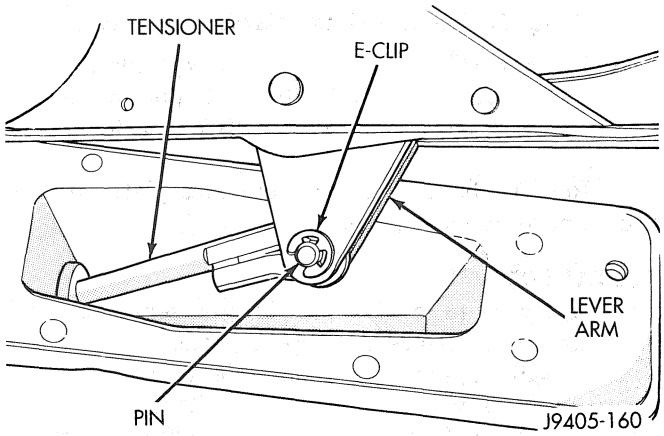


Fig. 39 Tensioner E-Clip

REMOVAL AND INSTALLATION (Continued)

(3) Position lever assembly on floorpan and install lever attaching screws/nuts. Also install parking brake switch if removed, or replaced.
(4) Raise vehicle.
(5) Insert cable tensioner rod in equalizer and install adjusting nut on tensioner rod.
(6) Install and tighten nuts that attach lever support plate to floorpan and lever screws.
(7) Adjust parking brakes. Refer to procedure in this section.
(8) Lower vehicle.
(9) Connect parking brake switch wire.
(10) Install lever trim cover, if equipped.
(11) Verify correct parking brake operation.

DISASSEMBLY AND ASSEMBLY

MASTER CYLINDER RESERVOIR

REMOVAL

(1) Remove reservoir cap and empty fluid into drain container.
(2) Remove pins that retain reservoir to master cylinder. Use hammer and pin punch to remove pins (Fig. 40).

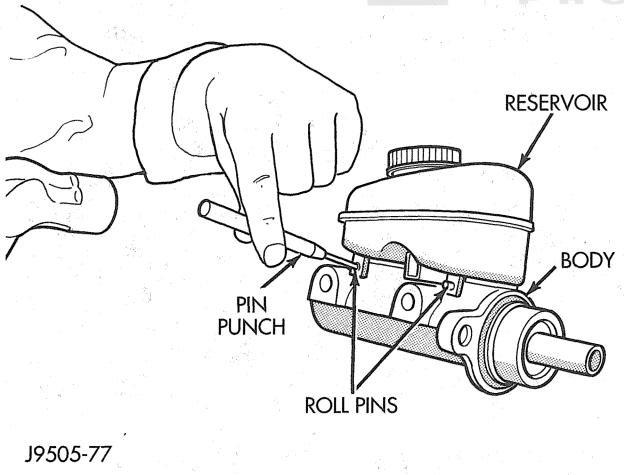


Fig. 40 Reservoir Retaining Pins

(3) Clamp cylinder body in vise with brass protective jaws.
(4) Loosen reservoir from grommets with pry tool (Fig. 41).
(5) Remove reservoir by rocking it to one side and pulling free of grommets (Fig. 42).
(6) Remove old grommets from cylinder body (Fig. 43).

INSTALLATION

CAUTION: Do not use any type of tool to install the grommets. Tools may cut, or tear the grommets creating a leak problem after installation. Install the grommets using finger pressure only.

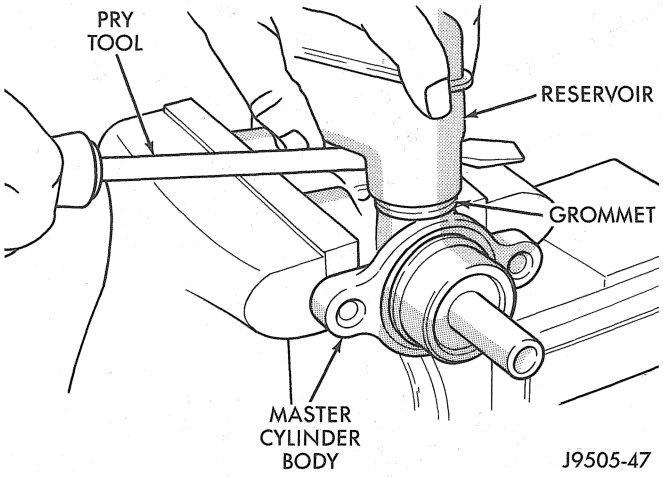


Fig. 41 Loosening Reservoir

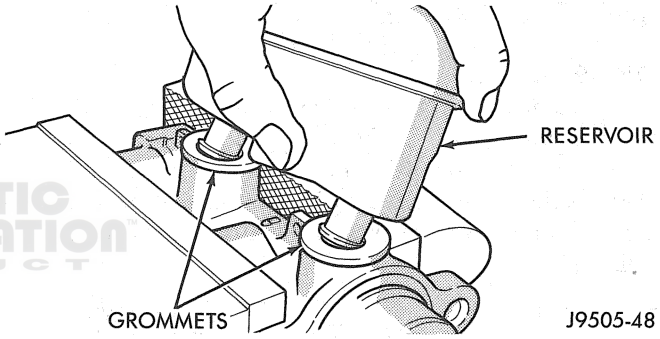


Fig. 42 Reservoir Removal

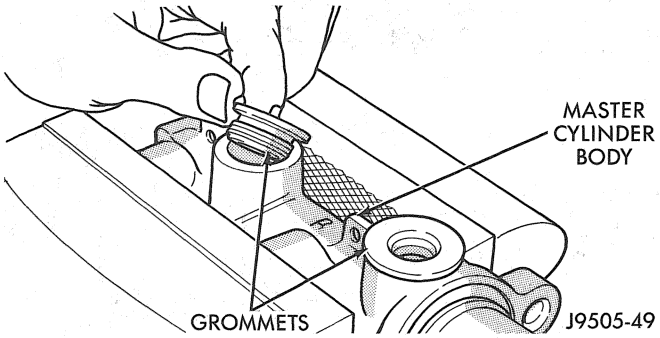


Fig. 43 Grommet Removal

(1) Lubricate new grommets with clean brake fluid and Install new grommets in cylinder body (Fig. 44). Use finger pressure to install and seat grommets.
(2) Start reservoir in grommets. Then rock reservoir back and forth while pressing downward to seat it in grommets.
(3) Install pins that retain reservoir to cylinder body.
(4) Fill and bleed master cylinder on bench before installation in vehicle.

DISASSEMBLY AND ASSEMBLY (Continued)

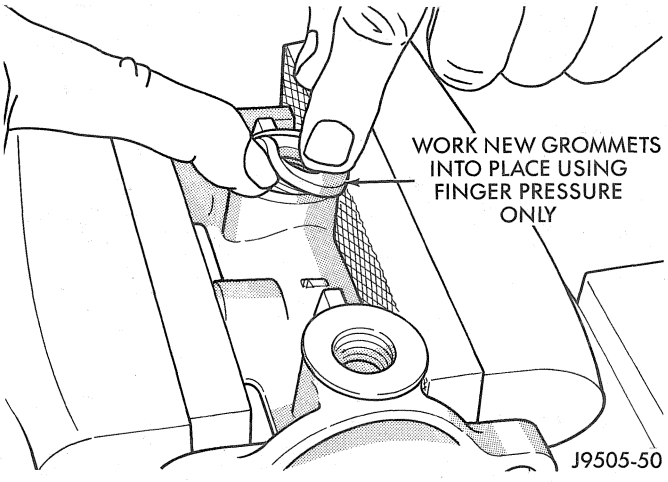


Fig. 44 Grommet Installation

DISC BRAKE CALIPER

DISASSEMBLY

(1) Remove brakeshoes from caliper.

(2) Drain brake fluid out of caliper.

(3) Pad interior of caliper with minimum, 2.54 cm (1 in.) thickness of shop towels or rags (Fig. 45). Towels are needed to protect caliper piston during removal.

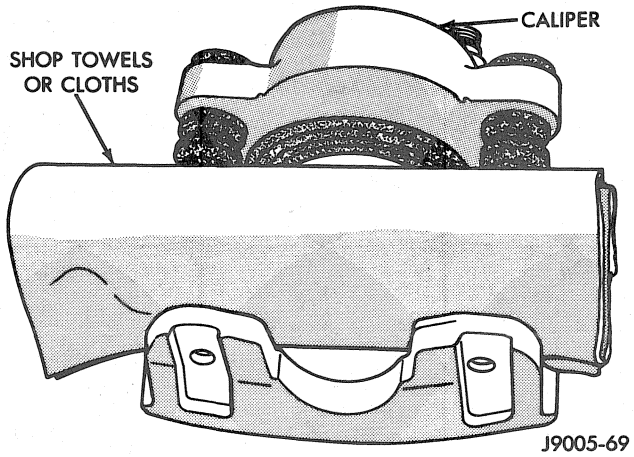


Fig. 45 Padding Caliper Interior

(4) Remove caliper piston with **short bursts** of low pressure compressed air. Direct air through fluid inlet port and ease piston out of bore (Fig. 46).

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston. Use only enough air pressure to ease the piston out. NEVER attempt to catch the piston as it leaves the bore. This will result in personal injury.

(5) Remove caliper piston dust boot with suitable tool (Fig. 47) and discard boot.

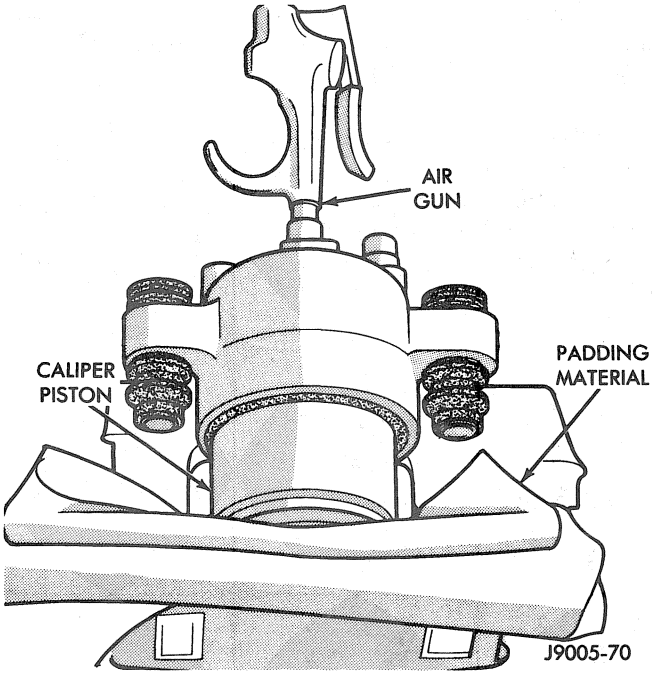


Fig. 46 Caliper Piston Removal

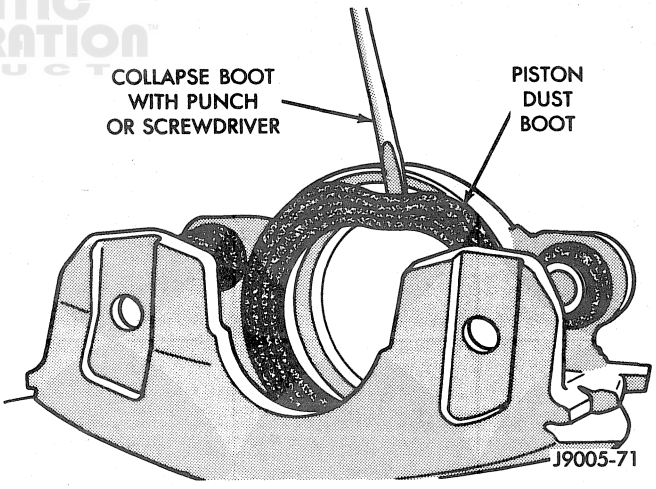


Fig. 47 Caliper Piston Dust Boot Removal

(6) Remove caliper piston seal with wood or plastic tool (Fig. 48) and discard seal. Do not use metal tools as they will scratch piston bore.

(7) Remove caliper mounting bolt bushings and boots (Fig. 49).

ASSEMBLY

(1) Coat caliper piston bore, new piston seal and piston with clean brake fluid.

(2) Lubricate caliper bushings and interior of bushing boots with Dielectric silicone grease.

(3) Install bushing boots in caliper, then insert bushing into boot and push bushing into place (Fig. 50).

DISASSEMBLY AND ASSEMBLY (Continued)

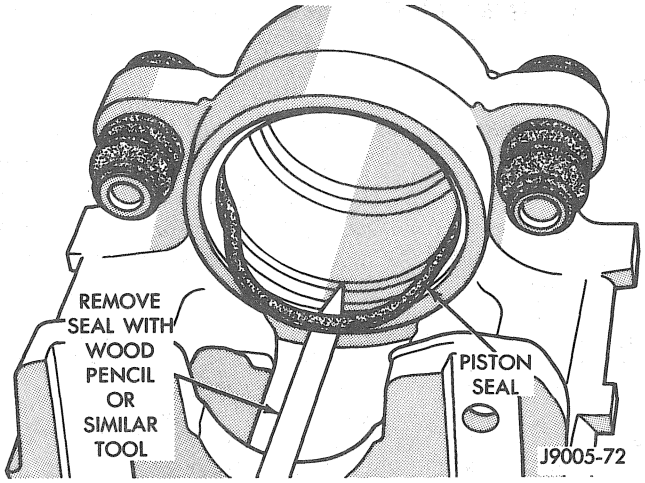


Fig. 48 Piston Seal Removal

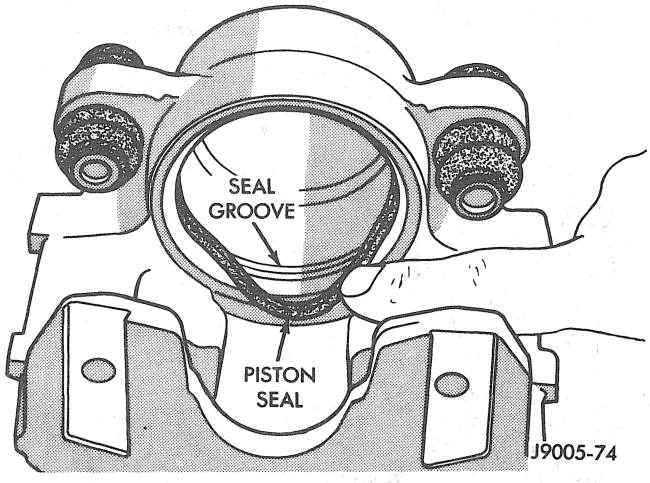


Fig. 51 Piston Seal Installation

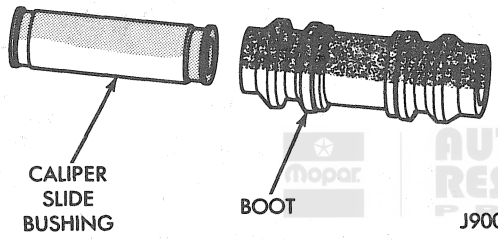


Fig. 49 Mounting Bolt Bushing And Boot

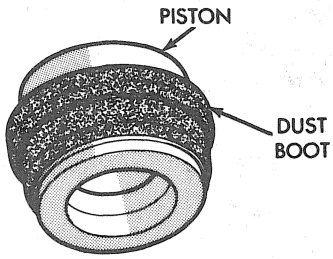


Fig. 52 Dust Boot On Piston

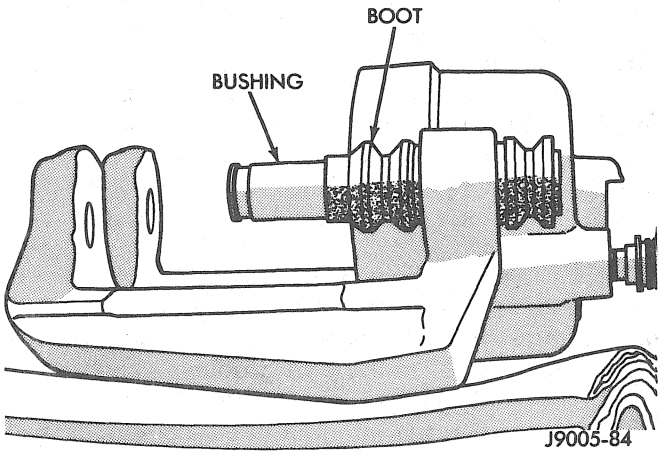


Fig. 50 Bushings And Boots Installation

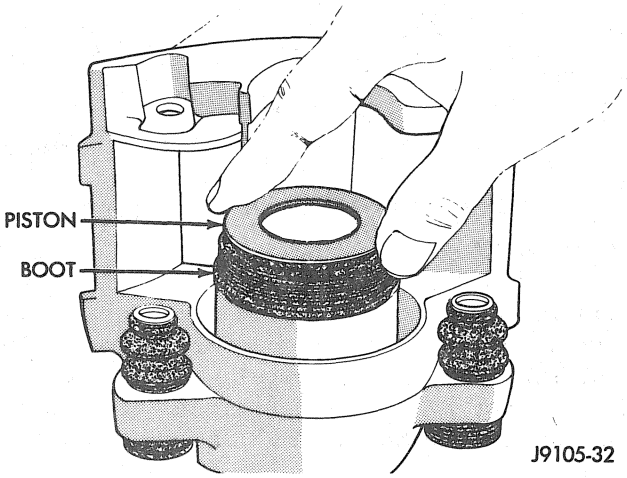


Fig. 53 Caliper Piston Installation

(4) Install new piston seal into seal groove with finger (Fig. 51).

(5) Install dust boot on caliper piston and seat boot in piston groove (Fig. 52).

(6) Press piston into caliper bore by hand, use a turn and push motion to work piston into seal (Fig. 53).

(7) Press caliper piston to bottom of bore.

(8) Seat dust boot in caliper with Installer Tool C-4842 and Tool Handle C-4171 (Fig. 54).

(9) Replace caliper bleed screw if removed.

WHEEL CYLINDER

DISASSEMBLY

(1) Remove push rods and boots (Fig. 55).

(2) Press pistons, cups and spring and expander out of cylinder bore.

(3) Remove bleed screw.

DISASSEMBLY AND ASSEMBLY (Continued)

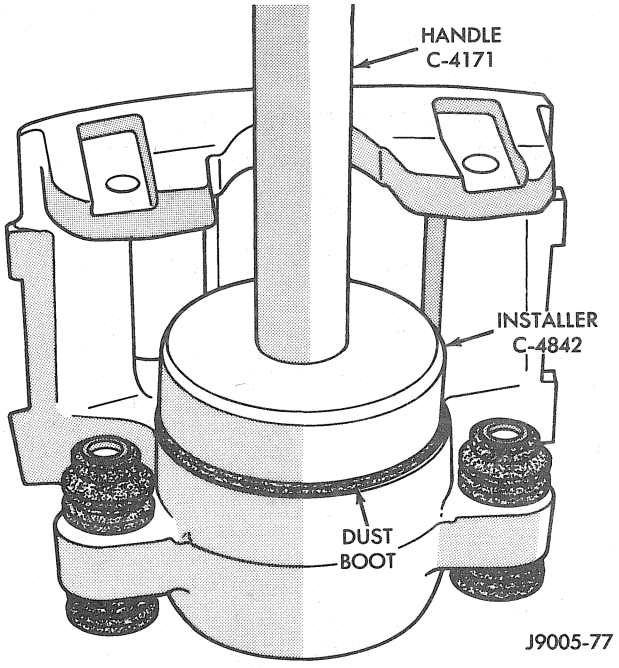


Fig. 54 Piston Dust Boot Installation

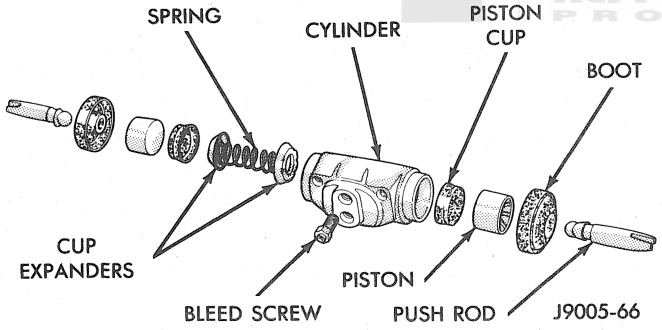


Fig. 55 Wheel Cylinder Components

ASSEMBLY

(1) Lubricate wheel cylinder bore, pistons, piston cups and spring and expander with clean brake fluid.

(2) Install first piston in cylinder bore. Then install first cup in bore and against piston. **Be sure lip of piston cup is facing inward (toward spring and expander) and flat side is against piston.**

(3) Install spring and expander followed by remaining piston cup and piston.

(4) Install boots on each end of cylinder and insert push rods in boots.

(5) Install cylinder bleed screw.

CLEANING AND INSPECTION

CALIPER

CLEANING

Clean the caliper components (Fig. 56) with clean brake fluid or Mopar brake cleaning solvent only. Do not use gasoline, kerosene, thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

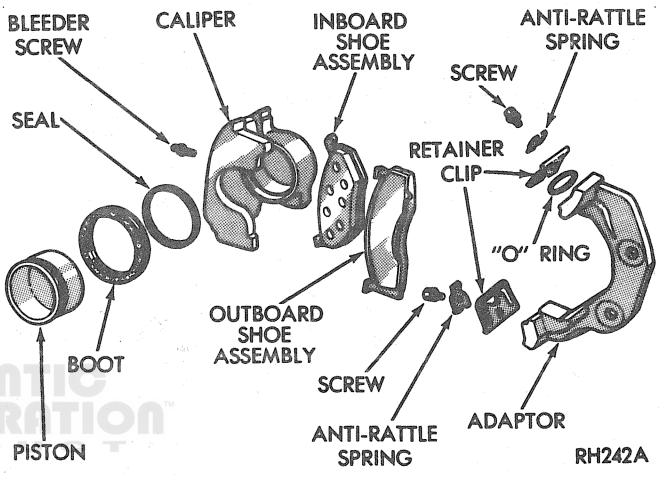


Fig. 56 Caliper Components

Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

INSPECTION

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

Replace the piston if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing. The piston must be replaced if damaged.

NOTE: If the caliper piston must be replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different for resin and steel pistons. Do not intermix these components at any time.

The bore can be lightly polished with a brake hone to remove very minor surface imperfections (Fig. 57). The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

CLEANING AND INSPECTION (Continued)

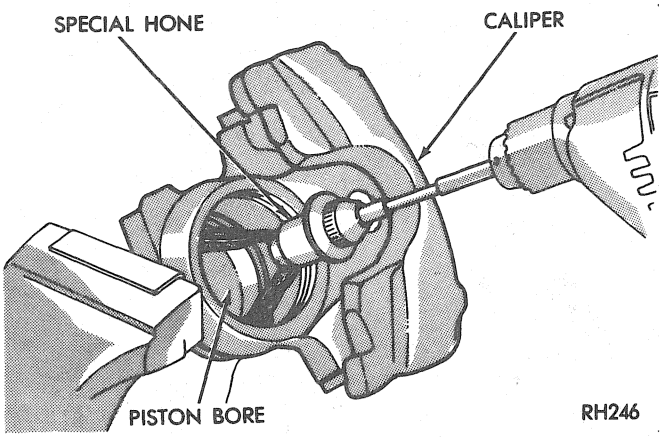


Fig. 57 Lightly Polishing Piston Bore With Tool

REAR DRUM BRAKE

CLEANING

Clean the individual brake components, including the support plate and wheel cylinder exterior, with a water dampened cloth or with Mopar brake cleaner. Do not use any other cleaning agents. Remove light rust and scale from the brakeshoe contact pads on the support plate with fine sandpaper.

INSPECTION

As a general rule, riveted brakeshoes should be replaced when worn to within 0.78 mm (1/32 in.) of the rivet heads. Bonded lining should be replaced when worn to a thickness of 1.6 mm (1/16 in.).

Examine the lining contact pattern to determine if the shoes are bent or the drum is tapered. The lining should exhibit contact across its entire width. Shoes exhibiting contact only on one side should be replaced and the drum checked for runout or taper.

Inspect the adjuster screw assembly. Replace the assembly if the star wheel threads are damaged, or the components are severely rusted or corroded.

Discard the brake springs and retainer components if worn distorted, or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

Inspect the brakeshoe contact pads on the support plate, replace the support plate if any of the pads are worn or rusted through. Also replace the plate if it is bent or distorted (Fig. 58).

WHEEL CYLINDER

CLEANING

Clean the cylinder and pistons with clean brake fluid or brake cleaner only. Do not use any other cleaning agents.

Dry the cylinder and pistons with compressed air. Do not use rags or shop towels to dry the cylinder components. Lint from cloth material will adhere to the cylinder bores and pistons.

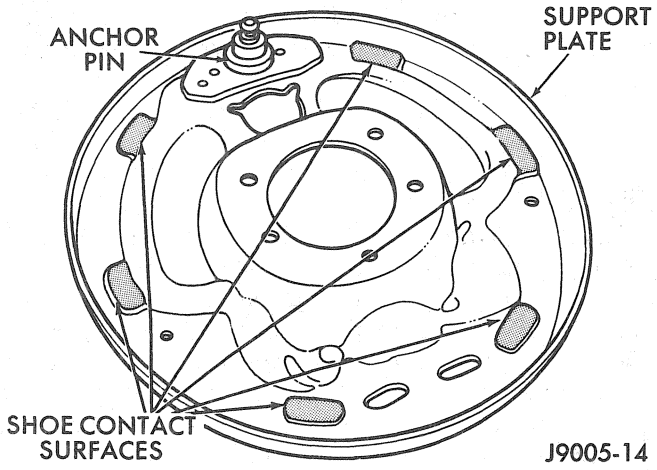


Fig. 58 Shoe Contact Surfaces

INSPECTION

Inspect the cylinder bore. Light discoloration and dark stains in the bore are normal and will not impair cylinder operation.

The cylinder bore can be lightly polished but only with crocus cloth. Replace the cylinder if the bore is scored, pitted or heavily corroded. Honing the bore to restore the surface is not recommended.

Inspect the cylinder pistons. The piston surfaces should be smooth and free of scratches, scoring and corrosion. Replace the pistons if worn, scored, or corroded. Do attempt to restore the surface by sanding or polishing.

Discard the old piston cups and the spring and expander. These parts are not reusable. The original dust boots may be reused but only if they are in good condition.

ADJUSTMENTS

STOP LAMP SWITCH

Check switch adjustment by moving the brake pedal forward by hand and note operation of the switch plunger. Plunger should extend when pedal free play is taken up and brake pedal moves away from plunger. A clearance of approximately 3 mm (1/8 in.) should exist between plunger and pedal at this point. If switch-to-pedal clearance is OK and stop lamps operate correctly, adjustment is not required.

If switch plunger does not extend and clearance between pedal and plunger is insufficient, adjust switch position.

ADJUSTMENT

(1) Grasp brake pedal and pull it rearward as far as possible using moderate force. Switch plunger bar-

ADJUSTMENTS (Continued)

rel will "ratchet" rearward in retaining clip to correct position. **Do not use excessive force to pull pedal rearward.**

(2) Verify stop lamp switch operation and proper clearance between switch plunger and brake pedal.

REAR DRUM BRAKE

The rear drum brakes are equipped with a self-adjusting mechanism. Under normal circumstances, the only time adjustment is required is when the shoes are replaced, removed for access to other parts, or when one or both drums are replaced.

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

ADJUSTMENT WITH BRAKE GAUGE

(1) Be sure parking brakes are fully released.

(2) Raise rear of vehicle and remove wheels and brake drums.

(3) Verify that left and right automatic adjuster levers and cables are properly connected.

(4) Insert brake gauge in drum. Expand gauge until gauge inner legs contact drum braking surface. Then lock gauge in position (Fig. 59).

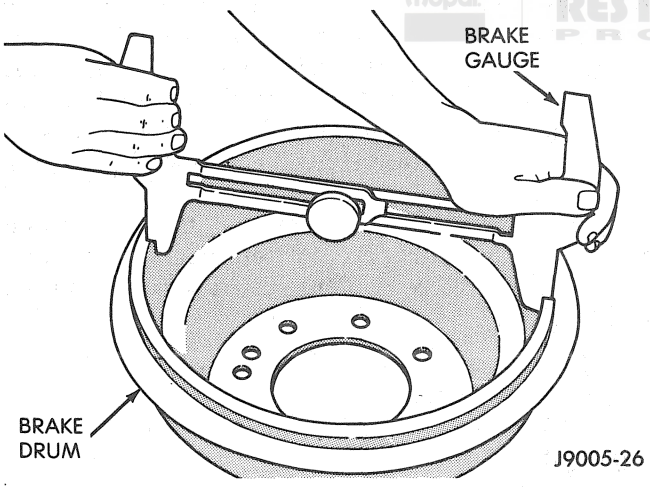


Fig. 59 Adjusting Gauge On Drum

(5) Reverse gauge and install it on brakeshoes. Position gauge legs at shoe centers as shown (Fig. 60). If gauge does not fit (too loose/too tight), adjust shoes.

(6) Pull shoe adjuster screw star wheel away from adjuster lever.

(7) Turn adjuster screw star wheel (by hand) to expand or retract brakeshoes. Continue adjustment until gauge outside legs are light drag-fit on shoes.

(8) Install brake drums and wheels and lower vehicle.

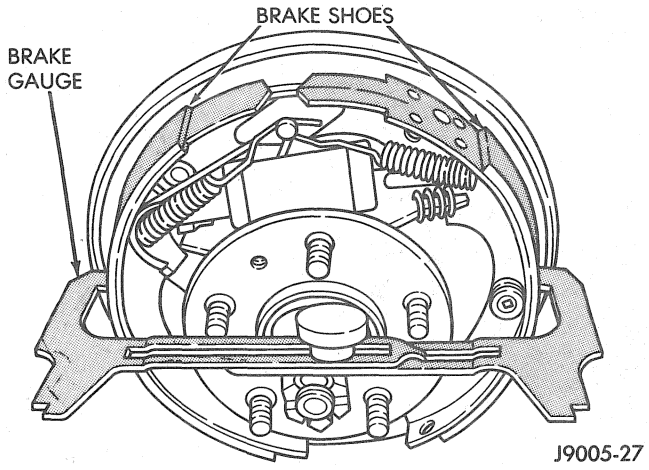


Fig. 60 Adjusting Gauge On Brakeshoes

(9) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

ADJUSTMENT WITH ADJUSTING TOOL

(1) Be sure parking brake lever is fully released.

(2) Raise vehicle so rear wheels can be rotated freely.

(3) Remove plug from each access hole in brake support plates.

(4) Loosen parking brake cable adjustment nut until there is slack in front cable.

(5) Insert adjusting tool through support plate access hole and engage tool in teeth of adjusting screw star wheel (Fig. 61).

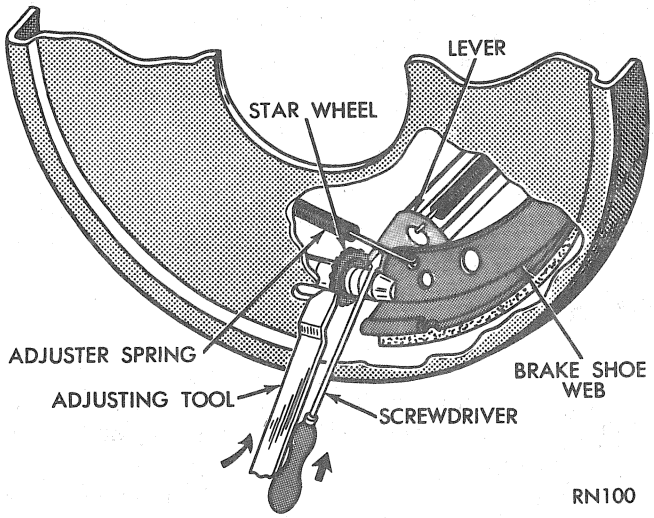


Fig. 61 Brake Adjustment

ADJUSTMENTS (Continued)

(6) Rotate adjuster screw star wheel (move tool handle upward) until slight drag can be felt when wheel is rotated.
(7) Push and hold adjuster lever away from star wheel with thin screwdriver.
(8) Back off adjuster screw star wheel until brake drag is eliminated.
(9) Repeat adjustment at opposite wheel. Be sure adjustment is equal at both wheels.
(10) Install support plate access hole plugs.
(11) Adjust parking brake cable and lower vehicle.
(12) Install brake drums and wheels and lower vehicle.
(13) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

PARKING BRAKE CABLE TENSIONER

Parking brake adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected for service. When adjustment is necessary, perform the following procedure for proper parking brake operation.

ADJUSTMENT

(1) Raise vehicle.
(2) Back off tensioner adjusting nut to create slack in cables.
(3) Remove rear wheel/tire assemblies and remove brake drums.
(4) Check rear brakeshoe adjustment with standard brake gauge. **Excessive shoe-to-drum clearance, or worn brake components will result in faulty parking brake adjustment and operation.**
(5) Verify that parking brake cables operate freely and are not binding, or seized. Replace faulty cables, before proceeding.
(6) Reinstall brake drums and wheel/tire assemblies after brakeshoe adjustment is complete.
(7) Lower vehicle enough for access to parking brake lever. **Then fully apply parking brakes. Leave brakes applied until adjustment is complete.**
(8) Raise vehicle and mark tensioner rod 6.5 mm (1/4 in.) from tensioner bracket (Fig. 62).
(9) Tighten adjusting nut at equalizer until mark on tensioner rod moves into alignment with tensioner bracket.

NOTE: Do not loosen/tighten equalizer adjusting nut for any reason after completing adjustment.

(10) Lower vehicle until rear wheels are 15-20 cm (6-8 in.) off shop floor.
(11) Release parking brake lever and verify that rear wheels rotate freely without drag.
(12) Lower vehicle.

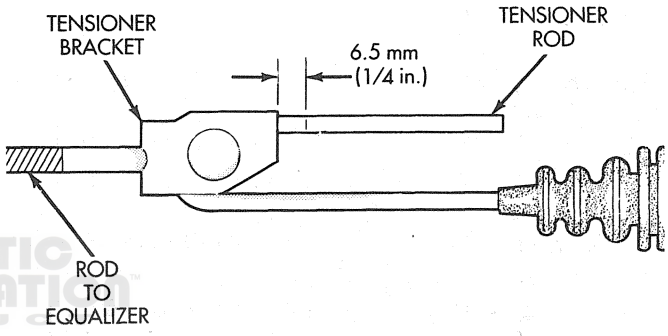


Fig. 62 Tensioner Rod Measurement

SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system.

SPECIFICATIONS (Continued)

BRAKE COMPONENTS

Disc Brake Caliper
- Type . . . . . .Sliding

Disc Brake Rotor
- Type . . . . . .Ventilated
- Max. Runout. . . . . .0.12 mm (0.005 in.)
- Max. Thickness Variation . . .0.013mm (0.0005 in.)

Brake Drum
- Size . . . . . .9 in. or 10 in.

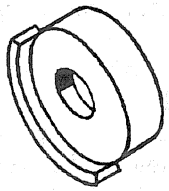
Brake Booster
- Type . . . . . .Dual Diaphragm

TORQUE CHART

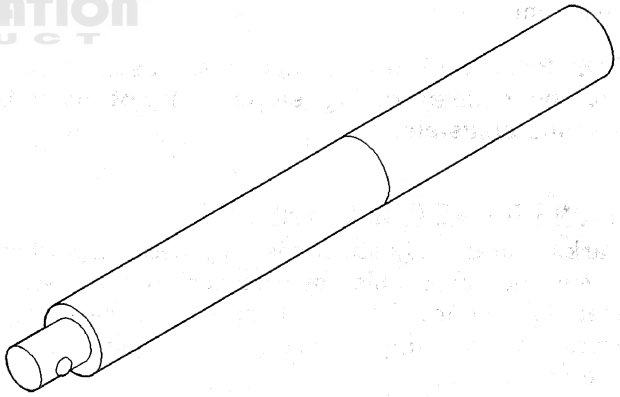
DESCRIPTION	TORQUE
Brake Pedal	
Support Bolt	23-34 N·m (17-25 ft. lbs.)
Pivot Bolt/Nut	27-35 N·m (20-26 ft. lbs.)
Brake Booster	
Mounting Nuts	41 N·m (30 ft. lbs.)
Master Cylinder	
Mounting Nuts	13-25 N·m (10-18 ft. lbs.)
Primary Brakeline	14-16 N·m (10-12 ft. lbs.)
Secondary Brakeline	15-18 N·m (11-13 ft. lbs.)
Combination Valve	
Mounting Nuts	25 N·m (18.5 ft. lbs.)
Brakeline	18-24 N·m (13-18 ft. lbs.)
Caliper	
Mounting Bolts	10-20 N·m (7-15 ft. lbs.)
Brake Hose Bolt	31 N·m (23 ft. lbs.)
Wheel Cylinder	
Mounting Bolts	10 N·m (7 ft. lbs.)
Brakeline	15-18 N·m (11-13 ft. lbs.)
Parking Brake	
Lever Screws	10-14 N·m (7-10 ft. lbs.)
Lever Bracket Screws	10-14 N·m (7-10 ft. lbs.)
Cable Retainer Nut	1-2 N·m (12-16 in. lbs.)

SPECIAL TOOLS

BASE BRAKES



Installer Caliper Dust Boot C-4842



Handle C-4171

ANTILOCK BRAKES

INDEX

	page
GENERAL INFORMATION	
ABS	31
DESCRIPTION AND OPERATION	
ABS SYSTEM RELAYS	35
ABS WARNING LAMP	35
ABS	31
ACCELERATION SWITCH	34
COMBINATION VALVE	34
CONTROLLER ANTILOCK BRAKES (CAB)	32
HYDRAULIC CONTROL UNIT (HCU)	32
WHEEL SPEED SENSORS AND TONE WHEEL	34
DIAGNOSIS AND TESTING	
ANTILOCK BRAKES	35
SERVICE PROCEDURES	
BLEEDING ABS BRAKE SYSTEM	35
REMOVAL AND INSTALLATION	
ACCELERATION SWITCH	39
CONTROLLER ANTILOCK BRAKES	35
FRONT WHEEL SENSOR	37
HYDRAULIC CONTROL UNIT	36
REAR WHEEL SPEED SENSOR	38
SPECIFICATIONS	
TORQUE CHART	39

GENERAL INFORMATION

ABS

The antilock brake system (ABS) is an electronically operated, all wheel brake control system.

The system is designed to prevent wheel lockup and maintain steering control during periods of high wheel slip when braking. Preventing lockup is accomplished by modulating fluid pressure to the wheel brake units.

The hydraulic system is a three channel design. The front wheel brakes are controlled individually and the rear wheel brakes in tandem (Fig. 1). The ABS electrical system is separate from other electrical circuits in the vehicle. A specially programmed controller antilock brake unit (CAB) operates the system components.

ABS system major components include:

- Controller Antilock Brakes (CAB)
- Hydraulic Control Unit (HCU)
- Wheel Speed Sensors (WSS)
- Acceleration Switch
- Main Relay And Pump Motor Relay
- ABS Warning Light
- Pump Motor Sensor

DESCRIPTION AND OPERATION

ABS

Battery voltage is supplied to the CAB ignition terminal when the ignition switch is turned to Run position. The CAB performs a system initialization procedure at this point. Initialization consists of a static and dynamic self check of system electrical components.

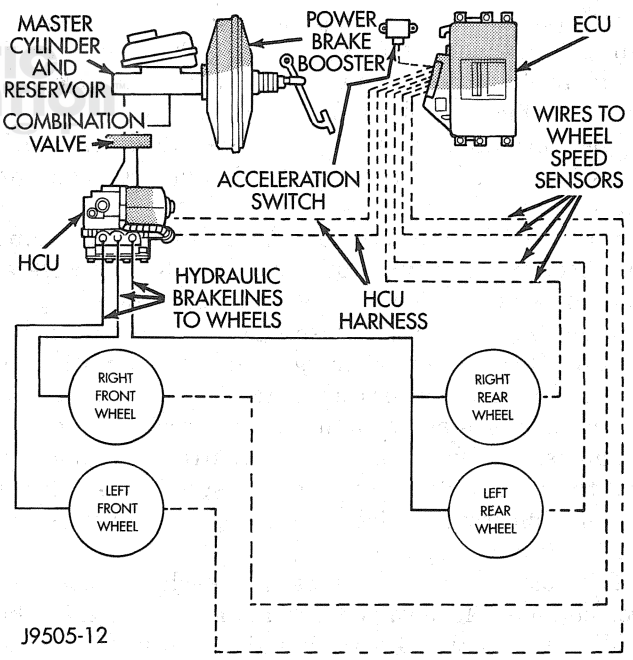


Fig. 1 Jeep ABS System

The static check occurs after the ignition switch is turned to Run position. The dynamic check occurs when vehicle road speed reaches approximately 10 kph (6 mph). During the dynamic check, the CAB briefly cycles the pump and solenoids to verify operation.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning

DESCRIPTION AND OPERATION (Continued)

light and registers a fault code in the microprocessor memory.

NORMAL BRAKING

The CAB monitors wheel speed sensor inputs continuously while the vehicle is in motion. However, the CAB will not activate any ABS components as long as sensor inputs and the acceleration switch indicate normal braking.

During normal braking, the master cylinder, power booster and wheel brake units all function as they would in a vehicle without ABS. The HCU components are not activated.

ANTILOCK BRAKING

The purpose of the antilock system is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock CAB activates the system whenever sensor signals indicate periods of high wheel slip. High wheel slip can be described as the point where wheel rotation begins approaching zero (or lockup) during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

The antilock system prevents lockup during high slip conditions by modulating fluid apply pressure to the wheel brake units.

Brake fluid apply pressure is modulated according to wheel speed, degree of slip and rate of deceleration. A sensor at each wheel converts wheel speed into electrical signals. These signals are transmitted to the CAB for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem. A speed sensor input signal indicating a high slip condition activates the CAB antilock program.

Two solenoid valves are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels.

The solenoid valves are not static during antilock braking. They are cycled continuously to modulate pressure. Solenoid cycle time in antilock mode can be measured in milliseconds.

CONTROLLER ANTILOCK BRAKES (CAB)

A separate electronic control unit (CAB) operates the ABS system (Fig. 2). The CAB is separate from other vehicle electrical circuits. CAB voltage source is through the ignition switch in the RUN position.

The CAB is located under the instrument panel in the passenger compartment. In left hand drive models, it at the right side of the steering column. In right hand drive models, it is near the cowl panel

The CAB contains dual microprocessors. A logic block in each microprocessor receives identical sensor signals. These signals are processed and compared simultaneously.

The CAB contains a self check program that illuminates the ABS warning light when a system fault is detected. Faults are stored in a diagnostic program memory and are accessible with the DRB scan tool.

ABS faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored faults are **not** erased if the battery is disconnected.

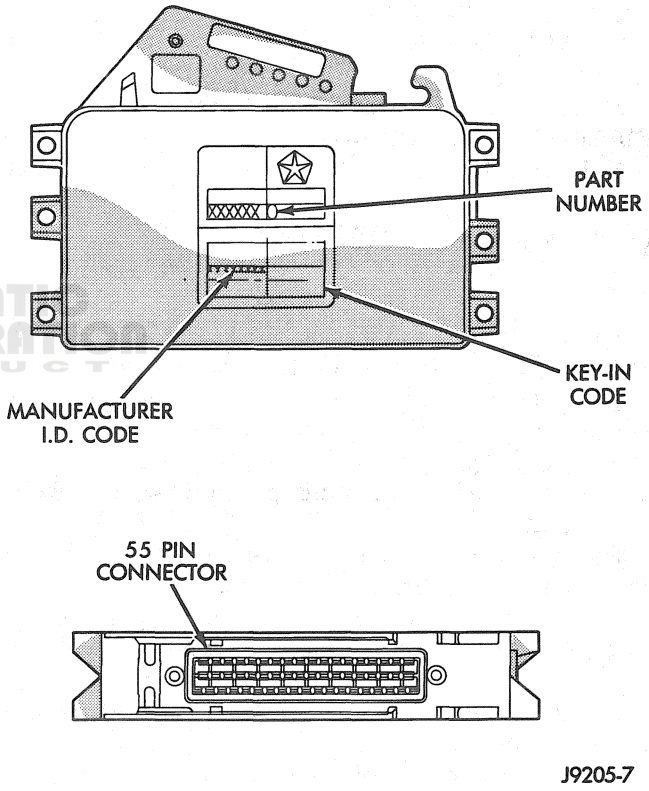


Fig. 2 Controller Antilock Brakes

HYDRAULIC CONTROL UNIT (HCU)

The hydraulic control unit (HCU) consists of a valve body, pump body, accumulators, pump motor, and wire harnesses (Fig. 3).

The pump, motor, and accumulators are combined into an assembly attached to the valve body. The accumulators store the extra fluid released to the system for ABS mode operation. The pump provides the fluid volume needed and is operated by a DC type motor. The motor is controlled by the CAB.

The valve body contains the solenoid valves. The valves modulate brake pressure during antilock braking and are controlled by the CAB.

DESCRIPTION AND OPERATION (Continued)

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed. The valves are not static. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration.

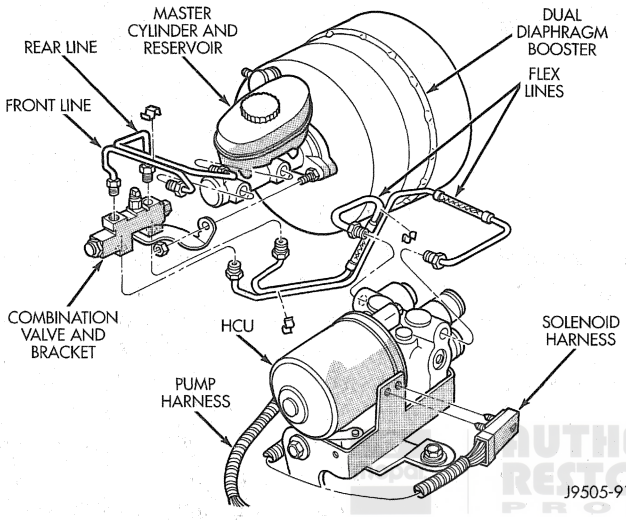


Fig. 3 ABS Master Cylinder-Booster-Combination Valve-HCU

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

Pressure Decrease

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle (Fig. 4).

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

Pressure Hold

Both solenoid valves are closed in the pressure hold cycle (Fig. 5). Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

Pressure Increase

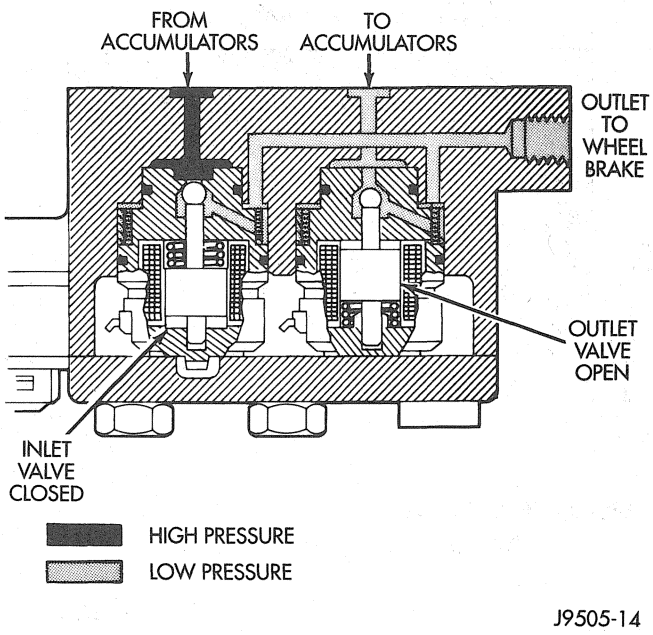


Fig. 4 Pressure Decrease Cycle

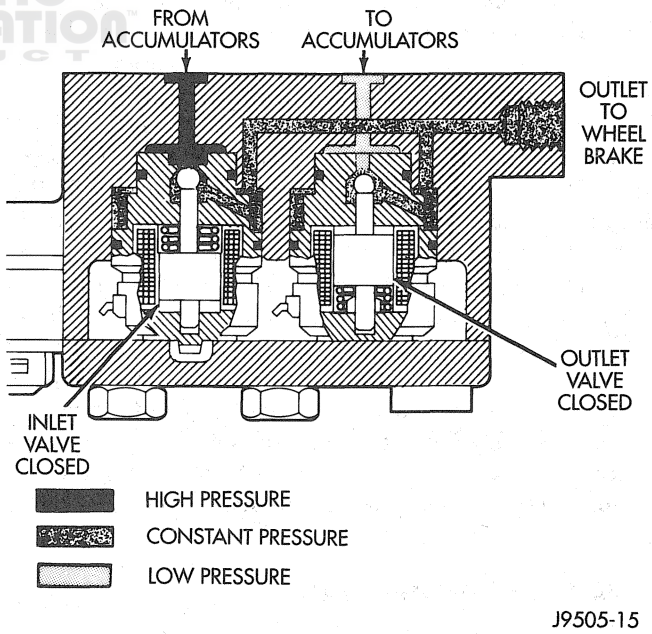


Fig. 5 Pressure Hold Cycle

The inlet valve is open and the outlet valve is closed during the pressure increase cycle (Fig. 6). The pressure increase cycle is used to counteract unequal wheel speeds. This cycle controls re-application of fluid apply pressure due to changing road surfaces or wheel speed.

DESCRIPTION AND OPERATION (Continued)

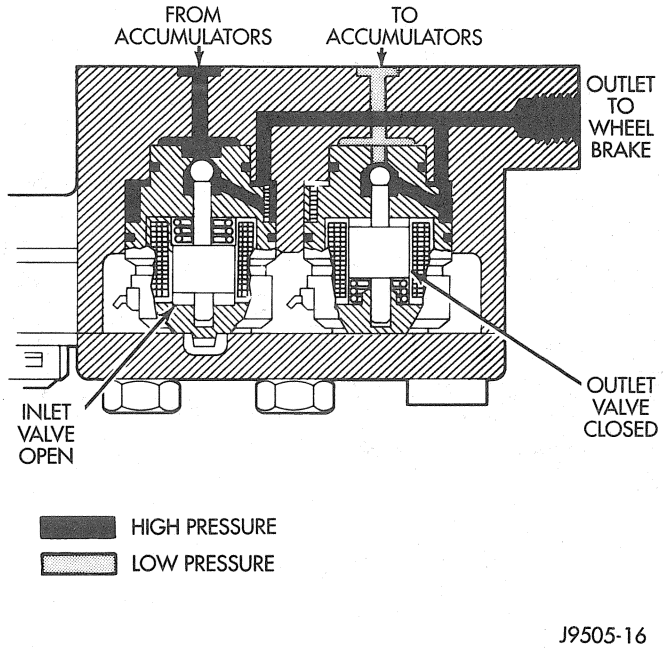


Fig. 6 Pressure Increase Cycle

WHEEL SPEED SENSORS AND TONE WHEEL

A speed sensor is used at each wheel. The front sensors are mounted to the steering knuckles. The rear sensors at the outboard end of the axle.

The sensors convert wheel speed into a small AC electrical signal. This signal is transmitted to the CAB. The CAB convert the AC signal into a digital signal for each wheel. This voltage is generated by magnetic induction when a tone wheel passes by the stationary magnetic of the wheel speed sensor.

A gear type tone ring serves as the trigger mechanism for each sensor. The tone rings are mounted at the outboard ends of the front and rear axle shafts.

Different sensors are used at the front and rear wheels (Fig. 7). The front/rear sensors have the same electrical values but are not interchangeable. The sensors have a resistance between 900 and 1300 ohms.

SPEED SENSOR AIR GAP

Front Sensor

Front sensor air gap is fixed and not adjustable. Only rear sensor air gap is adjustable.

Although front air gap is not adjustable, it can be checked if diagnosis indicates this is necessary. Front air gap should be 0.40 to 1.3 mm (0.0157 to 0.051 in.). If gap is incorrect, the sensor is either loose, or damaged.

Rear Sensor

A rear sensor air gap adjustment is only needed when reinstalling an original sensor. Replacement

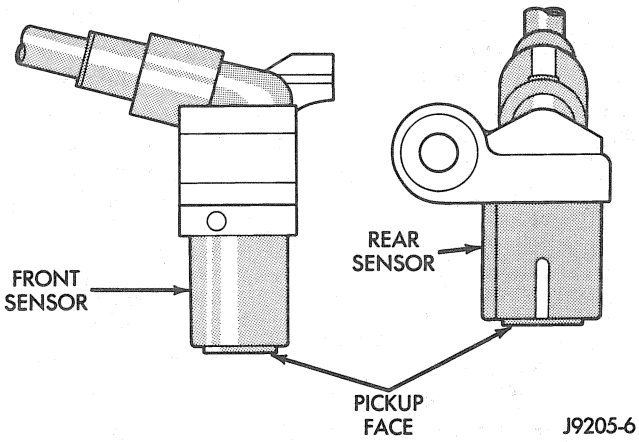


Fig. 7 Wheel Speed Sensors

sensors have an air gap spacer attached to the sensor pickup face. The spacer establishes correct air gap when pressed against the tone ring during installation. As the tone ring rotates, it peels the spacer off the sensor to create the required air gap. Rear sensor air gap is 0.92-1.45 mm (0.036-0.057 in.).

Sensor air gap measurement, or adjustment procedures are provided in this section. Refer to the front, or rear sensor removal and installation procedures as required.

COMBINATION VALVE

The combination valve contains a pressure differential valve and switch and a rear brake proportioning valve. The valve is not repairable. It must be replaced if diagnosis indicates this is necessary.

The pressure differential switch is connected to the brake warning light. The switch is actuated by movement of the switch valve. The switch monitors fluid pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs are made.

The rear proportioning valve is used to balance front-rear brake action. The valve allows normal fluid flow during moderate effort brake stops. The valve only controls (meters) fluid flow during high effort brake stops.

ACCELERATION SWITCH

The acceleration switch is located under the rear seat.

DESCRIPTION AND OPERATION (Continued)

The switch (Fig. 8), provides an additional vehicle deceleration reference during 4-wheel drive operation. The switch is monitored by the CAB at all times. The switch reference signal is utilized by the CAB when all wheels are decelerating at the same speed.

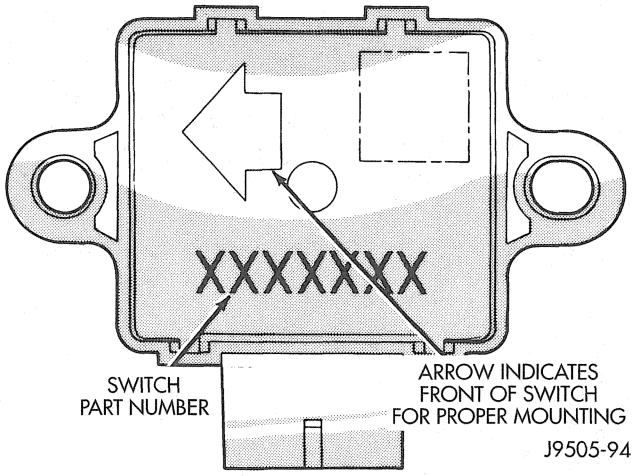


Fig. 8 Acceleration Switch

ABS SYSTEM RELAYS

The ABS system has two relays, which are the main and motor pump relays. The main relay is used for the solenoid valves and CAB.The main relay is connected to the CAB at the power control relay terminal.The motor pump relay is used for the motor pump only. The pump motor relay starts/stops the pump motor when signaled by the CAB.

ABS WARNING LAMP

The amber ABS warning lamp is located in the instrument cluster. The lamp illuminates at start-up to perform a self check. The lamp goes out when the self check program determines the system is operating normal. If an ABS component exhibits a fault the CAB will illuminate the lamp and register a trouble code in the microprocessor. The lamp is controlled by the CAB and or the main relay through an in-harness diode. The CAB controls the lamp by directly grounding the circuit. The main relay grounds the lamp circuit when it is de-energized.

DIAGNOSIS AND TESTING

ANTILOCK BRAKES

The ABS brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the systems input and output circuits to verify the system is operating correctly. If the on board diagnostic system senses that a circuit is malfunctioning the system will set a trouble code in its memory.

NOTE: The DRB111 scan tool is used to diagnose the ABS system. For additional information refer to the Antilock Brake section in Group 8W. For test procedures refer to the Chassis Diagnostic Manual.

SERVICE PROCEDURES

BLEEDING ABS BRAKE SYSTEM

ABS system bleeding requires conventional bleeding methods plus use of the DRB scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

(1) Perform base brake bleeding. Refer to base brake section for procedure.

(2) Connect scan tool to ABS diagnostic connector under carpet at front of console, just under instrument panel center bezel.

(3) Select CHASSIS SYSTEM, followed by TEVES ABS BRAKES, then BLEED BRAKES. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.

(4) Perform base brake bleeding a second time. Refer to base brake section for procedure.

(5) Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

REMOVAL AND INSTALLATION

CONTROLLER ANTILOCK BRAKES

REMOVAL

On left hand drive models, the CAB is located to the right of the steering column near the heater duct (Fig. 9). On right hand drive models, the CAB is located near the right side cowl panel adjacent to the dash (Fig. 10).

(1) Turn ignition key to Off position.

(2) Remove lower finish panel from instrument panel for added working clearance if necessary.

(3) Remove CAB mounting bracket attaching bolts/nuts.

(4) Release strap that secures CAB harness connector to pin terminals (Fig. 11). Use tool such as small flat blade screwdriver to lift and release strap.

(5) Disconnect harness connector from CAB. Tilt connector upward to disengage it from CAB pin terminals. Then slide it out of retaining tangs in CAB.

(6) Remove CAB and mounting bracket as assembly.

REMOVAL AND INSTALLATION (Continued)

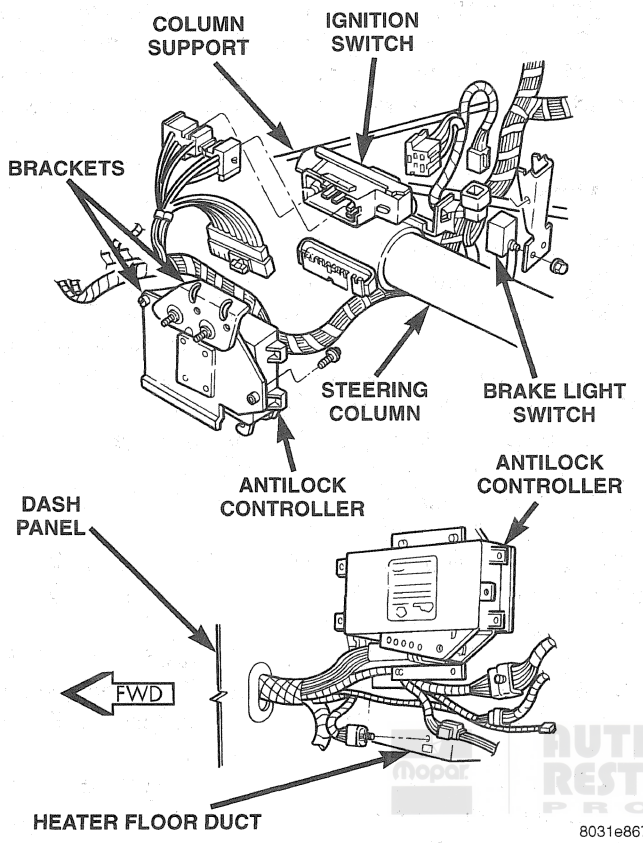


Fig. 9 CAB Mounting (LHD)

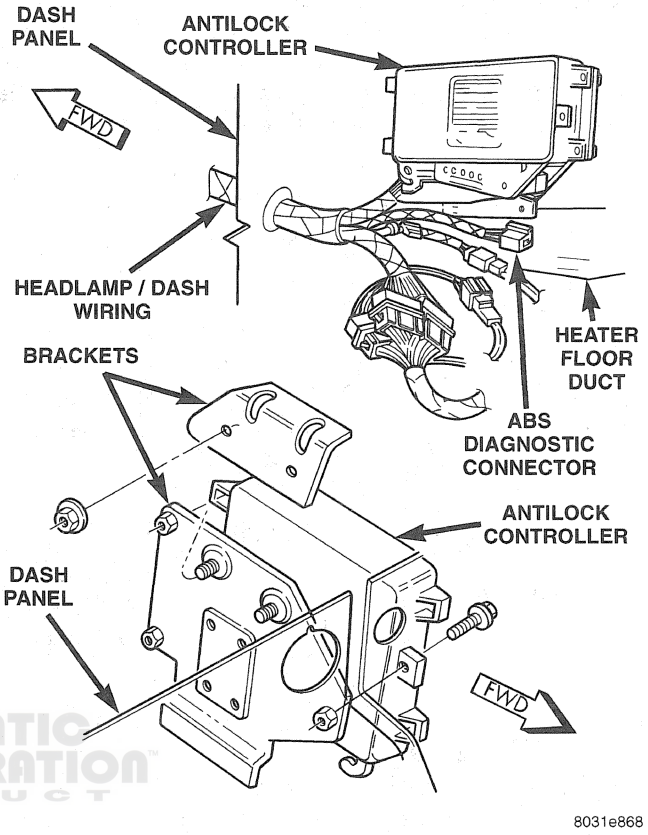


Fig. 10 CAB Mounting (RHD)

INSTALLATION

(1) If CAB is being replaced, install it on mounting bracket and tighten fasteners to 10-14 N·m (85-125 in. lbs.).

(2) Align and attach harness connector to CAB. Slide connector into engagement with tangs on CAB. Then tilt connector downward and into engagement with CAB pin terminals. Exercise care as pin terminals can be damaged if connector is forced into place.

(3) Connect harness to security alarm module, if equipped.

(4) Position CAB bracket under instrument panel.

(5) Install and tighten CAB mounting bracket bolts/nuts to 8-14 N·m (75-125 in. lbs.).

(6) Install trim panel on instrument panel, if removed.

HYDRAULIC CONTROL UNIT

REMOVAL

(1) Disconnect both flex brakelines at HCU (Fig. 12).

(2) Disconnect lines to front/rear brakes at lower left side of HCU (Fig. 13).

(3) Disconnect HCU solenoid harness from main harness.

(4) Disconnect HCU pump motor harness.

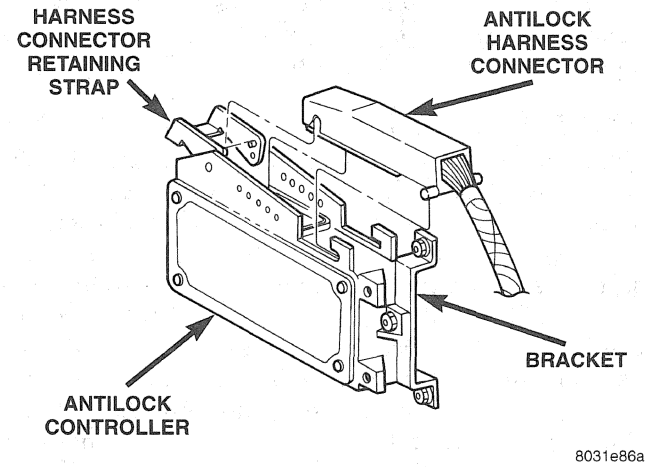


Fig. 11 CAB Harness Connector

(5) Remove three shoulder bolts attaching HCU to mounting bracket and remove HCU.

INSTALLATION

(1) Install HCU in mounting bracket. Then install and tighten three shoulder bolts that attach HCU to bracket (Fig. 14).

(2) Connect HCU harnesses.

REMOVAL AND INSTALLATION (Continued)

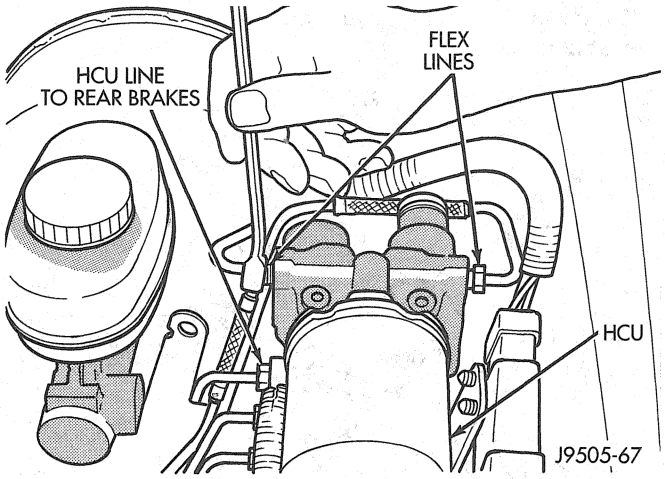


Fig. 12 HCU Flex Lines

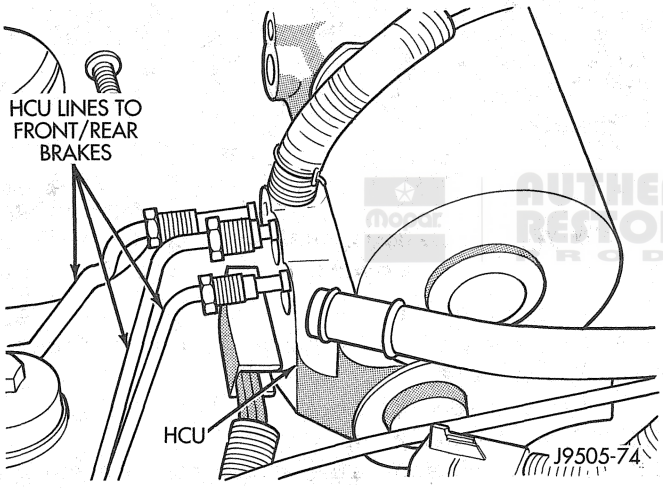


Fig. 13 HCU Front/Rear Brakelines

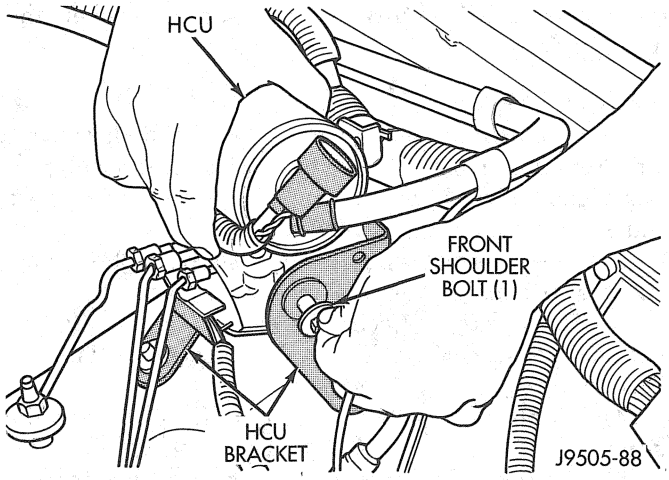


Fig. 14 HCU Mounting Bracket

(3) Connect front/rear brakelines to HCU by hand to avoid cross threading (Fig. 15). Then tighten line fittings snug but not to required torque at this time.

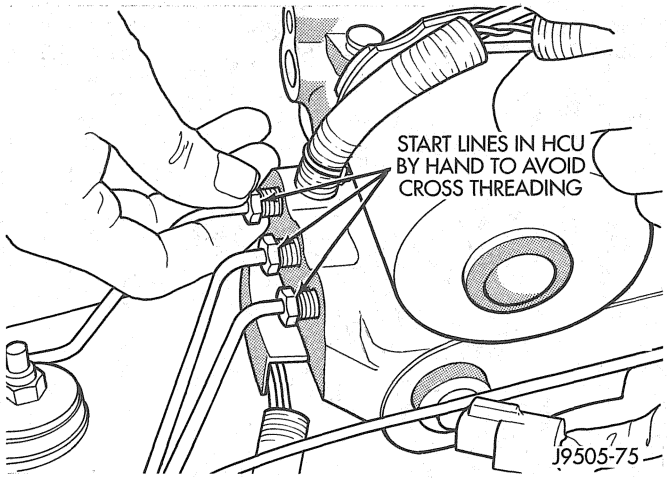


Fig. 15 HCU Front/Rear Brakelines

(4) Connect flex lines to HCU by hand to avoid cross threading. Then tighten line fittings snug but not to required torque at this time.

(5) Bleed brakes. Refer to procedure in Brake Fluid-Brake Bleeding-Brakelines And Hoses section.

(6) Tighten brakeline fittings to following torques after brake bleeding: 15-18 N·m (130-160 in. lbs.) at HCU and master cylinder and 18-24 N·m (160-210 in. lbs.) at combination valve.

(7) Check brake pedal action before moving vehicle. Bleed brakes again if pedal is not firm (feels soft/spongy).

FRONT WHEEL SENSOR

REMOVAL

(1) Raise vehicle and turn wheel outward for easier access to sensor.

(2) Remove sensor wire from mounting brackets.

(3) Clean sensor and surrounding area with shop towel before removal.

(4) Remove bolt attaching sensor to steering knuckle and remove sensor (Fig. 16).

(5) Remove sensor wire from brackets on body and steering knuckle.

(6) Unseat sensor wire grommet in wheel house panel.

(7) In engine compartment, disconnect sensor wire connector at harness plug. Then remove sensor and wire.

INSTALLATION

(1) If **original** sensor will be installed, wipe all traces of old spacer material off sensor pickup face. Use a dry shop towel for this purpose.

(2) Apply Mopar Lock N' Seal or Loctite 242 to bolt that secures sensor in steering knuckle. Use new sensor bolt if original bolt is worn or damaged.

REMOVAL AND INSTALLATION (Continued)

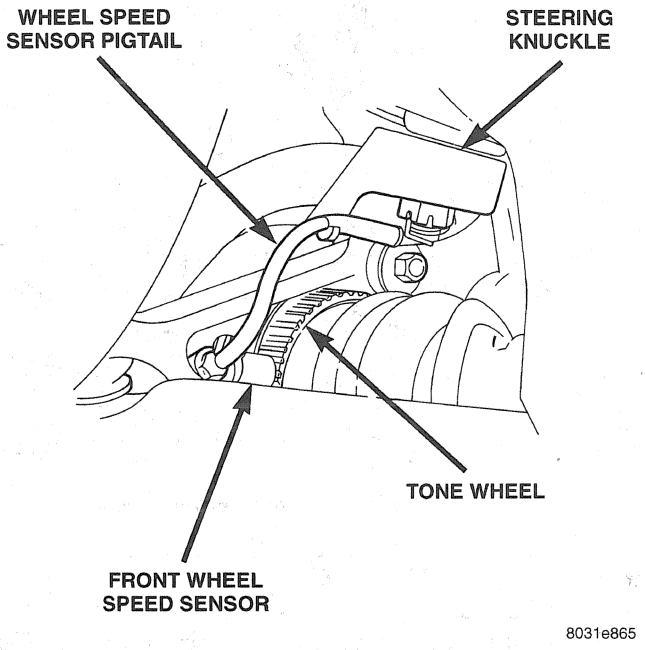


Fig. 16 Front Wheel Speed Sensor

(3) Position sensor on steering knuckle. Seat sensor locating tab in hole in knuckle and install sensor attaching bolt finger tight.

(4) Tighten sensor attaching bolt to 14 N·m (11 ft. lbs.).

(5) If original sensor has been installed, check sensor air gap. Air gap should be 0.40 to 1.3 mm (0.0157 to 0.051 in.). If gap is incorrect, sensor is either loose, or damaged.

(6) Secure sensor wire to steering knuckle and body brackets.

(7) Route sensor wire forward and behind shock absorber. Then attach sensor wire to spring seat bracket with grommets on sensor wire.

(8) Route sensor wire to outer sill bracket. Remove all twists or kinks from wire.

(9) Attach sensor wire to sill bracket with grommet. Be sure wire is free of twists and kinks.

(10) Verify sensor wire routing. Wire should loop forward and above sill bracket. Loose end of wire should be below sill bracket and towards brake hose.

(11) Seat sensor wire grommet in body panel and clip wire to brake line at grommet location.

(12) Connect sensor wire to harness in engine compartment.

REAR WHEEL SPEED SENSOR

REMOVAL

(1) Raise and fold rear seat forward for access to rear sensor connectors (Fig. 17).

(2) Disconnect sensors at rear harness connectors.

(3) Push sensor grommets and sensor wires through floorpan.

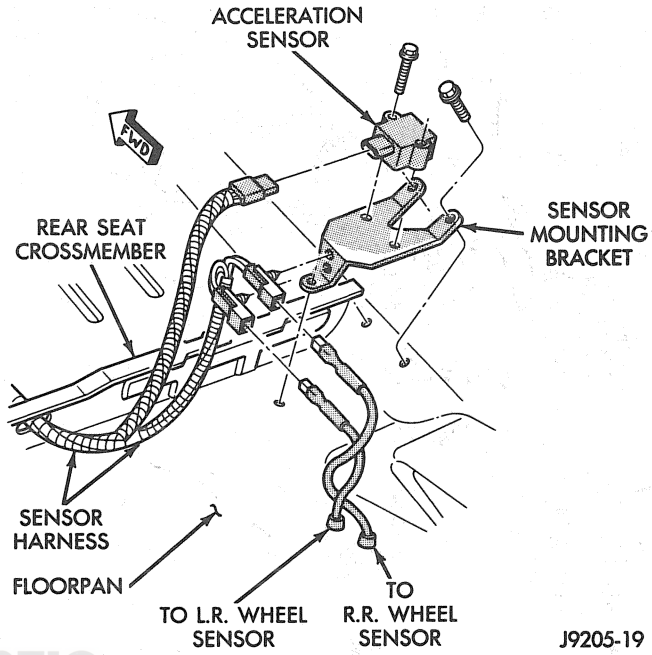


Fig. 17 Acceleration Switch And Rear Sensor Connections

(4) Raise vehicle.

(5) Disconnect sensor wires at rear axle connectors.

(6) Remove wheel and tire assembly.

(7) Remove brake drum.

(8) Remove clips securing sensor wires to brakelines, rear axle and, brake hose.

(9) Unseat sensor wire support plate grommet.

(10) Remove bolt attaching sensor to bracket and remove sensor.

INSTALLATION

(1) If **original sensor** is being installed, remove any remaining pieces of cardboard spacer from sensor pickup face. Use dry shop towel only to remove old spacer material.

(2) Insert sensor wire through support plate hole. Then seat sensor grommet in support plate.

(3) Apply Mopar Lock N' Seal or Loctite 242 to original sensor bolt. Use new bolt if original is worn or damaged.

(4) Install sensor bolt finger tight only at this time.

(5) If **original** rear sensor was installed, adjust sensor air gap to 0.92-1.45 mm (0.036-0.057 in.). Use feeler gauge to measure air gap (Fig. 18). Tighten sensor bolt to 11 N·m (11 ft. lbs.).

(6) If **new** sensor was installed, push cardboard spacer on sensor face against tone ring (Fig. 19). Then tighten sensor bolt to 8 N·m (6 ft. lbs.). Correct

REMOVAL AND INSTALLATION (Continued)

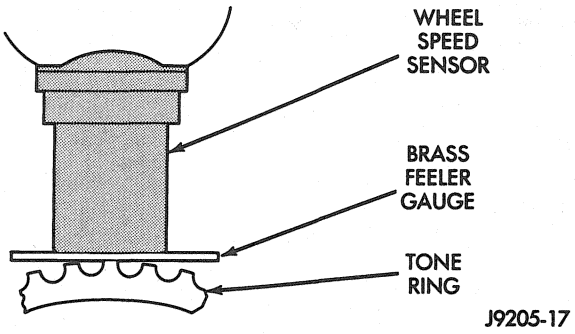


Fig. 18 Setting Air Gap On Original Rear Sensor

air gap will be established as tone ring rotates and peels spacer off sensor face.

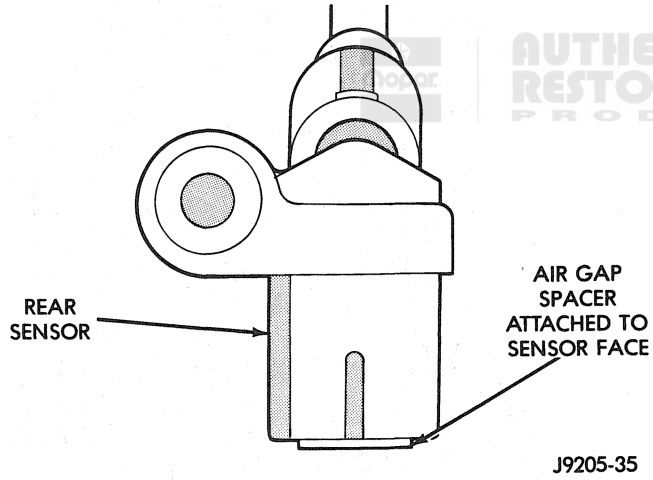


Fig. 19 New Rear Sensor

(7) Route sensor wires to rear seat area.

(8) Feed sensor wires through floorpan access hole and seat sensor grommets in floorpan.

(9) Verify that rear sensor wires are secured to rear brake hose and axle with clips. Verify that wire is clear of rotating components.

(10) Install brake drum and wheel and tire assembly.

(11) Lower vehicle.

(12) Connect sensor wire to harness connector. Then reposition carpet and fold rear seat down.

ACCELERATION SWITCH

REMOVAL

(1) Tilt rear seat assembly forward for access to sensor.

(2) Disconnect switch harness.

(3) Remove screws attaching switch to bracket and remove the switch.

INSTALLATION

CAUTION: The mercury switch (inside the acceleration switch), will not function properly if the switch is mispositioned. Verify that the switch locating arrow is pointing to the front of the vehicle.

(1) Position switch in mounting bracket.

(2) Install and tighten switch attaching screws to 2-4 N·m (17-32 in. lbs.).

(3) Connect harness to switch. Be sure harness connector is firmly seated.

(4) Move seat back to normal position.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Acceleration Sensor	
Sensor Bolt	.8-9 N·m (71-83 in. lbs.)
Bracket Bolt	.1-2 N·m (13-18 in. lbs.)
Hydraulic Control Unit	
Mounting Nuts	.10-13 N·m (92-112 in. lbs.)
Brakelines	.14-16 N·m (125-140 in. lbs.)
Controller Anitlock Brakes	
Mounting Bolts	.8-13 N·m (75-115 in. lbs.)
Wheel Speed Sensors	
Front Mounting Bolt	.4-6 (34-50 in. lbs.)
Rear Mounting Bolt	.12-14 N·m (106-124 in. lbs.)

CLUTCH

CONTENTS

	page
GENERAL INFORMATION	
CLUTCH COMPONENTS	1
INSTALLATION METHODS AND PARTS USAGE	2
SAFETY PRECAUTIONS	1
DESCRIPTION AND OPERATION	
CLUTCH OPERATION	2
DIAGNOSIS AND TESTING	
DIAGNOSTIC INFORMATION	2
SERVICE PROCEDURES	
CLUTCH COMPONENT LUBRICATION	9
CLUTCH FLUID LEVEL	9
CLUTCH LINKAGE FLUID	9
FLYWHEEL	9
REMOVAL AND INSTALLATION	
CLUTCH COVER AND DISC	10
CLUTCH HOUSING	13
CLUTCH HYDRAULIC LINKAGE	13
CLUTCH PEDAL	15
PILOT BEARING	11
RELEASE BEARING	11
SPECIFICATIONS	
TORQUE	15

GENERAL INFORMATION

CLUTCH COMPONENTS

The clutch mechanism in XJ models consists of a single, dry-type disc and a diaphragm style clutch cover. A hydraulic linkage is used to operate the clutch release bearing and fork.

A needle-type pilot bearing supports the transmission input shaft in the crankshaft. A sleeve type release bearing is used to engage and disengage the clutch cover pressure plate.

The release bearing is operated by a release fork in the clutch housing. The fork pivots on a ball stud mounted in the housing. The release fork is actuated by a hydraulic slave cylinder mounted in the housing. The slave cylinder is operated by a clutch master cylinder mounted on the dash panel. The cylinder push rod is connected to the clutch pedal.

The clutch disc has cushion springs in the disc hub. The clutch disc facing is riveted to the hub. The facing is made from a non-asbestos material. The clutch cover pressure plate is a diaphragm type with a one-piece spring and multiple release fingers. The pressure plate release fingers are preset during manufacture and are not adjustable.

HYDRAULIC LINKAGE COMPONENTS

The hydraulic linkage consists of a clutch master cylinder with integral reservoir, a clutch slave cylinder and an interconnecting fluid line.

The clutch master cylinder push rod is connected to the clutch pedal. The slave cylinder push rod is connected to the clutch release fork. The master cylinder is mounted on the driver side of the dash panel adjacent to the brake master cylinder and booster assembly. This positioning is similar for both left and right hand drive models.

SAFETY PRECAUTIONS

WARNING: EXERCISE CARE WHEN SERVICING CLUTCH COMPONENTS. DUST AND DIRT ON CLUTCH PARTS USE MAY CONTAIN ASBESTOS FIBERS. BREATHING EXCESSIVE CONCENTRATIONS OF THESE FIBERS CAN CAUSE SERIOUS BODILY HARM. WEAR A RESPIRATOR DURING SERVICE AND NEVER CLEAN CLUTCH COMPONENTS WITH COMPRESSED AIR OR WITH A DRY BRUSH. EITHER CLEAN THE COMPONENTS WITH A WATER DAMPENED RAGS OR USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR REMOVING ASBESTOS FIBERS AND DUST. DO NOT CREATE DUST BY SANDING A CLUTCH DISC. REPLACE THE DISC IF THE FRICTION MATERIAL IS DAMAGED OR CONTAMINATED. DISPOSE OF ALL DUST AND DIRT CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS. THIS WILL HELP MINIMIZE EXPOSURE TO YOURSELF AND TO OTHERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL SAFETY AGENCY (EPA), FOR THE HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

GENERAL INFORMATION (Continued)

INSTALLATION METHODS AND PARTS USAGE

Distortion of clutch components during installation and the use of non-standard components are additional causes of clutch malfunction.

Improper clutch cover bolt tightening can distort the cover. The usual result is clutch grab, chatter and rapid wear. Tighten the cover bolts as described in Removal and Installation section.

An improperly seated flywheel and/or clutch housing are additional causes of clutch failure. Improper seating will produce misalignment and additional clutch problems.

The use of non-standard or low quality parts will also lead to problems and wear. Use recommended factory quality parts to avoid comebacks.

A cocked pilot bearing is another cause of clutch noise, drag, and hard shifting, and rapid bearing wear. Always use an alignment tool to install a new bearing. This practice helps avoid cocking the bearing during installation.

DESCRIPTION AND OPERATION

CLUTCH OPERATION

Leverage, clamping force, and friction are what make the clutch work. The disc serves as the friction element and a diaphragm spring and pressure plate provide the clamping force. The clutch pedal, hydraulic linkage, release lever and bearing provide the leverage.

The clutch cover assembly clamps the disc against the flywheel. The assembly consists of the cover, diaphragm spring, pressure plate, and fulcrum components. The pressure plate clamps the clutch disc against the flywheel and the spring provides the clamping force.

The clutch disc friction material is riveted to the disc hub. The hub bore is splined for installation on the transmission input shaft. The hub splines connect the disc to the transmission.

The clutch linkage uses hydraulic pressure to operate the clutch. The clutch master cylinder push rod is connected to the clutch pedal and the slave cylinder push rod is connected to the release lever in the clutch housing.

Depressing the clutch pedal develops fluid pressure in the clutch master cylinder. This pressure is transmitted to the slave cylinder through a connecting line. In turn, the slave cylinder operates the clutch release lever.

The clutch release bearing is mounted on the transmission front bearing retainer. The bearing is attached to the release lever, which moves the bearing into contact with the clutch cover diaphragm spring.

Slave cylinder force causes the release lever to move the release bearing into contact with the diaphragm spring. As additional force is applied, the bearing presses the diaphragm spring fingers inward on the fulcrums. This action moves the pressure plate rearward relieving clamp force on the disc. The clutch disc is disengaged and freewheeling at this point.

The process of clutch re-engagement, is simply the reverse of what occurs during disengagement. Releasing pedal pressure removes clutch linkage pressure. The release bearing moves away from the diaphragm spring which allows the pressure plate to exert clamping force on the clutch disc.

DIAGNOSIS AND TESTING

DIAGNOSTIC INFORMATION

Unless the cause of a clutch problem is obvious, accurate problem diagnosis will usually require a road test to confirm a problem. Component inspection (Fig. 1) will then be required to determine the actual problem cause.

During a road test, drive the vehicle at normal speeds. Shift the transmission through all gear ranges and observe clutch action. If chatter, grab, slip, or improper release is experienced, remove and inspect the clutch components. However, if the problem is noise or hard shifting, further diagnosis may be needed as the transmission or another driveline component may be at fault. Careful observation during the test will help narrow the problem area.

CLUTCH CONTAMINATION

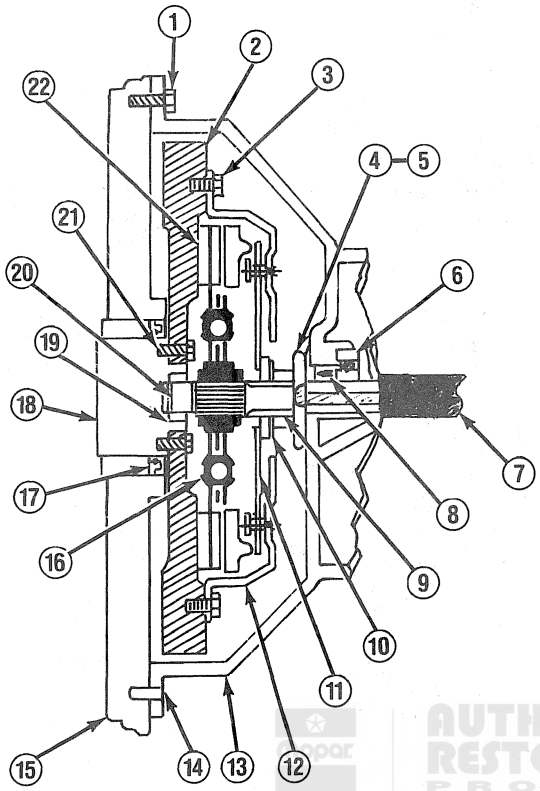
Fluid contamination is a frequent cause of clutch malfunctions. Oil, water, or clutch fluid on the clutch disc and pressure plate surfaces will cause chatter, slip and grab.

During inspection, note if any components are contaminated with oil, hydraulic fluid, or water/road splash.

Oil contamination indicates a leak at either the rear main seal or transmission input shaft. Oil leakage produces a residue of oil on the housing interior and on the clutch cover and flywheel. Heat buildup caused by slippage between the cover, disc and flywheel, can sometimes bake the oil residue onto the components. The glaze-like residue ranges in color from amber to black.

Road splash contamination means dirt/water is entering the clutch housing due to loose bolts, housing cracks, or through hydraulic line openings. Driving through deep water puddles can force water/road splash into the housing through such openings.

DIAGNOSIS AND TESTING (Continued)



1 Check clutch housing bolts. Tighten if loose. Be sure housing is fully seated on engine block.

2 Check flywheel. Scuff sand face to remove glaze. Clean surface with wax and grease remover. Replace flywheel if severely scored, worn or cracked. Secure flywheel with new bolts (if removed). Do not reuse old bolts. Use Mopar Lock N'Seal on bolts.

3 Tighten clutch cover bolts 2-3 threads at a time, alternately and evenly (in a star pattern) to specified torque. Failure to do so could warp the cover.

4 Check release fork. Replace fork if bent or worn. Make sure pivot and bearing contact surfaces are lubricated.

5 Check release fork pivot (in housing). Be sure pivot is secure and ball end is lubricated.

6 Transmission input shaft bearing will cause noise, chatter, or improper release if damaged. Check condition before installing transmission.

7 Check slave cylinder. Replace it if leaking. Be sure cylinder is properly secured in housing and cylinder piston is seated in release fork.

8 Check input shaft seal if clutch cover and disc were oil covered. Replace seal if worn, or cut.

9 Inspect release bearing slide surface of trans. front bearing retainer. Surface should be smooth, free of nicks, scores. Replace retainer if necessary. Lubricate slide surface before installing release bearing.

10 Do not replace release bearing unless actually faulty. Replace bearing only if seized, noisy, or damaged.

11 Check clutch cover diaphragm spring and release fingers. Replace cover if spring or fingers are bent, warped, broken, cracked. Do not tamper with factory spring setting as clutch problems will result.

12 Check condition of clutch cover. Replace clutch cover if plate surface is deeply scored, warped, worn, or cracked. Be sure cover is correct size and properly aligned on disc and flywheel.

13 Inspect clutch housing. Be sure bolts are tight. Replace housing if damaged.

14 Verify that housing alignment dowels are in position before installing housing.

15 Clean engine block surface before installing clutch housing. Dirt, grime can produce misalignment.

16 Make sure side of clutch disc marked "flywheel side" is toward flywheel.

17 Check rear main seal if clutch disc and cover were oil covered. Replace seal if necessary.

18 Check crankshaft flange (if flywheel is removed). Be sure flange is clean and flywheel bolt threads are in good condition.

19 Check pilot bearing. Replace bearing if damaged. Lube with Mopar high temp. bearing grease before installation.

20 Check transmission input shaft. Disc must slide freely on shaft splines. Lightly grease splines before installation. Replace shaft if splines or pilot bearing hub are damaged.

21 Check flywheel bolt torque. If bolts are loose, replace them. Use Mopar Lock N'Seal to secure new bolts.

22 Check clutch disc facing. Replace disc if facing is charred, scored, flaking off, or worn. Also check runout of new disc. Runout should not exceed 0.5 mm (0.02 in.).

J9506-2

Fig. 1 Clutch Components And Inspection

DIAGNOSIS AND TESTING (Continued)

Clutch fluid leaks are usually from damaged slave cylinder push rod seals. This type of leak can only be confirmed by visual inspection.

CLUTCH MISALIGNMENT

Clutch components must be in proper alignment with the crankshaft and transmission input shaft. Misalignment caused by excessive runout or warpage of any clutch component will cause grab, chatter and improper clutch release.

FLYWHEEL RUNOUT

Check flywheel runout whenever misalignment is suspected. Flywheel runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the indicator on a stud installed in place of one of the flywheel bolts.

Common causes of runout are:

- heat warpage
- improper machining
- incorrect bolt tightening
- improper seating on crankshaft flange shoulder
- foreign material on crankshaft flange

Flywheel machining is not recommended. The flywheel clutch surface is machined to a unique contour and machining will negate this feature. However, minor flywheel scoring can be cleaned up by hand with 180 grit emery, or with surface grinding equipment. Remove only enough material to reduce scoring (approximately 0.001 - 0.003 in.). Heavy stock removal is **not recommended.** Replace the flywheel if scoring is severe and deeper than 0.076 mm (0.003 in.). Excessive stock removal can result in flywheel cracking or warpage after installation; it can also weaken the flywheel and interfere with proper clutch release.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout. Use new bolts when remounting a flywheel and secure the bolts with Mopar Lock And Seal. Tighten flywheel bolts to specified torque only. Overtightening can distort the flywheel hub causing runout.

CLUTCH COVER AND DISC RUNOUT

Check the clutch disc before installation. Axial (face) runout of a **new** disc should not exceed 0.50 mm (0.020 in.). Measure runout about 6 mm (1/4 in.) from the outer edge of the disc facing. Obtain another disc if runout is excessive.

Check condition of the clutch before installation. A warped cover or diaphragm spring will cause grab and incomplete release or engagement. Be careful when handling the cover and disc. Impact can distort the cover, diaphragm spring, release fingers and the hub of the clutch disc.

Use an alignment tool when positioning the disc on the flywheel. The tool prevents accidental misalignment which could result in cover distortion and disc damage.

A frequent cause of clutch cover distortion (and consequent misalignment) is improper bolt tightening. To avoid warping the cover, the bolts must tightened alternately (diagonal pattern) and evenly (2-3 threads at a time) to specified torque.

CLUTCH HOUSING MISALIGNMENT

Clutch housing alignment is important to proper clutch operation. The housing maintains alignment between the crankshaft and transmission input shaft. Misalignment can cause clutch noise, hard shifting, incomplete release and chatter. It can also result in premature wear of the pilot bearing, cover release fingers and clutch disc. In severe cases, misalignment can also cause premature wear of the transmission input shaft and front bearing.

Housing misalignment is generally caused by incorrect seating on the engine or transmission, loose housing bolts, missing alignment dowels, or housing damage. Infrequently, misalignment may also be caused by housing mounting surfaces that are not completely parallel. Misalignment can be corrected with shims.

INSPECTION AND DIAGNOSIS CHARTS

The clutch inspection chart (Fig. 1) outlines items to be checked before and during clutch installation. Use the chart as a check list to help avoid overlooking potential problem sources during service operations.

The diagnosis charts describe common clutch problems, causes and correction. Fault conditions are listed at the top of each chart. Conditions, causes and corrective action are outlined in the indicated columns.

The charts are provided as a convenient reference when diagnosing faulty clutch operation.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
DISC FACING WORN OUT	1. Normal wear. Driver frequently rides (slips) clutch. Results in rapid wear overheating. Insufficient clutch cover diaphragm spring tension.	1. Replace clutch disc. Also replace cover if spring is weak or pressure plate surface is damaged.
CLUTCH DISC FACING CONTAMINATED WITH OIL, GREASE, OR CLUTCH FLUID	1. Leak at rear main seal or at transmission input shaft seal. Excessive amount of grease applied to input shaft splines. Road splash, water entering housing. Slave cylinder leaking.	1. Replace leaking seals. Apply less grease to input shaft splines. Replace clutch disc (do not clean and reuse). Clean clutch cover and reuse only if cover is in good condition. Replace slave cylinder if leaking.
CLUTCH IS RUNNING PARTIALLY DISENGAGED	1. Release bearing sticking-binding. Does not return to normal running position.	1. Verify that bearing is actually binding, then replace bearing and transmission front bearing retainer if sleeve surface is damaged.
FLYWHEEL HEIGHT INCORRECT	1. Flywheel surface improperly machined. Too much stock removed or surface is tapered.	1. Replace flywheel.
WRONG DISC OR PRESSURE PLATE INSTALLED	1. Incorrect parts order or model number.	1. Replace with correct parts. Compare old and new parts before installation.
CLUTCH DISC, COVER AND/OR DIAPHRAGM SPRING, WARPED, DISTORTED	1. Rough handling (impact) bent cover, spring, or disc. Incorrect bolt tightening sequence and method caused warped cover.	1. Install new disc or cover as needed. Follow installation/tightening instructions.
FACING ON FLYWHEEL SIDE OF DISC TORN, GOUGED, WORN	1. Flywheel surface scored and nicked.	1. Reduce scores and nicks by sanding or surface grinding. Replace flywheel if scores-nicks are deeper than .002-.004 inch.
CLUTCH DISC FACING BURNT (CHARRED). FLYWHEEL AND COVER PRESSURE PLATE SURFACES HEAVILY GLAZED	1. Frequent operation under high loads or hard acceleration conditions. Driver frequently rides (slips) clutch. Results in rapid wear and overheating of disc and cover.	1. Scuff sand flywheel. Replace clutch cover and disc. Alert driver to problem cause.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH DISC WARPED	1. New disc not checked for axial runout before installation.	1. Replace disc. Be sure runout of new disc is less than .5 mm (.020 in.).
CLUTCH DISC BINDS ON INPUT SHAFT SPLINES	1. Clutch disc hub splines damaged during installation. Input shaft splines rough, damaged. Corrosion, rust formations on splines of disc and input shaft.	1. Clean, smooth and lubricate disc and shaft splines. Replace disc and/or input shaft if splines are severely damaged.
CLUTCH DISC RUSTED TO FLYWHEEL AND/OR PRESSURE PLATE	1. Occurs in vehicles stored, or not driven for extended periods of time. Also occurs after steam cleaning if vehicle is not used for extended period.	1. Remove clutch cover and disc. Sand rusted surfaces clean with 180 grit paper. Replace disc cover, and flywheel if corrosion is severe.
CLUTCH DISC FACING STICKS TO FLYWHEEL	1. Vacuum may form in pockets over rivet heads in clutch disc. Occurs as clutch cools down after use.	1. Drill 1/16 inch diameter hole through rivets and scuff sand disc facing with 180 grit paper.
CLUTCH DISC TOO THICK	1. Wrong disc installed.	1. Replace disc.
PILOT BEARING SEIZED, LOOSE, OR ROLLERS ARE WORN	1. Bearing cocked during installation. Bearing defective. Bearing not lubricated. Clutch misalignment.	1. Lubricate and install new bearing. Check and correct any misalignment.
CLUTCH WILL NOT DISENGAGE PROPERLY	1. Low clutch fluid level. 2. Clutch cover loose. 3. Wrong clutch disc. 4. Disc bent, distorted during installation. 5. Clutch cover diaphragm spring bent or warped during transmission installation. 6. Clutch disc installed backwards. 7. Release fork bent or fork pivot is loose or damaged. 8. Clutch master or slave cylinder fault.	1. Top off reservoir and check for leaks. 2. Tighten bolts. 3. Install correct disc. 4. Replace disc. 5. Replace cover. 6. Remove and reinstall disc correctly. Be sure disc side marked "to flywheel" is actually toward flywheel. 7. Replace fork and pivot if worn or damaged. 8. Replace master and slave cylinder as assembly.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUTCH DISC FACING COVERED WITH OIL, GREASE, OR CLUTCH FLUID	1. Oil leak at rear main or input shaft seal. 2. Too much grease applied to splines or disc and input shaft.	1. Correct leak and replace disc (do not clean and reuse the disc). 2. Apply lighter grease coating to splines and replace disc (do not clean and reuse the disc).
CLUTCH DISC AND/OR COVER WARPED, OR DISC FACINGS EXHIBIT UNUSUAL WRONG TYPE	1. Incorrect or substandard parts.	1. Replace disc and/or cover with correct parts.
CLUTCH MASTER OR SLAVE CYLINDER PLUNGER DRAGGING-BINDING	1. Master or slave cylinder components worn or corroded.	1. Replace both cylinders as assembly (and reservoir).
NO FAULT FOUND WITH CLUTCH COMPONENTS	1. Problem actually related to suspension or driveline component. 2. Engine related problem.	1. Further diagnosis required. Check engine/transmission mounts, propeller shafts and U-joints, tires, suspension attaching parts and other driveline components as needed. 2. Check EFI and ignition systems.
PARTIAL ENGAGEMENT OF CLUTCH DISC (ONE SIDE WORN-OPPOSITE SIDE GLAZED AND LIGHTLY WORN)	1. Clutch pressure plate position setting incorrect or modified. 2. Clutch cover, spring, or release fingers bent, distorted (rough handling, improper assembly). 3. Clutch disc damaged or distorted. 4. Clutch misalignment.	1. Replace clutch cover and disc. 2. Replace clutch cover and disc. 3. Replace disc. 4. Check alignment and runout of flywheel, disc, or cover and/or clutch housing. Correct as necessary.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
Clutch components damaged or worn out prematurely.	1. Incorrect or sub-standard clutch parts.	1. Replace with parts of correct type and quality.
Pilot bearing damaged.	1. Bearing cocked during installation. Bearing not lubricated prior to installation. Bearing defect. 2. Clutch misalignment.	1. Replace bearing. Be sure it is properly seated and lubricated before installing clutch. 2. Check and correct misalignment caused by excessive runout of flywheel, disc, cover or clutch housing. Replace input shaft if bearing hub is damaged.
Loose components.	1. Attaching bolts loose at flywheel, cover, or clutch housing.	1. Tighten bolts to specified torque. Replace any clutch bolts that are damaged.
Components appear overheated. Hub of disc cracked or torsion damper springs are distorted or broken.	1. Frequent high load, full throttle operation.	1. Replace parts as needed. Alert driver to condition causes.
Contact surface of release bearing damaged.	1. Clutch cover incorrect, or release fingers are bent or distorted causing damage. 2. Release bearing defect. 3. Release bearing misaligned.	1. Replace clutch cover and bearing. 2. Replace bearing. 3. Check and correct runout of clutch components. Check front bearing retainer sleeve surface. Replace if damaged.
Release bearing is noisy.	1. Release bearing defect.	1. Replace bearing.
Clutch pedal squeak.	1. Pivot pin loose. Pedal bushings worn out or cracked.	1. Tighten pivot pin. Replace bushings if worn or damaged. Lubricate pin and bushings with silicone base lubricator chassis grease.

SERVICE PROCEDURES

CLUTCH COMPONENT LUBRICATION

Proper clutch component lubrication is important to satisfactory operation. Using the correct lubricant and not over lubricating are equally important. Apply recommended lubricant sparingly to avoid disc and pressure plate contamination.

Clutch and transmission components requiring lubrication are:

- Pilot bearing
- Release lever pivot ball stud
- Release lever contact surfaces
- Release bearing bore
- Clutch disc hub splines
- Clutch pedal pivot shaft bore
- Clutch pedal bushings
- Input shaft splines
- Input shaft pilot hub
- Transmission front bearing retainer slide surface

NOTE: Never apply grease to any part of the clutch cover, or disc.

RECOMMENDED LUBRICANTS

Use Mopar multi-purpose grease for the clutch pedal bushings and pivot shaft. Use Mopar high temperature grease (or equivalent) for all other lubrication requirements. Apply recommended amounts and do not over lubricate.

CLUTCH LINKAGE FLUID

The integral clutch master cylinder reservoir, slave cylinder and fluid lines are pre-filled with fluid prior to assembly operations.

The hydraulic system should not require additional fluid under normal circumstances. In fact, **the reservoir fluid level will actually increase as normal clutch wear occurs. For this reason, it is important to avoid overfilling, or removing fluid from the reservoir. This will cause clutch release problems.**

If inspection or diagnosis indicates additional fluid may be needed, use Mopar brake fluid, or an equivalent meeting standards SAE J1703 and DOT 3. Do not use any other type of fluid.

CLUTCH FLUID LEVEL

The clutch fluid reservoir, master cylinder, slave cylinder and fluid lines are pre-filled with fluid at the factory during assembly operations.

The hydraulic system should not require additional fluid under normal circumstances. In fact, **the reservoir fluid level will actually increase as normal clutch wear occurs. For this reason, it is important to avoid overfilling, or removing fluid from the reservoir.**

If inspection or diagnosis indicates additional fluid may be needed, use Mopar brake fluid, or an equivalent meeting standards SAE J1703 and DOT 3. Do not use any other type of fluid.

Clutch fluid level is checked at the master cylinder reservoir (Fig. 2). An indicator ring is provided either on the side, or interior rim of the reservoir (Fig. 3).

Be sure to wipe the reservoir and cover clean before removing the cover. This will avoid having dirt or foreign material fall into the reservoir during a fluid level check.

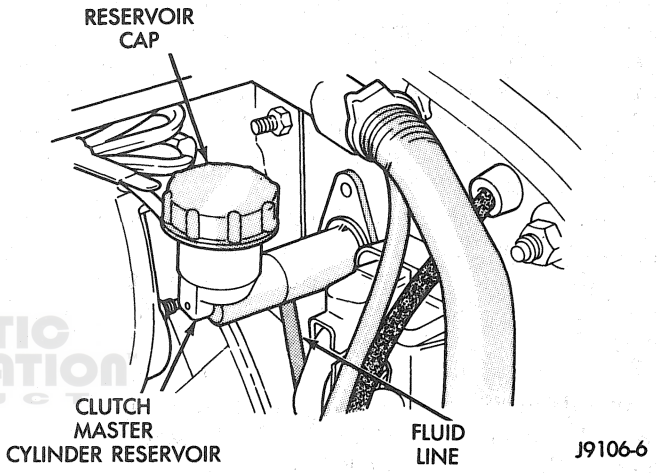


Fig. 2 Clutch Master Cylinder Reservoir And Cap

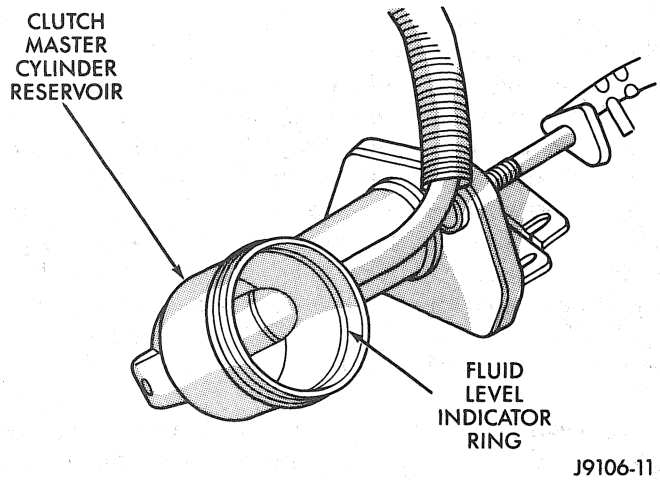


Fig. 3 Reservoir Fluid Level Indicator Ring

FLYWHEEL

Inspect the flywheel whenever the clutch disc, cover and housing are removed for service. Check condition of the flywheel face, hub, ring gear teeth, and flywheel bolts.

Minor scratches, burrs, or glazing on the flywheel face can be reduced with 180 grit emery cloth. However, the flywheel should be replaced if the disc con-

SERVICE PROCEDURES (Continued)

tact surface is severely scored, heat checked, cracked, or obviously worn.

Flywheel machining is not recommended. The flywheel surface is manufactured with a unique contour that would be negated by machining. However, cleanup of minor flywheel scoring can be performed by hand with 180 grit emery, or with surface grinding equipment. Replace the flywheel if scoring is deeper than 0.0762 mm (0.003 in.).

Heavy stock removal by grinding is **not recommended.** Excessive stock removal can result in flywheel cracking or warpage after installation. It can also weaken the flywheel and interfere with proper clutch release.

Check flywheel runout if misalignment is suspected. Runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the dial indicator on a stud installed in place of one of the flywheel attaching bolts.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout.

Check condition of the flywheel hub and attaching bolts. Replace the flywheel if the hub exhibits cracks in the area of the attaching bolt holes.

Install new attaching bolts whenever the flywheel is replaced and use Mopar Lock N' Seal, or Loctite 242 on the replacement bolt threads.

Recommended flywheel bolt torques are:

- 142 N·m (105 ft. lbs.) for 6-cylinder flywheels
- 68 N·m (50 ft. lbs.) plus an additional turn of 60° for 4-cylinder flywheels

Inspect the teeth on the starter ring gear. **If the teeth are worn or damaged, the flywheel should be replaced as an assembly. This is the recommended and preferred method of repair.**

In cases where a new flywheel is not readily available, a replacement ring gear can be installed. However, the following precautions must be observed to avoid damaging the flywheel and replacement gear.

(1) Mark position of the old gear for alignment reference on the flywheel. Use a scriber for this purpose.

(2) Wear protective goggles or approved safety glasses. Also wear heat resistent gloves when handling a heated ring gear.

(3) Remove the old gear by cutting most of the way through it (at one point) with an abrasive cut-off wheel. Then complete removal with a cold chisel or punch.

(4) The ring gear is a shrink fit on the flywheel. This means the gear must be expanded by heating in order to install it. **The method of heating and expanding the gear is extremely important.** Every surface of the gear must be heated at the same time to produce uniform expansion. An oven or similar enclosed heating device must be used. Temperature required for uniform expansion is approximately 375° F.

CAUTION: Do not use an oxy/acetylene torch to remove the old gear, or to heat and expand a new gear. The high temperature of the torch flame can cause localized heating that will damage the flywheel. In addition, using the torch to heat a replacement gear will cause uneven heating and expansion. The torch flame can also anneal the gear teeth resulting in rapid wear and damage after installation.

(5) The heated gear must be installed evenly to avoid misalignment or distortion. A shop press and suitable press plates should be used to install the gear if at all possible.

(6) Be sure to wear eye and hand protection. Heat resistent gloves and safety goggles are needed for personal safety. Also use metal tongs, vise grips, or similar tools to position the gear as necessary for installation.

(7) Allow the flywheel and ring gear to cool down before installation. Set the assembly on a workbench and let it cool in normal shop air.

CAUTION: Do not use water, or compressed air to cool the flywheel. The rapid cooling produced by water or compressed air can distort, or crack the gear and flywheel.

REMOVAL AND INSTALLATION

CLUTCH COVER AND DISC

REMOVAL

(1) Remove transmission. Refer to procedures in Group 21.

(2) If original clutch cover will be reinstalled, mark position of cover on flywheel for assembly reference. Use paint or a scriber for this purpose.

(3) If clutch cover is to be replaced, cover bolts can be removed in any sequence. However, if original cover will be reinstalled, loosen cover bolts evenly and in rotation to relieve spring tension equally. This is necessary avoid warping cover.

(4) Remove cover bolts and remove cover and disc (Fig. 4).

INSTALLATION

(1) Lightly scuff sand flywheel face with 180 grit emery cloth. Then clean surface with a wax and grease remover.

REMOVAL AND INSTALLATION (Continued)

(2) Lubricate pilot bearing with Mopar high temperature bearing grease.

(3) Check runout and free operation of new clutch disc as follows:

(a) Slide disc onto transmission input shaft splines. Disc should slide freely on splines.

(b) Leave disc on shaft and check face runout with dial indicator. Check runout at disc hub and about 6 mm (1/4 in.) from outer edge of facing.

(c) Face runout should not exceed 0.5 mm (0.020 in.). Obtain another clutch disc if runout exceeds this limit.

(4) Position clutch disc on flywheel. Be sure side of disc marked flywheel side is positioned against flywheel (Fig. 4). If disc is not marked, be sure flat side of disc hub is toward flywheel.

(5) Inspect condition of pressure plate surface of clutch cover (Fig. 4). Replace cover if this surface is worn, heat checked, cracked, or scored.

(6) Insert clutch alignment tool in clutch disc (Fig. 5).

(7) Insert alignment tool in pilot bearing and position disc on flywheel. Be sure disc hub is positioned correctly. Side of hub marked Flywheel Side should face flywheel (Fig. 4). If disc is not marked, place flat side of disc against flywheel.

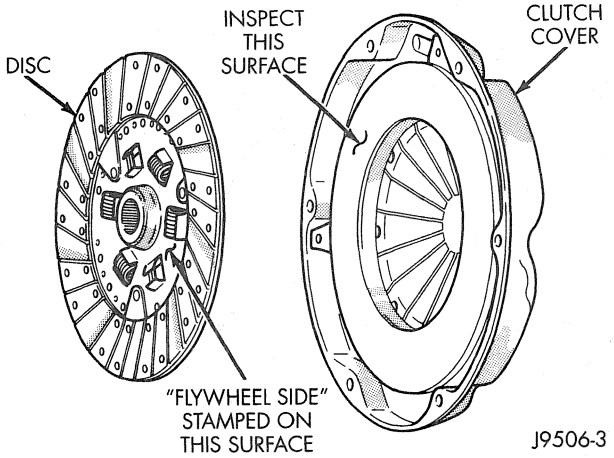


Fig. 4 Clutch Disc And Pressure Plate Inspection

(8) Position clutch cover over disc and on flywheel (Fig. 5).

(9) Install clutch cover bolts finger tight.

(10) Tighten cover bolts evenly and in rotation a few threads at a time. **Cover bolts must be tightened evenly and to specified torque to avoid distorting cover. Tightening torques are 31 N·m (23 ft. lbs.) on 2.5L engines and 54 N·m (40 ft. lbs.) on 4.0L engines.**

(11) Apply light coat of Mopar high temperature bearing grease to pilot bearing hub and splines of transmission input shaft. **Do not over lubricate shaft splines. This will result in grease contamination of disc.**

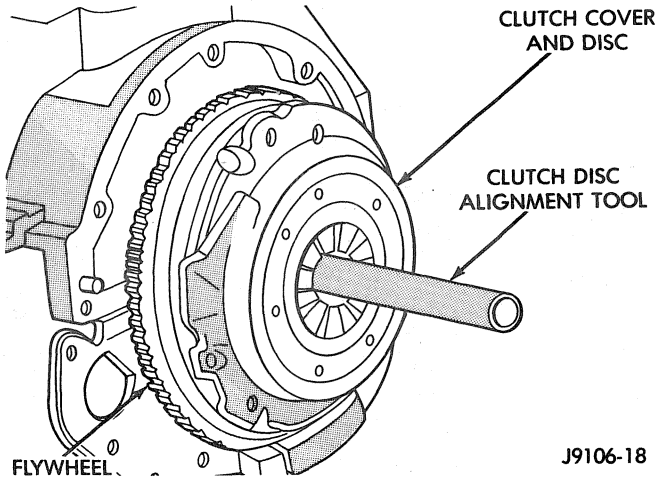


Fig. 5 Typical Method Of Aligning Clutch Disc

(12) Install transmission (Fig. 6) and (Fig. 7). Refer to procedures in Group 21.

RELEASE BEARING

REMOVAL

(1) Remove transmission as described in Group 21.

(2) Disconnect release bearing from release lever and remove bearing (Fig. 8).

(3) Inspect bearing slide surface of transmission front bearing retainer. Replace retainer if slide surface is scored, worn, or cracked.

(4) Inspect release fork and fork pivot. Be sure pivot is secure and in good condition. Be sure fork is not distorted or worn. Replace release fork retainer spring if bent or damaged in any way.

INSTALLATION

(1) Lubricate crankshaft pilot bearing with Mopar high temperature bearing grease. Apply grease to end of long shank, small diameter flat blade screwdriver. Then insert tool through clutch disc hub to reach bearing.

(2) Lubricate input shaft splines, bearing retainer slide surface, fork pivot and release fork pivot surface with Mopar high temperature grease.

(3) Install new release bearing. Be sure bearing is properly secured to release fork.

(4) Install transmission as described in Group 21.

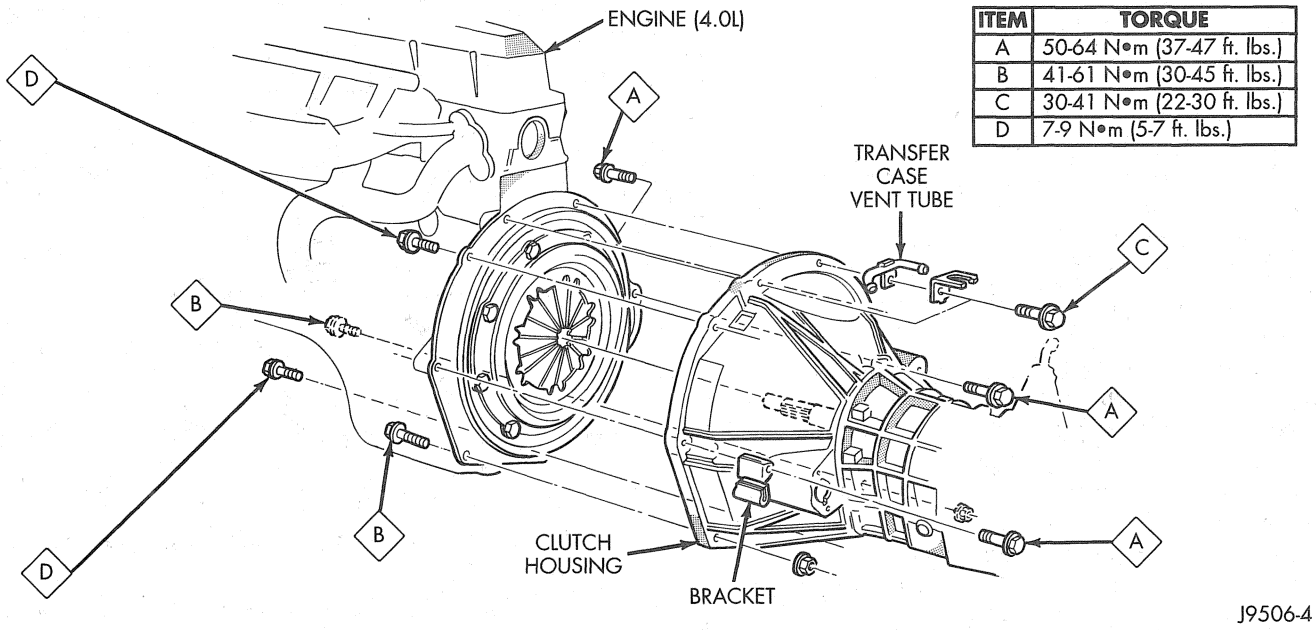
PILOT BEARING

REMOVAL

(1) Remove transmission. Refer to Group 21 for procedure.

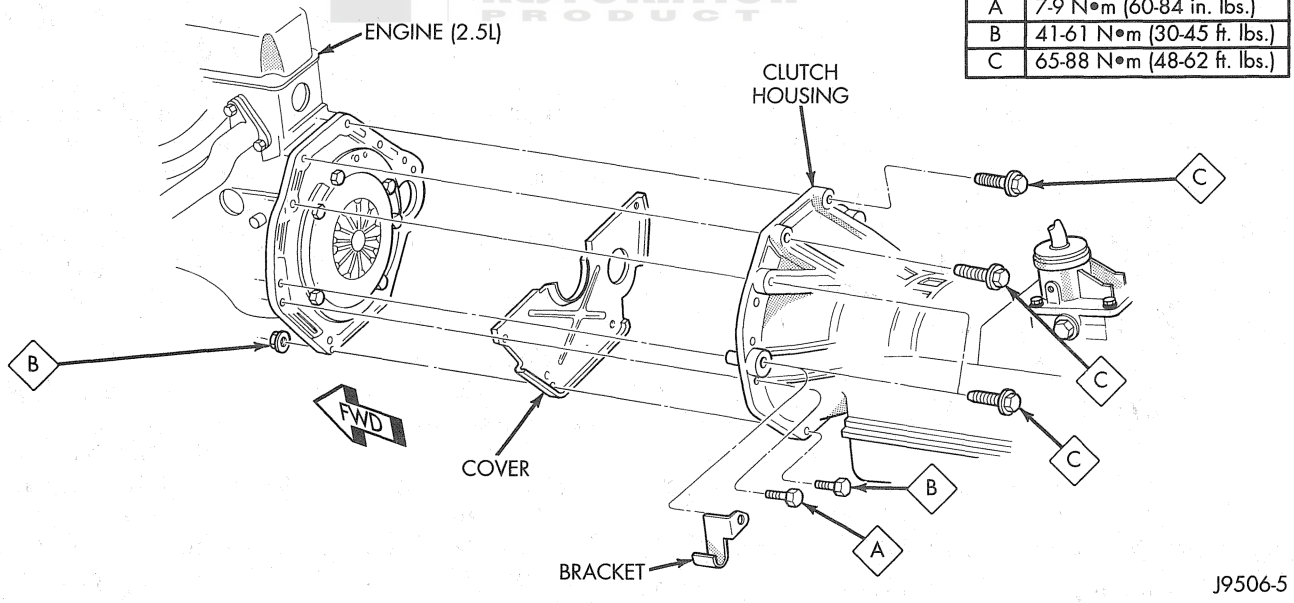
(2) Remove clutch cover and disc.

REMOVAL AND INSTALLATION (Continued)



ITEM	TORQUE
A	50-64 N•m (37-47 ft. lbs.)
B	41-61 N•m (30-45 ft. lbs.)
C	30-41 N•m (22-30 ft. lbs.)
D	7-9 N•m (5-7 ft. lbs.)

Fig. 6 Manual Transmission Mounting—4.0L



ITEM	TORQUE
A	7-9 N•m (60-84 in. lbs.)
B	41-61 N•m (30-45 ft. lbs.)
C	65-88 N•m (48-62 ft. lbs.)

Fig. 7 Manual Transmission Mounting—2.5L

(3) Remove pilot bearing. Use internal (blind hole) puller such those as supplied in Snap On Tool Set CG40CB to remove bearing.

INSTALLATION

(1) Lubricate new bearing with Mopar high temperature bearing grease.

(2) Start new bearing into crankshaft by hand. Then seat bearing with clutch alignment tool (Fig. 9).

(3) Lightly scuff sand flywheel surface with 180 grit emery cloth. Then clean surface with wax and grease remover.

(4) Install clutch disc and cover as described in this section.

(5) Install transmission. Refer to Group 21 for procedure.

REMOVAL AND INSTALLATION (Continued)

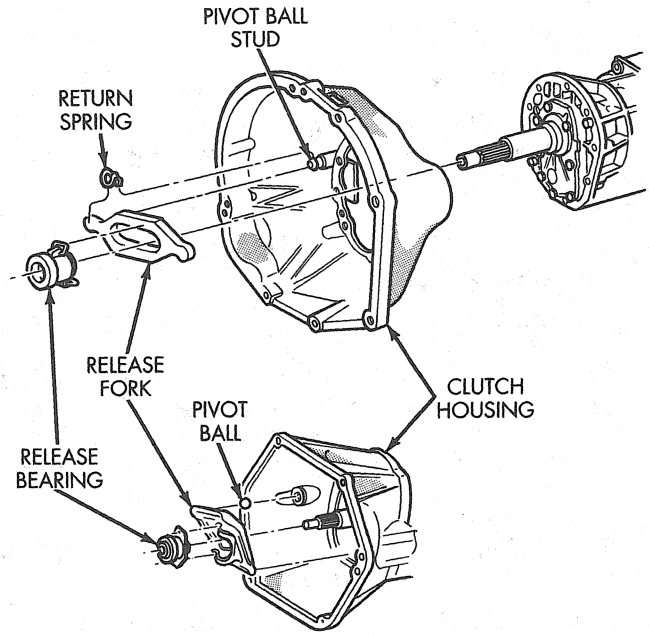


Fig. 8 Release Bearing Attachment

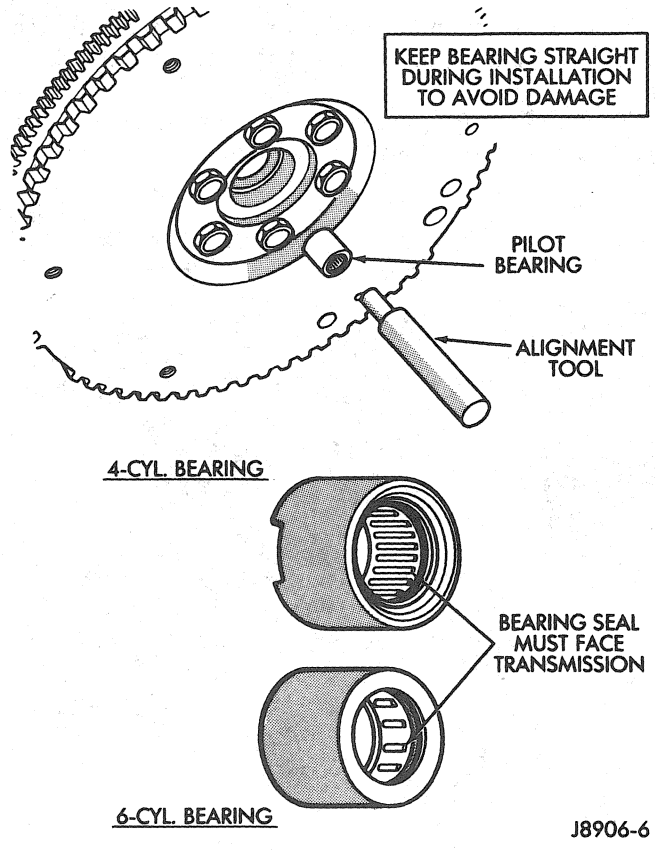


Fig. 9 Pilot Bearing Installation

CLUTCH HOUSING

The clutch housing is removable and can be replaced when the transmission is out of the vehicle.

The bolts attaching the housing to the transmission case are located inside the housing (Fig. 10). Recommended tightening torque for the clutch housing-to-transmission bolts is 38 N·m (28 ft. lbs.).

NOTE: Be sure the transmission and housing mating surfaces are clean before installing an original, or replacement clutch housing. Dirt/foreign material trapped between the housing and transmission will cause misalignment. If misalignment is severe enough, the result will be clutch drag, incomplete release and hard shifting.

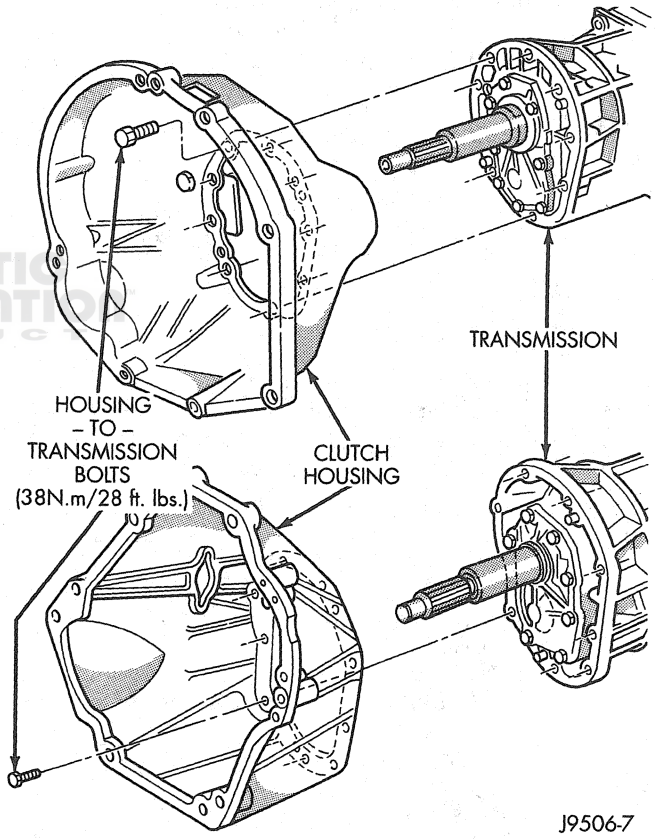


Fig. 10 Clutch Housing Attachment

CLUTCH HYDRAULIC LINKAGE

The clutch master cylinder, slave cylinder and connecting line are serviced as an assembly only. The linkage components cannot be overhauled or serviced separately. The cylinders and connecting line are sealed units. Also note that removal/installation procedures for right and left hand drive models are basically the same. Only master cylinder location is different.

REMOVAL

(1) Raise vehicle.

REMOVAL AND INSTALLATION (Continued)

(2) Remove fasteners attaching slave cylinder to clutch housing.

(3) Remove slave cylinder from clutch housing (Fig. 11).

(4) Disengage clutch fluid line from body clips.

(5) Lower vehicle.

(6) Verify that cap on clutch master cylinder reservoir is tight. This is necessary to avoid undue spillage during removal.

(7) Remove clutch master cylinder attaching nuts. Note that one nut is accessible from engine compartment and one nut is accessible from under instrument panel (Fig. 12) and (Fig. 13).

(8) Remove clip securing clutch master cylinder push rod to pedal and slide push rod off pedal pin.

(9) Disconnect clutch pedal position switch wires.

(10) If pedal pin is equipped with bushing, inspect condition of bushing and replace it if worn or damaged.

(11) Remove clutch hydraulic linkage through engine compartment.

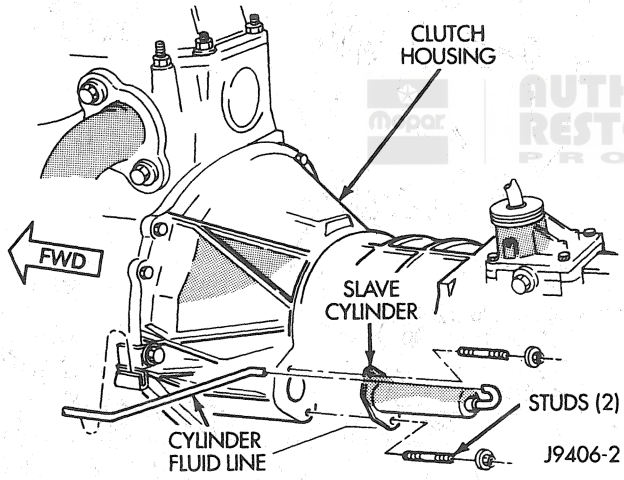


Fig. 11 Slave Cylinder Attachment

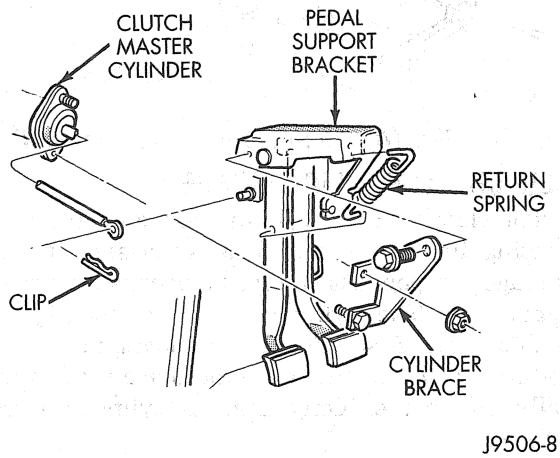


Fig. 12 Clutch Master Cylinder And Push Rod Attachment—Left Hand Drive Models

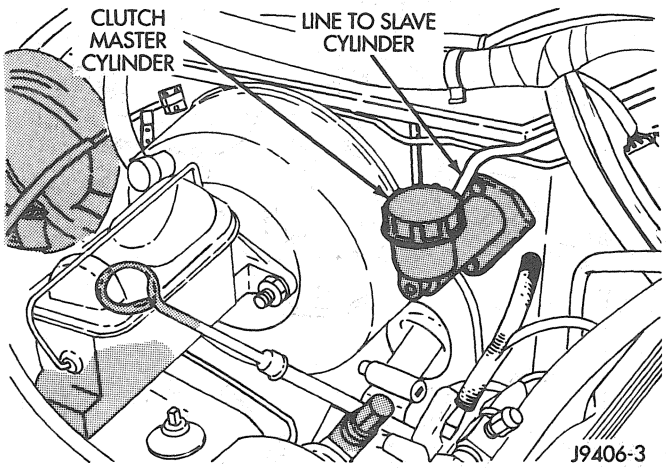


Fig. 13 Clutch Master Cylinder Location—Right Hand Drive Models

INSTALLATION

(1) Be sure reservoir cover on clutch master cylinder is tight to avoid spills.

(2) Position clutch linkage components in vehicle. Work connecting line and slave cylinder downward past engine and adjacent to clutch housing.

(3) Position clutch master cylinder on dash panel (Fig. 14).

(4) Attach clutch master cylinder push rod to pin on clutch pedal. Secure rod with new clip if necessary.

(5) Install and tighten clutch master cylinder attaching nuts to 23-34 N·m (200-300 in. lbs.) torque.

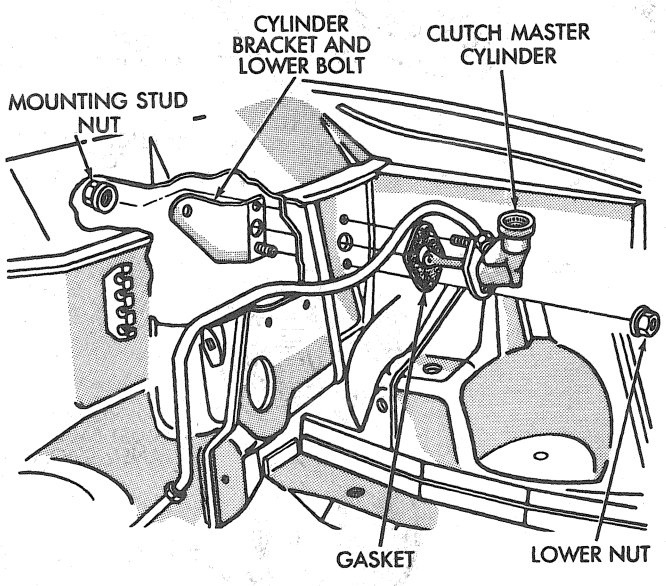


Fig. 14 Clutch Master Cylinder Mounting—Typical

REMOVAL AND INSTALLATION (Continued)

(6) Raise vehicle.

(7) Insert slave cylinder push rod through clutch housing opening and into release lever. Be sure cap on end of rod is securely engaged in lever. Check this before installing cylinder attaching nuts.

(8) Install and tighten slave cylinder attaching nuts to 23-34 N·m (200-300 in. lbs.) torque.

(9) Secure clutch fluid line in body clips.

(10) Lower vehicle.

(11) Connect clutch pedal position switch wires.

CLUTCH PEDAL

REMOVAL

(1) Remove instrument panel lower trim cover for extra working clearance.

(2) Disconnect clutch pedal position switch wires.

(3) Remove retainer clip that attaches clutch master cylinder push rod to pedal.

(4) Remove nut securing pedal to pivot shaft (Fig. 15).

(5) Move pedal pivot shaft to right and slide pedal off shaft.

INSTALLATION

(1) Lubricate clutch pedal pivot shaft and pedal bushings or sleeve with Mopar multi-mileage grease.

(2) Position pedal on pivot shaft and through brace. Secure pedal with washer and nut on.

(3) Install clutch master cylinder push rod on pedal. Secure rod with washer(s) and new cotter pin.

(4) Connect clutch pedal position switch wires.

(5) Install instrument panel lower trim cover, if removed.

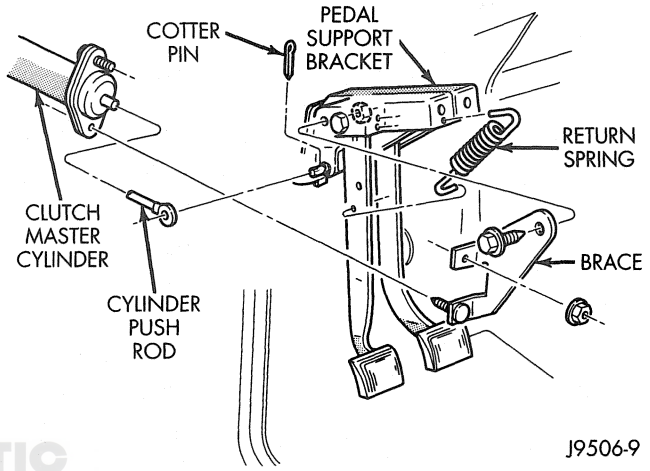


Fig. 15 Clutch Pedal Mounting

SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Bolts, clutch cover 2.5 L	31 N·m (23 ft. lbs)
Bolts, clutch cover 4.0 L	52 N·m (38 ft. lbs)
Bolt/Nut, clutch cyl. mount	23 N·m (200 in. lbs)
Bolt, clutch housing M12	75 N·m (55 ft. lbs)
Bolt, clutch housing 3/8	37 N·m (27 ft. lbs)
Bolt, clutch housing 7/16	58 N·m (43 ft. lbs)
Bolt, clutch housing/trans.	38 N·m (28 ft. lbs)
Bolt, dust shield M8	8 N·m (72 in. lbs)
Bolt, dust shield lower	50 N·m (37 ft. lbs)
Bolt, X-member/frame	41 N·m (30 ft. lbs)
Bolt, X-member/rear support	45 N·m (33 ft. lbs.)
Bolts, flywheel 4.0 L	142 N·m (105 ft. lbs)
Bolts, flywheel 2.5 L	68 N·m (50 ft. lbs) +1/4 turn
Bolt, starter motor	45 N·m (33 ft. lbs)
Bolts, U-joints	19 N·m (170 in. lbs.)

COOLING SYSTEM

CONTENTS

page

GENERAL INFORMATION
BELT TENSION 2
COOLANT 2
COOLING SYSTEM COMPONENTS 2
COOLING SYSTEM 2
ENGINE ACCESSORY DRIVE BELTS 1
ENGINE BLOCK HEATER 2
RADIATORS 2
SYSTEM COOLANT ROUTING 2
WATER PUMPS 2
DESCRIPTION AND OPERATION
AUTOMATIC TRANSMISSION OIL COOLER 2
AUXILIARY ELECTRIC COOLING FAN 8
BELT TENSION 4
COOLANT PERFORMANCE 5
COOLANT RESERVE/OVERFLOW SYSTEM 3
COOLANT SELECTION-ADDITIVES 6
COOLING SYSTEM FANS 3
COOLING SYSTEM HOSES 6
ENGINE BLOCK HEATER 4
RADIATOR PRESSURE CAP 6
THERMOSTAT 5
VISCOUS FAN DRIVE 7
WATER PUMPS 6
DIAGNOSIS AND TESTING
AUXILIARY ELECTRIC COOLING FAN 22
COOLING SYSTEM DIAGNOSIS 14
DEAERATION 24
DRB SCAN TOOL 10
ENGINE ACCESSORY DRIVE BELTS 10
LOW COOLANT LEVEL-AERATION 24
ON-BOARD DIAGNOSTICS (OBD) 9
PRELIMINARY CHECKS 10
PRESSURE TESTING RADIATOR CAPS 23
RADIATOR CAP-TO-FILLER NECK SEAL—PRESSURE RELIEF CHECK 23

page

RADIATOR COOLANT FLOW CHECK 20
TESTING COOLING SYSTEM FOR LEAKS 20
VISCOUS FAN DRIVE 22
WATER PUMP TESTS 10
SERVICE PROCEDURES
ADDING ADDITIONAL COOLANT—ROUTINE . . 24
COOLANT LEVEL CHECK-SERVICE 24
COOLANT LEVEL CHECK—ROUTINE 24
COOLANT SERVICE 24
DRAINING AND FILLING COOLING SYSTEM . . 24
REVERSE FLUSHING 25
REMOVAL AND INSTALLATION
AUXILIARY ELECTRIC COOLING FAN 34
COOLANT RESERVE TANK 27
COOLING SYSTEM FANS 38
ENGINE ACCESSORY DRIVE BELTS 35
ENGINE BLOCK HEATER 35
RADIATOR 31
THERMOSTAT 29
TRANSMISSION OIL COOLERS 26
VISCOUS FAN DRIVE REMOVAL/INSTALLATION 39
WATER PUMPS 27
CLEANING AND INSPECTION
COOLING SYSTEM CLEANING 39
COOLING SYSTEM HOSES 39
FAN BLADE INSPECTION 39
RADIATOR CLEANING 39
RADIATOR PRESSURE CAP 39
SPECIFICATIONS
BELT TENSION 40
COOLING SYSTEM CAPACITIES 40
TORQUE SPECIFICATIONS 40
SPECIAL TOOLS
COOLING SYSTEM 41

GENERAL INFORMATION

ENGINE ACCESSORY DRIVE BELTS

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to water pump rotating in wrong direction. Refer to the appropriate engine Belt Schematic in this group for the correct belt routing. Or, refer to the Belt Routing Label located in the engine compartment.

GENERAL INFORMATION (Continued)

COOLING SYSTEM

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible, maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

An optional factory installed heavy duty cooling package is available on most models. The package consists of a radiator that has an increased number of cooling fins. Vehicles equipped with a 4.0L 6- cylinder engine and heavy duty cooling and/or air conditioning also have an auxiliary electric cooling fan.

COOLING SYSTEM COMPONENTS

The cooling system consists of:

- A radiator
- Cooling fan (mechanical and/or electrical)
- Thermal viscous fan drive
- Fan shroud
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

SYSTEM COOLANT ROUTING

For cooling system flow routings, refer to (Fig. 1) (Fig. 2).

WATER PUMPS

A quick test to determine if the pump is working is to check if the heater warms properly. A defective water pump will not be able to circulate heated coolant through the long heater hose to the heater core.

COOLANT

The cooling system is designed around the coolant. Coolant flows through the engine water jackets absorbing heat produced during engine operation. The coolant carries heat to the radiator and heater core. Here it is transferred to the ambient air passing through the radiator and heater core fins. The coolant also removes heat from the automatic transmission fluid in vehicles equipped with an automatic transmission.

RADIATORS

2.5L 4–cylinder engine radiators are the down flow type, 4.0L 6-cylinder engine radiators are the cross flow type. Plastic tanks are used on all radiators.

CAUTION: Plastic tanks, while stronger than brass, are subject to damage by impact, such as wrenches.

If the plastic tank has been damaged, the plastic tank and/or o- rings are available for service repair. Tank replacement should be done by qualified personal with proper equipment.

BELT TENSION

Correct accessory drive belt tension is required to be sure of optimum performance of belt driven engine accessories. If specified tension is not maintained, belt slippage may cause; engine overheating, lack of power steering assist, loss of air conditioning capacity, reduced generator output rate and greatly reduced belt life.

CONVENTIONAL LEFT HAND DRIVE VEHICLES

Belt tension is adjusted at the power steering pump bracket and idler pulley assembly.

RIGHT HAND DRIVE VEHICLES

If equipped with a 4.0L 6-cylinder engine; the serpentine belt is adjusted at the generator mounting bracket.When equipped with a 2.5L 4-cylinder engine the serpentine belt is adjusted at the power steering pump bracket and idler pulley assembly.

ENGINE BLOCK HEATER

An optional engine block heater is available for all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block (in place of a freeze plug) with the heating element immersed in engine coolant. Connect the power cord to a grounded 110-120 volt AC electrical outlet with a grounded, three-wire extension cord.

DESCRIPTION AND OPERATION

AUTOMATIC TRANSMISSION OIL COOLER

WATER-TO-OIL COOLER

All models equipped with an automatic transmission are equipped with a transmission oil cooler mounted internally within the radiator tank. This

DESCRIPTION AND OPERATION (Continued)

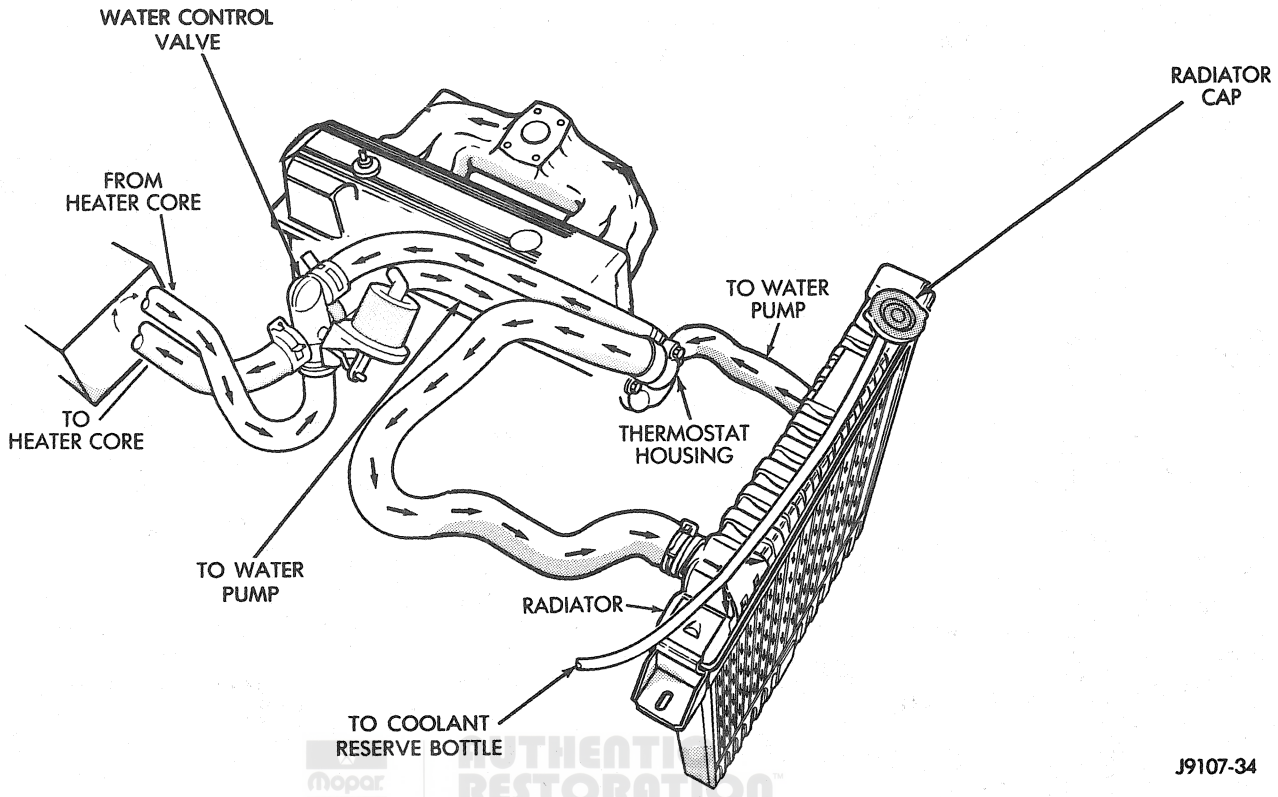


Fig. 1 Coolant Flow—2.5L 4-Cylinder Engine—Typical

internal cooler is supplied as standard equipment on all models equipped with an automatic transmission.

Transmission oil is cooled when it passes through this separate cooler. In case of a leak in the internal radiator mounted transmission oil cooler, engine coolant may become mixed with transmission fluid or transmission fluid may enter engine cooling system. Both cooling system and transmission should be drained and inspected if the internal radiator mounted transmission cooler is leaking.

AIR-TO-OIL COOLER

An auxiliary air-to-oil transmission oil cooler is available with most engine packages.

The auxiliary air-to-oil transmission oil cooler is located in front of the radiator or A/C condenser (if equipped) and behind the grill. It is mounted to the front frame crossmember.

The auxiliary oil coolers on all models operate in conjunction with the internal radiator mounted main oil cooler. The transmission oil is routed through the main cooler first, then the auxiliary cooler, before returning to the transmission.

COOLANT RESERVE/OVERFLOW SYSTEM

The system works along with the radiator pressure cap. This is done by using thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides:

- A volume for coolant expansion and contraction.
- A convenient and safe method for checking/adjusting coolant level at atmospheric pressure. This is done without removing the radiator pressure cap.
- Some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant tank and returned to a proper level in the radiator.

The coolant reserve/overflow system consists of a radiator mounted pressurized cap, a plastic reserve/overflow tank (Fig. 3) (Fig. 4), a tube (hose) connecting the radiator and tank, and an overflow tube on the side of the tank.

COOLING SYSTEM FANS

Also refer to either the Viscous Fan Drive and/or the Auxiliary Electric Cooling Fan.

All models are equipped with a mechanical temperature controlled fan. This thermal viscous fan drive is a torque-and-temperature-sensitive clutch unit. It automatically increases or decreases fan speed to provide proper engine cooling. Vehicles with a 4.0L 6-cylinder engine may also have an auxiliary electrical cooling fan; when equipped air conditioning and/or heavy duty cooling.

DESCRIPTION AND OPERATION (Continued)

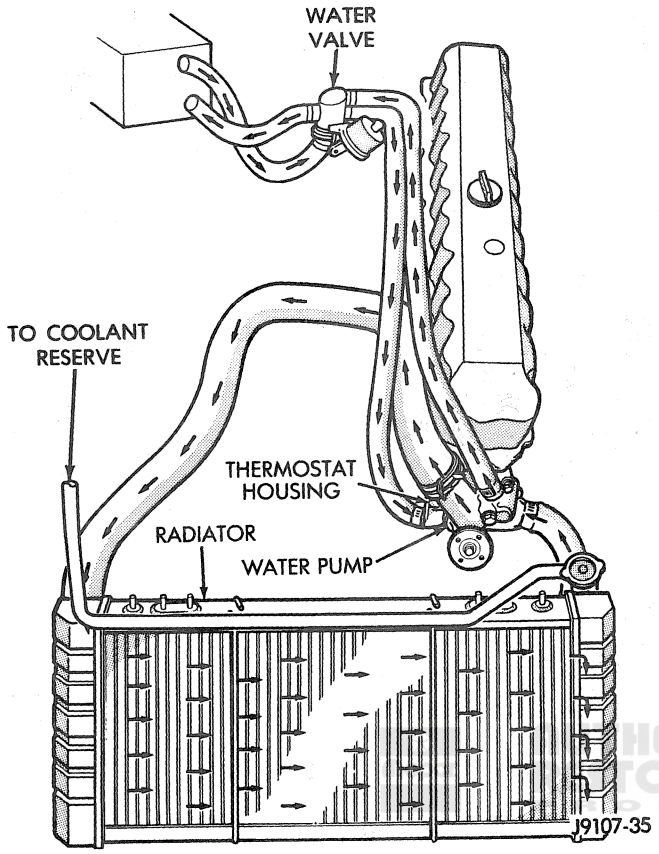


Fig. 2 Coolant Flow—4.0L 6-Cylinder Engine—Typical

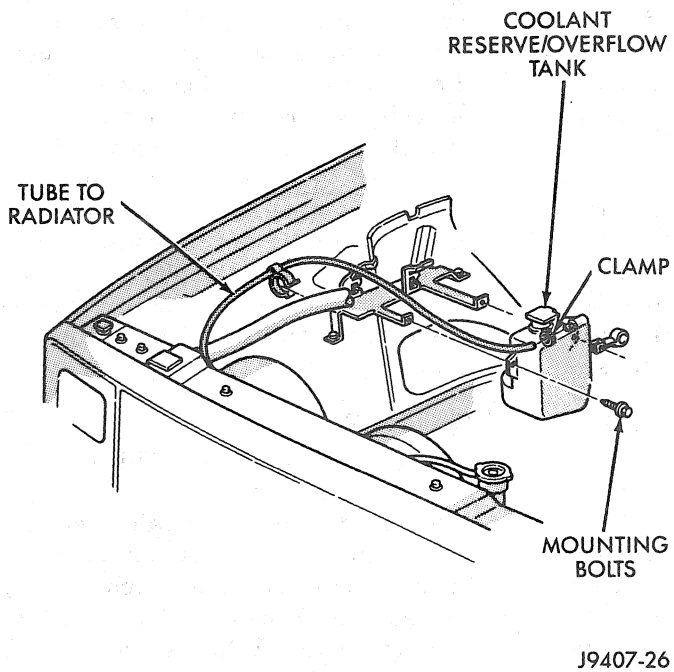


Fig. 3 Reserve/Overflow Tank—Except Right Hand Drive

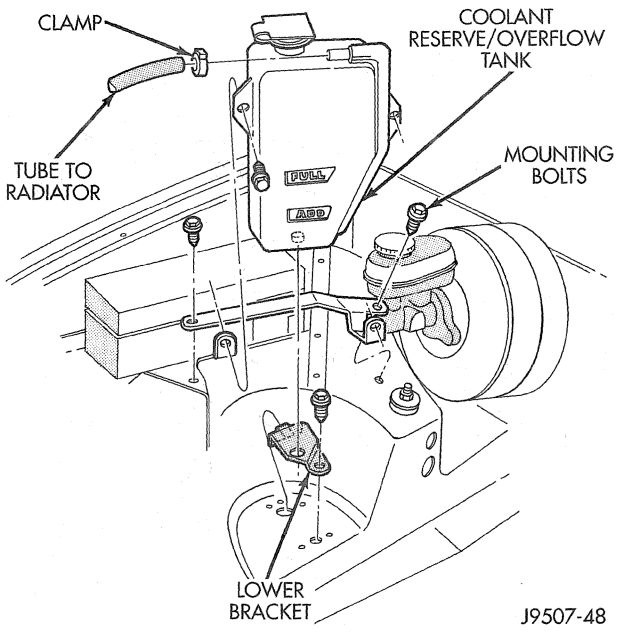


Fig. 4 Reserve/Overflow Tank—With Right Hand Drive

BELT TENSION

Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. There are different types of adjustment gauges for checking either a serpentine or a V-type belt. Refer to the instructions supplied with the gauge. Use the correct gauge when checking belt tension. Place gauge in the middle of the section of belt being tested (between two pulleys) to check tension. Do not allow the gauge (or gauge adapter) to contact anything but the belt.

ENGINE BLOCK HEATER

An optional engine block heater is available for all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block (in place of a freeze plug) with the heating element immersed in engine coolant. Connect the power cord to a grounded 110-120 volt AC electrical outlet with a grounded, three-wire extension cord.

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE.

BLOCK HEATER SPECIFICATIONS

- 2.5L 4-Cylinder Engine: 115 Volts 400 Watts
- 4.0L 6-Cylinder Engine: 120 Volts 600 Watts

DESCRIPTION AND OPERATION (Continued)

THERMOSTAT

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warmup and overall temperature control.

An arrow plus the word **UP** is stamped on the front flange next to the air bleed. The words **TO RAD** are stamped on one arm of the thermostat. They indicate the proper installed position.

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: longer engine warmup time, unreliable warmup performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes longer engine warmup time, unreliable warmup performance, increased exhaust emissions and crankcase condensation that can result in sludge formation.

DIAGNOSTICS

All models are equipped with On-Board Diagnostics for certain cooling system components. Refer to On-Board Diagnostics (OBD) in the Diagnosis section of this group for additional information. If the powertrain control module (PCM) detects low engine coolant temperature, it will record a Diagnostic Trouble Code (DTC) in the PCM memory. The DTC number for low coolant temperature is 17. Do not change a thermostat for lack of heat as indicated by the instrument panel gauge or heater performance unless a DTC number 17 is present. Refer to the Diagnosis section of this group for other probable causes. For other DTC numbers, refer to On-Board Diagnostics in the General Diagnosis section of Group 14, Fuel Systems.

The DTC can also be accessed through the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for diagnostic information and operation of the DRB scan tool.

COOLANT PERFORMANCE

ETHYLENE-GLYCOL MIXTURES

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The recommended mixture of 50/50 ethylene-glycol and water will provide protection against freezing to -37 deg. C (-35 deg. F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7 deg. C (-90 deg. F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

100 Percent Ethylene-Glycol—Should Not Be Used in Chrysler Vehicles

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149 deg. C (300) deg. F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22 deg. C (-8 deg. F).

Propylene-glycol Formulations—Should Not Be Used in Chrysler Vehicles

Propylene-glycol formulations do not meet Chrysler coolant specifications. It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32 deg. C (-26 deg. F). 5 deg. C higher than ethylene-glycol's freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125 deg. C (257 deg. F) at 96.5 kPa (14 psi), compared to 128 deg. C (263 deg. F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up in Chrysler vehicles, which are designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-glycol/Ethylene-glycol Mixtures—Should Not Be Used in Chrysler Vehicles

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

DESCRIPTION AND OPERATION (Continued)

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

COOLANT SELECTION-ADDITIVES

Coolant should be maintained at the specified level with a mixture of ethylene glycol-based antifreeze and low mineral content water. Only use an antifreeze containing ALUGARD 340-2 ™.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

RADIATOR PRESSURE CAP

All radiators are equipped with a pressure cap. This cap releases pressure at some point within a range of 83-110 kPa (12-16 psi). The pressure relief point (in pounds) is engraved on top of the cap (Fig. 5).

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve that opens when system pressure reaches release range of 83-110 kPa (12-16 psi).

A vent valve in the center of cap allows a small coolant flow through cap when coolant is below boiling temperature. The valve is completely closed when boiling point is reached. As the coolant cools, it contracts and creates a vacuum in the cooling system. This causes the vacuum valve to open and coolant in the reserve/overflow tank to be drawn through its connecting hose into radiator. If the vacuum valve is stuck shut, the radiator hoses will collapse on cool-down.

A rubber gasket seals radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.

WATER PUMPS

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a drive belt on all engines.

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has a small hole to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

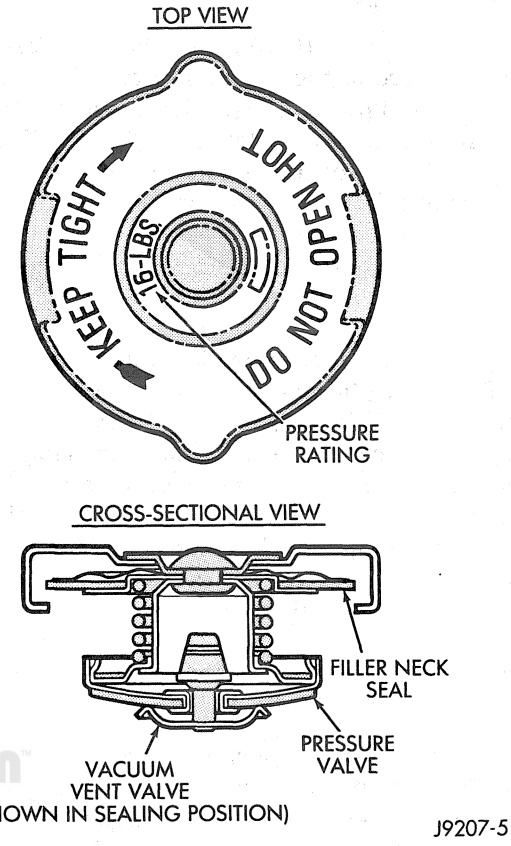


Fig. 5 Radiator Pressure Cap and Filler Neck—Typical

CAUTION: All engines are equipped with a reverse (counter-clockwise) rotating water pump and viscous fan drive assembly. REVERSE is stamped or imprinted on the cover of the viscous fan drive and inner side of the fan. The letter R is stamped into the back of the water pump impeller (Fig. 6).

Engines from previous model years, depending upon application, may have been equipped with a forward (clockwise) rotating water pump. Installation of the wrong water pump will cause engine overheating.

A quick test to determine if the pump is working is to check if the heater warms properly. A defective water pump will not be able to circulate heated coolant through the long heater hose to the heater core.

COOLING SYSTEM HOSES

Rubber hoses route coolant to and from the radiator, intake manifold and heater core. All models equipped with air conditioning have a coolant control valve. This is located in-line with the heater core inlet and outlet hoses. It controls coolant flow to the heater core when the air conditioning system is in operation.

DESCRIPTION AND OPERATION (Continued)

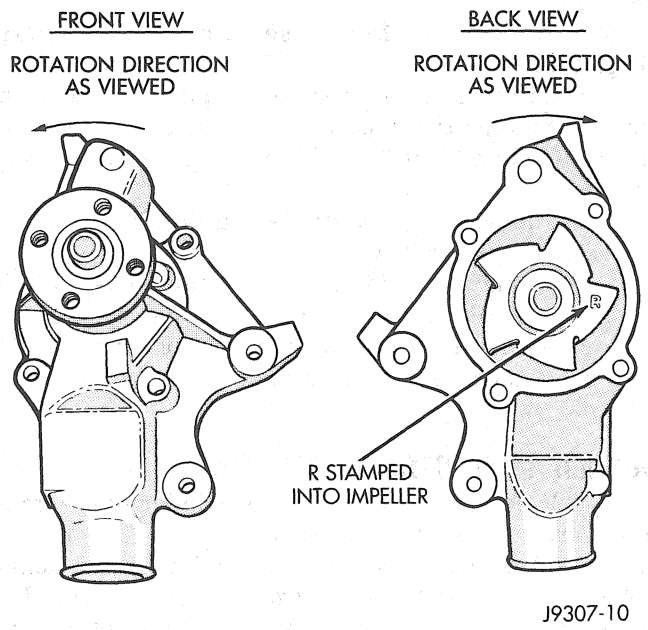


Fig. 6 Reverse Rotating Water Pump—Typical

Radiator lower hoses are spring-reinforced to prevent collapse from water pump suction at moderate and high engine speeds.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 7). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 8). If replacement is necessary, use only an original equipment clamp with matching number or letter.

Inspect the hoses at regular intervals. Replace hoses that are cracked, feel brittle when squeezed, or swell excessively when the system is pressurized.

For all vehicles: In areas where specific routing clamps are not provided, be sure that hoses are positioned with sufficient clearance. Check clearance from exhaust manifolds and pipe, fan blades, drive belts and sway bars. Improperly positioned hoses can be damaged, resulting in coolant loss and engine overheating.

Ordinary worm gear type hose clamps (when equipped) can be removed with a straight screwdriver or a hex socket. **To prevent damage to hoses or clamps, the hose clamps should be tightened to 4 N·m (34 in. lbs.) torque. Do not over tighten hose clamps.**

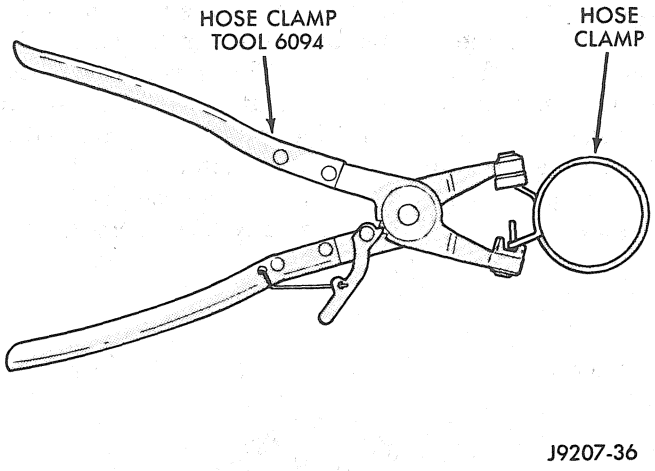


Fig. 7 Hose Clamp Tool—Typical

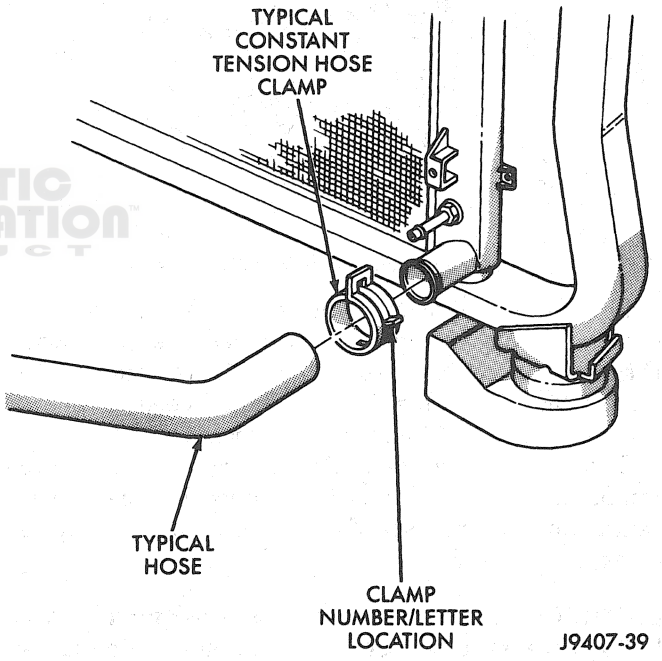


Fig. 8 Clamp Number/Letter Location

VISCOUS FAN DRIVE

Also refer to Cooling System Fans.

The thermal viscous fan drive is a silicone-fluid-filled coupling used to connect the fan blades to either the engine or the water pump shaft. The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the top speed of the fan to a predetermined maximum level at higher engine speeds.

DESCRIPTION AND OPERATION (Continued)

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit (a typical viscous unit is shown in (Fig. 9). This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, the fan will remain at a reduced rpm regardless of engine speed.

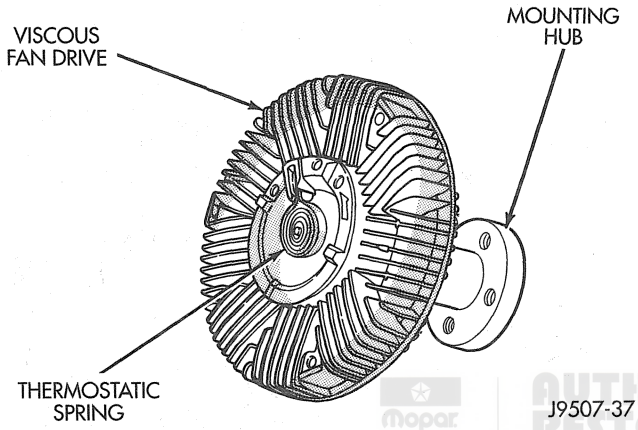


Fig. 9 Typical Viscous Fan Drive

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

CAUTION: Engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

NOISE

It is normal for fan noise to be louder (roaring) when:

- The underhood temperature is above the engagement point for the viscous drive coupling. This may occur when ambient (outside air temperature) is very high.
- Engine loads and temperatures are high such as when towing a trailer.
- Cool silicone fluid within the fan drive unit is being redistributed back to its normal disengaged (warm) position. This can occur during the first 15 seconds to one minute after engine start-up on a cold engine.

AUXILIARY ELECTRIC COOLING FAN

Models equipped with a 4.0L 6-cylinder engine may also have an auxiliary electrical cooling fan. This is with models that have air conditioning and/or heavy duty cooling. The fan is controlled by the cooling fan relay, which is located in the power distribution center (PDC). For the location of relay within the PDC (Fig. 10), refer to the label on PDC cover.

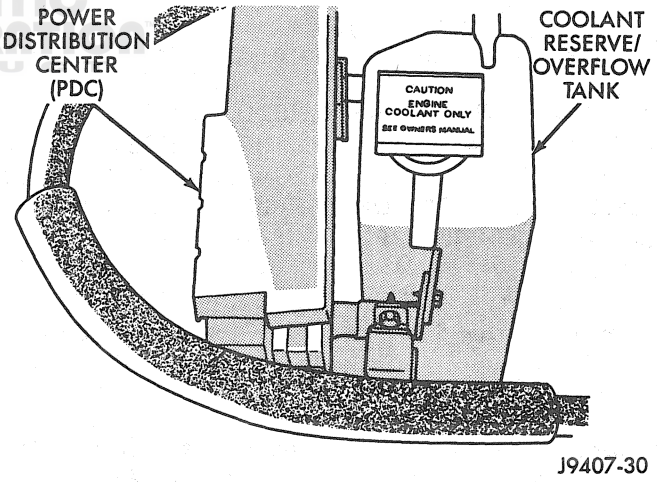


Fig. 10 Power Distribution Center (PDC)

When coolant temperature reaches approximately 103°C (218°F), the powertrain control module (PCM) provides a ground path for the fan relay. This ground is provided through pin/connector #31 of the PCM 60-way connector. Battery voltage is then applied to the fan through the relay. When coolant temperature drops below approximately 98°C (209°F), the PCM opens the ground path to the relay. This will prevent the cooling fan from being energized.

Whenever the air conditioning is operated, the PCM engages the auxiliary cooling fan. It provides a ground path to the cooling fan relay. This ground is provided through pin/connector #31 of the PCM 60-way connector.

DIAGNOSIS AND TESTING

ON-BOARD DIAGNOSTICS (OBD)

FOR CERTAIN COOLING SYSTEM COMPONENTS

The powertrain control module (PCM) has been programmed to monitor the certain following cooling system components:

- If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) number 17 can be observed at the malfunction indicator lamp. This lamp is displayed on the instrument panel as the CHECK ENGINE lamp (Fig. 11) .
- If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan, a Diagnostic Trouble Code (DTC) number 35 can be observed at the CHECK ENGINE lamp.

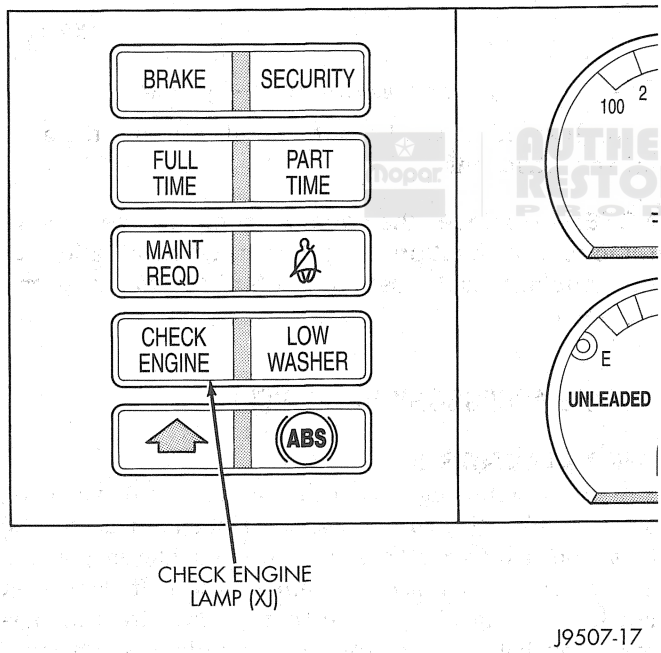


Fig. 11 Check Engine Lamp—Typical

If the problem is sensed in a monitored circuit often enough to indicate an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. If the problem is repaired or ceases to exist, the PCM cancels the DTC after 51 engine starts.

Certain criteria must be met for a DTC to be entered into PCM memory. The criteria may be a specific range of engine rpm, engine temperature and/or input voltage to the PCM.

A DTC indicates that the PCM has recognized an abnormal signal in a circuit or the system. A DTC may indicate the result of a failure, but never identify the failed component directly.

It is possible that a DTC for a monitored circuit may not be entered into memory even though a malfunction has occurred. Refer to On- Board Diagnostics (OBD) in Group 14, Fuel Systems for additional DTC information.

ACCESSING DIAGNOSTIC TROUBLE CODES

A stored Diagnostic Trouble Code (DTC) can be displayed by cycling the ignition key On-Off-On-Off-On within three seconds and observing the malfunction indicator lamp. This lamp is displayed on the instrument panel as the CHECK ENGINE lamp (Fig. 11).

They can also be displayed through the use of the Diagnostic Readout Box (DRB) scan tool. The DRB connects to the data link connector; located under the instrument panel left of the steering column (Fig. 12). For operation of the DRB, refer to the appropriate Powertrain Diagnostic Procedures service manual.

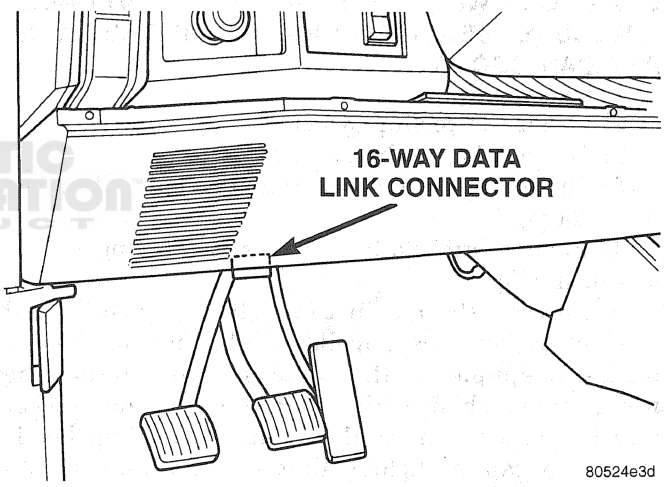


Fig. 12 Data Link Connector—Typical

EXAMPLES:

- If the lamp (Fig. 12) flashes 1 time, pauses and flashes 2 more times, a flashing Diagnostic Trouble Code (DTC) number 12 is indicated. If this code is observed, it is indicating that the battery has been disconnected within the last 50 key-on cycles. It could also indicate that battery voltage has been disconnected to the PCM. In either case, other DTC's may have been erased.
- If the lamp flashes 1 time, pauses and flashes 7 more times, a flashing Diagnostic Trouble Code (DTC) number 17 is indicated.
- If the lamp flashes 3 times, pauses and flashes 5 more times, a flashing Diagnostic Trouble Code (DTC) number 35 is indicated.

After any stored DTC information has been observed, the display will end with a flashing DTC number 55. This will indicate the end of all stored information.

DIAGNOSIS AND TESTING (Continued)

ERASING TROUBLE CODES

After the problem has been repaired, the DRB scan tool must be used to erase a DTC. Refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool.

DRB SCAN TOOL

For operation of the DRB scan tool, refer to the appropriate Powertrain Diagnostic Procedures service manual.

WATER PUMP TESTS

LOOSE IMPELLER

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(1) Drain the cooling system.
(2) Loosen the fan belt(s).
(3) Disconnect the lower radiator hose from the water pump.
(4) Bend a stiff clothes hanger or welding rod as shown in (Fig. 13).
(5) Position the rod in the water pump inlet and attempt to hold the impeller while turning the fan blades. If equipped with a viscous fan drive, turn the water pump shaft with a breaker bar and socket attached to a mounting flange nut. If the impeller is loose and can be held with the rod while the fan blades are turning, the pump is defective. If the impeller turns, the pump is OK.
(6) Connect the hose and install the coolant, or proceed with repairs.

INSPECTING FOR INLET RESTRICTIONS

Inadequate heater performance may be caused by a metal casting restriction in the water pump heater hose inlet.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(1) Drain sufficient coolant from the radiator to decrease the level below the water pump heater hose inlet.
(2) Remove the heater hose.

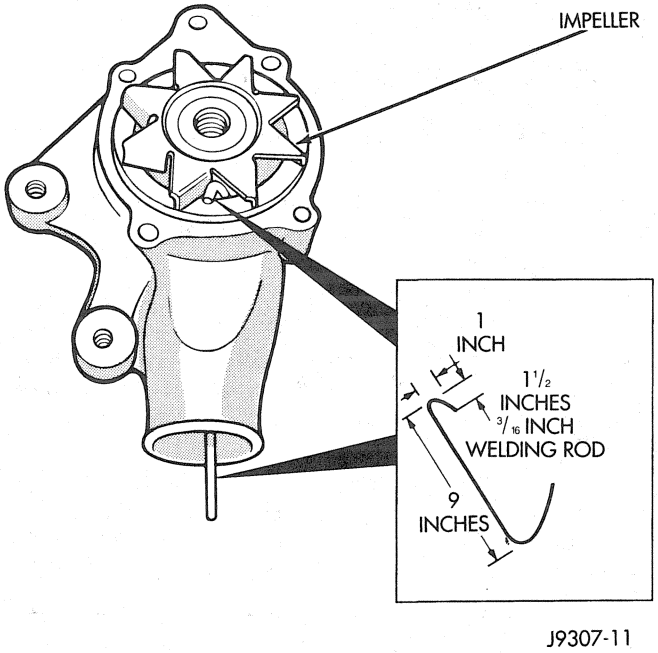


Fig. 13 Impeller Test—Typical

(3) Inspect the inlet for metal casting flash or other restrictions.

NOTE: Remove the pump from engine before removing restriction to prevent contamination of the coolant with debris. Refer to Water Pump Removal.

ENGINE ACCESSORY DRIVE BELTS

BELT DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib (Fig. 14), are considered normal. These are not a reason to replace the belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced (Fig. 14). Also replace the belt if it has excessive wear, frayed cords or severe glazing.

Refer to the Serpentine Drive Belt Diagnosis charts for further belt diagnosis.

PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

PROLONGED IDLE, VERY HIGH AMBIENT TEMPERATURE, SLIGHT TAIL WIND AT IDLE, SLOW TRAFFIC, TRAFFIC JAMS, HIGH SPEED OR STEEP GRADES.

Driving techniques that avoid overheating are:

DIAGNOSIS AND TESTING (Continued)

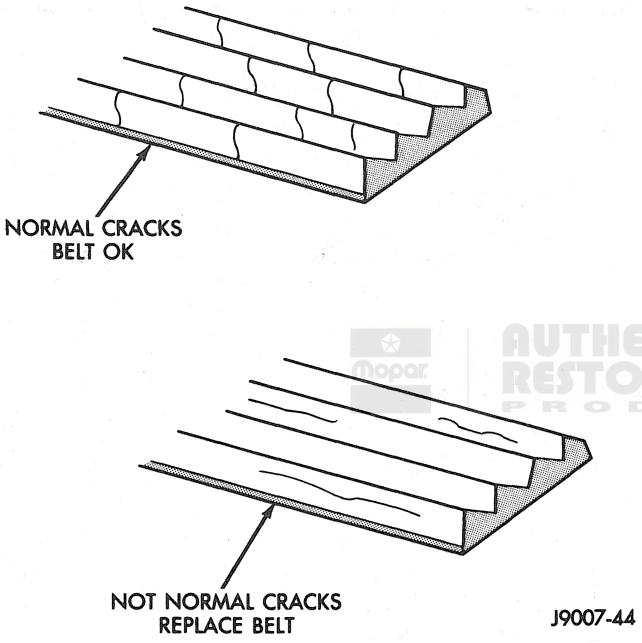


Fig. 14 Serpentine Belt Wear Patterns

- Idle with A/C off when temperature gauge is at end of normal range.
- Increasing engine speed for more air flow is recommended.

TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

AIR CONDITIONING; ADD-ON OR AFTER MARKET:

A maximum cooling package should have been ordered with vehicle if add-on or after market A/C is installed. If not, maximum cooling system components should be installed for model involved per manufacturer's specifications.

RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

NOTE: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to following Cooling System Diagnosis charts.

These charts are to be used as a quick-reference only. Refer to the group text for information.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (ONE OR MORE RIBS HAS SEPARATED FROM BELT BODY	1. Foreign objects imbedded in pulley grooves. 2. Installation damage.	1. Remove foreign objects from pulley grooves. Replace belt. 2. Replace belt.
RIB OR BELT WEAR	1. Pulley(s) misaligned. 2. Abrasive environment. 3. Rusted pulley(s). 4. Sharp or jagged pulley groove tips. 5. Rubber deteriorated.	1. Align pulley(s). 2. Clean pulley(s). Replace belt if necessary. 3. Clean rust from pulley(s). 4. Replace pulley. 5. Replace belt.
LONGITUDINAL BELT CRACKING (CRACKS BETWEEN TWO RIBS)	1. Belt has mistracked from pulley groove. 2. Pulley groove tip has worn away rubber to tensile member.	1. Replace belt. 2. Replace belt.
BELT SLIPS	1. Belt slipping because of insufficient tension. 2. Belt or pulley subjected to substance (belt dressing, oil, ethylene glycol) that has reduced friction. 3. Driven component bearing failure. 4. Belt glazed and hardened from heat and excessive slippage.	1. Adjust tension. 2. Replace belt and clean pulleys. 3. Replace faulty component bearing. 5. Replace belt.
"GROOVE JUMPING" (BELT DOES NOT MAINTAIN CORRECT POSITION ON PULLEY)	1. Belt tension either too high or too low. 2. Pulley(s) not within design tolerance. 3. Foreign object(s) in grooves. 4. Pulley misalignment. 5. Belt cordline is broken.	1. Adjust belt tension. 2. Replace pulley(s). 3. Remove foreign objects from grooves. 4. Align component. 5. Replace belt.
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	1. Excessive tension. 2. Tensile member damaged during belt installation. 3. Severe misalignment. 4. Bracket, pulley, or bearing failure.	1. Replace belt and adjust tension to specification. 2. Replace belt. 3. Align pulley(s). 4. Replace defective component and belt.
NOISE (OBJECTIONAL SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION)	1. Belt slippage. 2. Bearing noise. 3. Belt misalignment. 4. Belt-to-pulley mismatch.	1. Adjust belt. 2. Locate and repair. 3. Align belt/pulley(s). 4. Install correct belt.

J9507-25

SERPENTINE DRIVE BELT DIAGNOSIS

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISE (OBJECTIONAL SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION (Continued)	5. Driven component induced vibration. 6. System resonant frequency induced vibration.	5. Locate defective driven component and repair. 6. Vary belt tension within specifications. Replace belt.
TENSION SHEETING FABRIC FAILURE (WOVEN FABRIC ON OUTSIDE, CIRCUMFERENCE OF BELT HAS CRACKED OR SEPARATED FROM BODY OF BELT)	1. Tension sheeting contacting stationary object. 2. Excessive heat causing woven fabric to age. 3. Tension sheeting splice has fractured.	1. Correct rubbing condition. 2. Replace belt. 3. Replace belt.
CORD EDGE FAILURE (TENSILE MEMBER EXPOSED AT EDGES OF BELT OR SEPARATED FROM BELT BODY)	1. Excessive tension. 2. Belt contacting stationary object. 3. Pulley(s) out of tolerance. 4. Insufficient adhesion between tensile member and rubber matrix.	1. Adjust belt tension. 2. Correct as necessary. 3. Replace pulley. 4. Replace belt and adjust tension to specifications.

J9507-26

SERPENTINE DRIVE BELT DIAGNOSIS (CONT.)

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) number 17 been set indicating a stuck open engine thermostat?	1. Refer to On-Board Diagnostics in the service manual text. Replace thermostat if necessary. If a Diagnostic Trouble Code (DTC) number 17 has not been set, the problem may be with the temperature gauge.
	2. Is the temperature gauge (if equipped) connected to the temperature gauge coolant sensor on the engine?	2. Check the engine temperature sensor connector in the engine compartment. Refer to Group 8E. Repair as necessary.
	3. Is the temperature gauge (if equipped) operating OK?	3. Check gauge operation. Refer to Group 8E. Repair as necessary.
	4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.	4. Check coolant level in the coolant reserve/overflow tank and the radiator. Inspect system for leaks. Repair leaks as necessary. Refer to the Coolant section of the manual text for WARNINGS and precautions before removing the radiator cap.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. Refer to Group 24, Heating and Air Conditioning for procedures.
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM COOLING SYSTEM	1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to normal range, determine the cause for overheating and repair. Refer to POSSIBLE CAUSES (numbers 2 through 20).
	2. Is temperature gauge (if equipped) reading correctly?	2. Check gauge. Refer to Group 8E. Repair as necessary.
	3. Is temperature warning lamp (if equipped) illuminating unnecessarily?	3. Check warning lamp operation. Refer to Group 8E. Repair as necessary.
	4. Coolant low in coolant reserve/overflow tank and radiator?	4. Check for coolant leaks and repair as necessary. Refer to Testing Cooling System For Leaks in this group.
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following step 6.	5. Tighten cap.
	6. Poor seals at radiator cap.	6. (a) Check condition of cap and cap seals. Refer to Radiator Cap. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.

COOLING SYSTEM DIAGNOSIS

J9507-28

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM COOLING SYSTEM - CONT.	7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools. As the engine cools, a vacuum is formed in the cooling system of the engine and radiator. If radiator cap seals are defective, or cooling system has leaks, a vacuum can not be formed.	7. (a) Check condition of radiator cap and cap seals. Refer to Radiator Cap in this group. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator. (c) Check the condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary. (d) Check coolant reserve/overflow tank and tank hoses for blockage. Repair as necessary.
	8. Freeze point of antifreeze not correct. Mixture may be too rich.	8. Check antifreeze. Refer to Coolant section of this group. Adjust antifreeze-to-water ratio as required.
	9. Coolant not flowing through system.	9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine reason for lack of flow and repair as necessary.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Clean insects or debris. Refer to Radiator Cleaning in this group.
	11. Radiator core is corroded or plugged.	11. Have radiator re-cored or replaced.
	12. Aftermarket A/C installed without proper radiator.	12. Install proper radiator.
	13. Fuel or ignition system problems.	13. Refer to Fuel and Ignition System groups for diagnosis. Also refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool.
	14. Dragging brakes.	14. Check and correct as necessary. Refer to Group 5, Brakes in the manual text.
	15. Bug screen is being used reducing airflow.	15. Remove bug screen.
	16. Thermostat partially or completely shut. This is more prevalent on high mileage vehicles.	16. Check thermostat operation and replace as necessary. Refer to Thermostats in this group.
	17. Thermal viscous fan drive not operating properly.	17. Check fan drive operation and replace if necessary. Refer to Viscous Fan Drive in this group.
	18. Electric cooling fan not operating properly (XJ models with 4.0L engine equipped with heavy duty cooling and/or air conditioning).	18. Check electric fan operation and repair as necessary. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6-cylinder Engine in the manual text.

J9507-29

COOLING SYSTEM DIAGNOSIS (CONT.)

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM COOLING SYSTEM - CONT.	19. Cylinder head gasket leaking. 20. Heater core leaking.	19. Check for cylinder head gasket leaks. Refer to Testing Cooling System For Leaks in this group. For repair, refer to Group 9, Engines. 20. Check heater core for leaks. Refer to Group 24, Heating and Air Conditioning. Repair as necessary.
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. On XJ models equipped with a 4.0L 6-cylinder engine, heavy duty cooling and/or air conditioning, the gauge may cycle up and down. This is due to the cycling of the electric radiator fan. 2. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly. 3. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit. 4. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running). 5. Gauge reading high after re-starting a warmed-up (hot) engine. 6. Coolant level low in radiator (air will build up in the cooling system causing the thermostat to open late). 7. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing thermostat to open late. 8. Water pump impeller loose on shaft. 9. Loose accessory drive belt (water pump slipping). 10. Air leak on the suction side of water pump allows air to build up in cooling system causing thermostat to open late.	1. A normal condition. No correction is necessary. If gauge cycling is going into the hot zone, check electric fan operation and repair as necessary. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6-Cylinder Engine in the manual text. 2. A normal condition. No correction is necessary. 3. Check operation of gauge and repair if necessary. Refer to Group 8E, Instrument Panel And Gauges. 4. A normal condition. No correction is necessary. Gauge reading should return to normal range after vehicle is driven. 5. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation. 6. Check and correct coolant leaks. Refer to Testing Cooling System For Leaks in this group. 7. (a) Check for cylinder head gasket leaks with a commercially available Block Leak Tester. Repair as necessary. (b) Check for coolant in the engine oil. Inspect for white steam emitting from exhaust system. Repair as necessary. 8. Check water pump and replace as necessary. Refer to Water Pumps in this group. 9. Refer to Engine Accessory Drive Belts in this group. Check and correct as necessary. 10. Locate leak and repair as necessary.

J9507-30

COOLING SYSTEM DIAGNOSIS (CONT.)

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/OVERFLOW TANK	1. Pressure relief valve in radiator cap is defective.	1. Check condition of radiator cap and cap seals. Refer to Radiator Caps in this group. Replace cap as necessary.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE IS READING HIGH OR HOT	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. Refer to Testing Cooling System For Leaks in this group.
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. Engine overheating. 2. Freeze point of antifreeze not correct. Mixture is too rich or too lean.	1. Check reason for overheating and repair as necessary. 2. Check antifreeze. Refer to the Coolant section of this group. Adjust antifreeze-to-water ratio as required.
HOSE OR HOSES COLLAPSE WHEN ENGINE IS COOLING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	1. (a) Radiator cap relief valve stuck. Refer to Radiator Cap in this group. Replace if necessary. (b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary. (c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary. (d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.
ELECTRIC RADIATOR FAN RUNS ALL THE TIME (XJ MODELS WITH 4.0L ENGINE EQUIPPED WITH HEAVY DUTY COOLING AND/OR AIR CONDITIONING ONLY)	1. Fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective.	1. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6 Cylinder Engine in the manual text. Repair as necessary. Also refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool.
ELECTRIC RADIATOR FAN WILL NOT RUN (XJ MODELS WITH 4.0L ENGINE EQUIPPED WITH HEAVY DUTY COOLING AND/OR AIR CONDITIONING ONLY) GAUGE READING HIGH OR HOT	1. Fan motor defective. 2. Fan relay, powertrain control module (PCM) or engine coolant temperature sensor defective. 3. Blown fuse in power distribution center (PDC).	1. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6 Cylinder Engine in the manual text. Repair as necessary. 2. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6 Cylinder Engine in the manual text. Repair as necessary. Also refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool. 3. Determine reason for blown fuse and repair as necessary.

J9507-31

COOLING SYSTEM DIAGNOSIS (CONT.)

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY FAN	1. Fan blades loose.	1. Replace fan blade assembly. Refer to Cooling System Fans in this group.
	2. Fan blades striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or air conditioning condenser.	3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser.
	4. Electric fan motor defective (if equipped).	4. Replace electric fan motor. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6 Cylinder Engine in the manual text.
	5. Thermal viscous fan drive has defective bearing.	5. Replace fan drive. Bearing is not serviceable. Refer to Viscous Fan Drive in this group.
	6. A certain amount of fan noise (roaring) may be evident on models equipped with a thermal viscous fan drive. Some of this noise is normal.	6. Refer to Viscous Fan Drive in this group for an explanation of normal fan noise.
INADEQUATE AIR CONDITIONER PERFORMANCE (COOLING SYSTEM SUSPECTED)	1. Radiator and/or A/C condenser is restricted, obstructed or dirty (insects, leaves etc.).	1. Remove restriction and/or clean as necessary. Refer to Radiator Cleaning in this group.
	2. Electric radiator fan not operating when A/C is operated (if equipped with electric fan).	2. Refer to Auxiliary Electric Cooling Fan-XJ Models With 4.0L 6 Cylinder Engine in the manual text. Repair as necessary.
	3. Thermal viscous fan drive is free-wheeling.	3. Refer to Viscous Fan Drive for diagnosis. Repair as necessary.
	4. Engine is overheating (heat may be transferred from radiator to A/C condenser. High underhood temperatures due to engine overheating may also transfer heat to A/C components).	4. Correct overheating condition. Refer to text in Group 7, Cooling.
	5. Some models with certain engines are equipped with air seals at the radiator and/or A/C condenser. If these seals are missing or damaged, not enough air flow will be pulled through the radiator and A/C condenser.	5. Check for missing or damaged air seals and repair as necessary.
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION	1. Has a diagnostic trouble code (DTC) number 17 been set?	1. Refer to On-Board Diagnostics in the manual text and replace thermostat if necessary.
	2. Coolant level low.	2. Refer to Testing Cooling System For Leaks in the manual text. Repair as necessary.
	3. Obstructions in heater hose fittings at engine.	3. Remove heater hoses at both ends and check for obstructions. Repair as necessary.
	4. Heater hose kinked.	4. Locate kinked area and repair as necessary.

J9507-32

COOLING SYSTEM DIAGNOSIS (CONT.)

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION - CONT.	5. Some models with certain engines are equipped with a water control valve located on one of the heater hoses. This valve may be defective. 6. Water pump is not pumping water to heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly. The accessory drive belt may also be slipping causing poor water pump operation.	5. Refer to Group 24, Heating and Air Conditioning for diagnosis. Repair as necessary. 6. Refer to Water Pumps in this group. Repair as necessary. If a slipping belt is detected, refer to Engine Accessory Drive Belts in this group. Repair as necessary.
HEAT ODOR	1. Various heat shields are used at certain drive line components. One or more of these shields may be missing. 2. Is temperature gauge reading above the normal range? 3. Is cooling fan operating correctly? 4. Has undercoating been applied to any unnecessary component? 5. Engine may be running rich causing the catalytic convertor to overheat.	1. Locate missing shields and replace or repair as necessary. 2. Refer to the previous Temperature Gauge Reads High in these Diagnosis Charts. Repair as necessary. 3. Refer to Cooling System Fan in this group for diagnosis. Repair as necessary. 4. Clean undercoating as necessary. 5. Refer to the DRB scan tool and the appropriate Powertrain Diagnostic Procedures service manual. Repair as necessary.
POOR DRIVEABILITY (THERMOSTAT POSSIBLY STUCK OPEN). GAUGE MAY BE READING LOW	1. For proper driveability, good vehicle emissions and for preventing build-up of engine oil sludge, the thermostat must be operating properly. Has a diagnostic trouble code (DTC) number 17 been set?	1. Refer to On-Board Diagnostics in this group. DTC's may also be checked using the DRB scan tool. Refer to the proper Powertrain Diagnostics Procedures service manual for checking the thermostat using the DRB scan tool. Replace thermostat if necessary.
STEAM IS COMING FROM FRONT OF VEHICLE NEAR GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.

AUTOMOTIVE RESTORATION

J9507-33

COOLING SYSTEM DIAGNOSIS (CONT.)

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. Refer to Coolant in this group for antifreeze tests. Adjust antifreeze-to-water ratio as necessary.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal engine operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.

J9507-34

COOLING SYSTEM DIAGNOSIS (CONT.)

RADIATOR COOLANT FLOW CHECK

The following procedure will determine if coolant is flowing through the cooling system.

If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If hose is hot, the thermostat is open and water is circulating through cooling system.

TESTING COOLING SYSTEM FOR LEAKS

ULTRAVIOLET LIGHT METHOD

All Jeep models have a leak detection additive added to the cooling system before they leave the factory. The additive is highly visible under ultraviolet light (black light). If the factory original coolant has been drained, pour one ounce of additive into the cooling system. The additive is available through the part's department. Place the heater control unit in HEAT position. Start and operate the engine until the radiator upper hose is warm to the touch. Aim the commercially available black light tool at the components to be checked. If leaks are present, the black light will cause the additive to glow a bright green color.

The black light can be used along with a pressure tester to determine if any external leaks exist (Fig. 15).

PRESSURE TESTER METHOD

The engine should be at the normal operating temperature. Recheck the system cold if the cause of coolant loss is not located during warm engine examination.

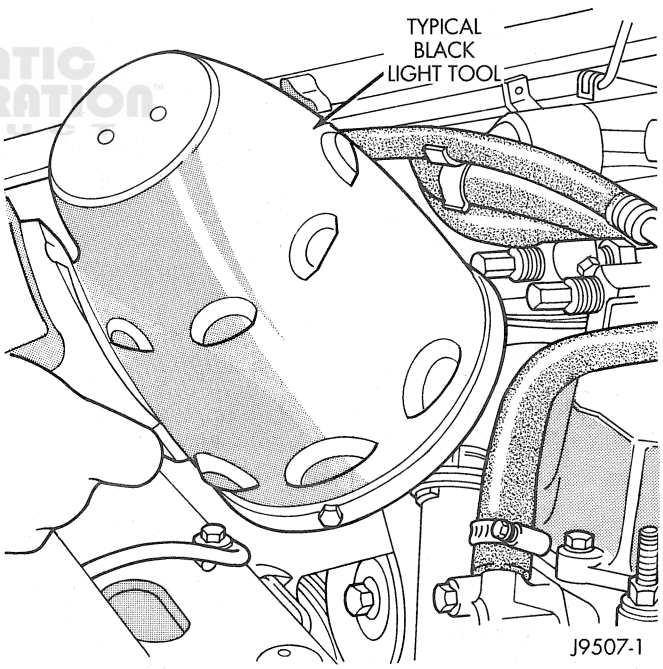


Fig. 15 Leak Detection Using Black Light—Typical

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.

Carefully remove the radiator pressure cap from the filler neck and check the coolant level. Push down on the cap to disengage it from the stop tabs. Wipe the inner part of the filler neck and examine the lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect the reserve/overflow tank tube for internal obstructions. Insert a wire through the tube to be sure it is not obstructed.

DIAGNOSIS AND TESTING (Continued)

Inspect the cams on the outside part of the filler neck. If the cams are bent, seating of pressure cap valve and tester seal will be affected. Replace cap if cams are bent.

Attach pressure tester 7700 (or an equivalent) to the radiator filler neck (Fig. 16).

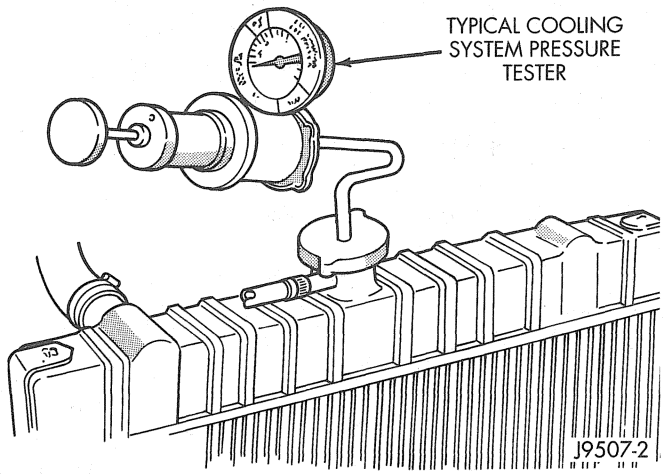


Fig. 16 Pressurizing System—Typical

Operate the tester pump to apply 124 kPa (18 psi) pressure to the system. If the hoses enlarge excessively or bulge while testing, replace as necessary. Observe the gauge pointer and determine the condition of the cooling system according to the following criteria:

- Holds Steady: If the pointer remains steady for two minutes, there are no serious coolant leaks in the system. However, there could be an internal leak that does not appear with normal system test pressure. Inspect for interior leakage or do the Internal Leakage Test. Do this if it is certain that coolant is being lost and no leaks can be detected.
- Drops Slowly: Shows a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect the radiator, hoses, gasket edges and heater. Seal any small leak holes with a Sealer Lubricant or equivalent. Repair leak holes and reinspect the system with pressure applied.
- Drops Quickly: Shows that a serious leakage is occurring. Examine the system for serious external leakage. If no leaks are visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove the engine oil pan drain plug and drain a small amount of engine oil. Coolant, being heavier than engine oil, will drain first. Another way of testing is to operate the engine and check for water globules on the engine oil dipstick. Also inspect the automatic transmission oil dipstick for water globules. Inspect the automatic transmission fluid cooler for leakage. Operate the engine without the pressure cap on the radiator until thermostat opens.

Attach a pressure tester to the filler neck. If pressure builds up quickly, a leak exists as a result of a faulty cylinder head gasket or crack in the engine. Repair as necessary.

WARNING: DO NOT ALLOW PRESSURE TO EXCEED 124 KPA (18 PSI). TURN THE ENGINE OFF. TO RELEASE THE PRESSURE, ROCK THE TESTER FROM SIDE TO SIDE. WHEN REMOVING THE TESTER, DO NOT TURN THE TESTER MORE THAN 1/2 TURN IF THE SYSTEM IS UNDER PRESSURE.

If there is no immediate pressure increase, pump the pressure tester until the indicated pressure is within the system range. Vibration of the gauge pointer indicates compression or combustion leakage into the cooling system.

WARNING: DO NOT DISCONNECT THE SPARK PLUG WIRES WHILE THE ENGINE IS OPERATING.

CAUTION: Do not operate the engine with a spark plug shorted for more than a minute. The catalytic converter may be damaged.

Isolate the compression leak by shorting each spark plug to the cylinder block. The gauge pointer should stop or decrease vibration when spark plug for leaking cylinder is shorted. This happens because of the absence of combustion pressure.

COMBUSTION LEAKAGE TEST (WITHOUT PRESSURE TESTER)

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Drain sufficient coolant to allow for thermostat removal. Refer to Thermostat Replacement. Disconnect the water pump drive belt.

Disconnect the upper radiator hose from the thermostat housing. Remove the housing and thermostat. Install the thermostat housing.

Add coolant to the radiator to bring the level to within 6.3 mm (1/4 in) of the top of the thermostat housing.

DIAGNOSIS AND TESTING (Continued)

CAUTION: Avoid overheating. Do not operate the engine for an excessive period of time. Open the draincock immediately after the test to eliminate boil over of coolant.

Start the engine and accelerate rapidly three times (to approximately 3000 rpm) while observing the coolant. If internal engine combustion gases are leaking into the cooling system, bubbles will appear in the coolant. If bubbles do not appear, there is no internal combustion gas leakage.

VISCOUS FAN DRIVE

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

TESTING

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

(1) Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.

(2) Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18°-to-105°C (0°-to-220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.

(3) Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).

(4) Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

(5) Be sure that the air conditioner (if equipped) is turned off.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(6) Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 88° C (190° F). Fan drive **engagement** should have started to occur at between 74° to 82° C (165° to 180° F). Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

(7) When the air temperature reaches 88° C (190° F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 57° to 79° C (135° to 175° F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

AUXILIARY ELECTRIC COOLING FAN

DIAGNOSIS AND RELAY TESTING

The powertrain control module (PCM) will enter a diagnostic trouble code (DTC) number 35 in memory if it detects a problem in the auxiliary cooling fan relay or circuit. This will be read as a flashing signal at the instrument panel mounted Malfunction Indicator Lamp (displayed on the instrument panel as the CHECK ENGINE lamp (Fig. 17). Refer to On- Board Diagnostics in Group 14, Fuel Systems for information on accessing a DTC.

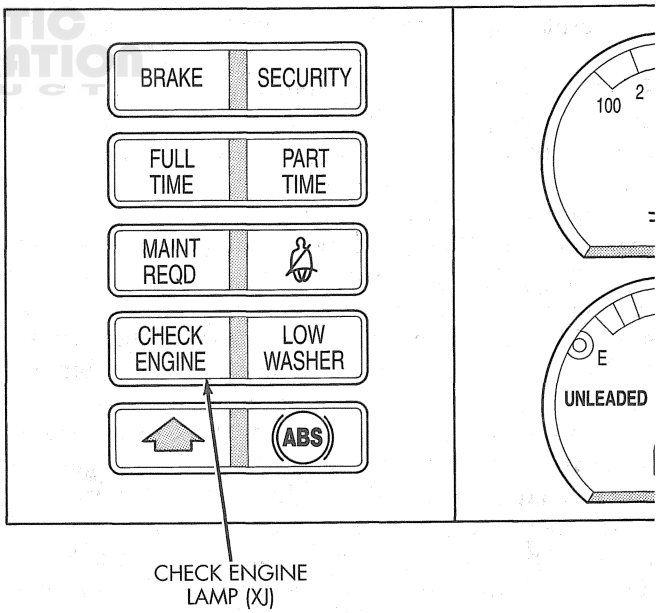


Fig. 17 Check Engine Lamp—Typical

The DTC can also be accessed through the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for diagnostic information and operation of the DRB scan tool.

To test operation of the fan relay only, refer to Relays—Operation/Testing. This can be found in Group 14, Fuel Systems.

DIAGNOSIS AND TESTING (Continued)

RADIATOR CAP-TO-FILLER NECK SEAL—PRESSURE RELIEF CHECK

With radiator cap installed on filler neck, remove coolant reserve/ overflow tank hose from nipple on filler neck. Connect a hand operated vacuum pump to nipple. Operate pump until a reading of 47-to-61 kPa (14- to-18 in. Hg) appears on gauge. If the reading stays steady, or drops slightly and then remains steady, the pressure valve seal is good. Replace radiator cap if reading does not hold.

WARNING: THE WARNING WORDS -DO NOT OPEN HOT- ON THE RADIATOR PRESSURE CAP (Fig. 18) ARE A SAFETY PRECAUTION. WHEN HOT, PRESSURE BUILDS UP IN COOLING SYSTEM. TO PREVENT SCALDING OR INJURY, THE RADIATOR CAP SHOULD NOT BE REMOVED WHILE THE SYSTEM IS HOT AND/OR UNDER PRESSURE.

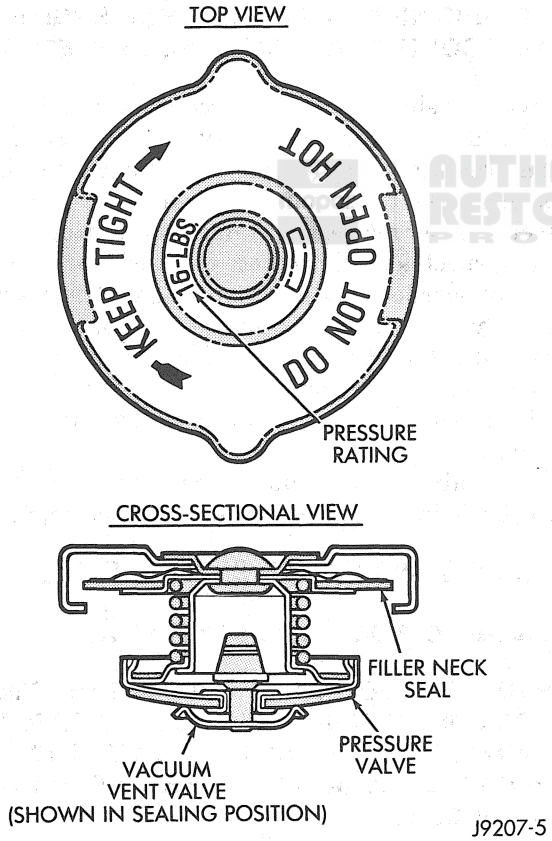


Fig. 18 Radiator Pressure Cap

There is no need to remove the radiator cap **except**for the following purposes:

(1) To check and adjust antifreeze freeze point.
(2) To refill system with new antifreeze.
(3) For conducting service procedures.
(4) When checking for vacuum leaks.

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT AT LEAST 15 MINUTES BEFORE REMOVING RADIATOR CAP. WITH A RAG, SQUEEZE RADIATOR UPPER HOSE TO CHECK IF SYSTEM IS UNDER PRESSURE. PLACE A RAG OVER THE CAP AND WITHOUT PUSHING DOWN, ROTATE CAP COUNTER-CLOCKWISE TO THE FIRST STOP. ALLOW FLUID TO ESCAPE THROUGH OVERFLOW HOSE INTO COOLANT RESERVE/ OVERFLOW TANK. SQUEEZE RADIATOR UPPER HOSE TO DETERMINE WHEN PRESSURE HAS BEEN RELEASED. WHEN COOLANT AND STEAM STOP BEING PUSHED INTO TANK AND SYSTEM PRESSURE DROPS, REMOVE RADIATOR CAP COMPLETELY.

PRESSURE TESTING RADIATOR CAPS

Remove cap from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install the cap on pressure tester (tool 7700 or an equivalent) (Fig. 19).

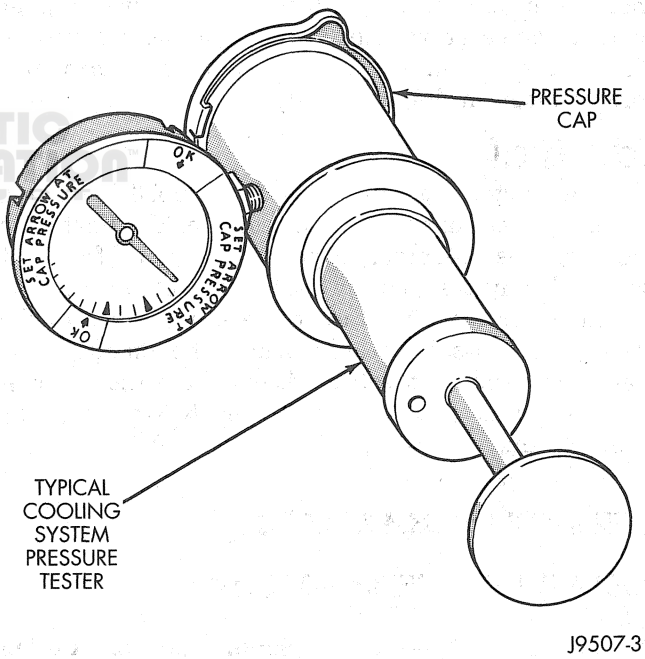


Fig. 19 Pressure Testing Radiator Pressure Cap—Typical

Operate the tester pump and observe the gauge pointer at its highest point. The cap release pressure should be 83-to-110 kPa (12-to-16 psi). The cap is satisfactory when the pressure holds steady. It is also good if it holds pressure within the 83-to-110 kPa (12-to-16 psi) range for 30 seconds or more. If the pointer drops quickly, replace the cap.

DIAGNOSIS AND TESTING (Continued)

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

LOW COOLANT LEVEL-AERATION

If the coolant level in radiator drops below top of radiator core tubes, air will enter cooling system.

Low coolant level can cause thermostat pellet to be suspended in air instead of coolant. This will cause thermostat to open later, which in turn causes higher coolant temperature. Air trapped in cooling system also reduces amount of coolant circulating in heater core resulting in low heat output.

DEAERATION

As the engine operates, any air trapped in cooling system gathers under the radiator cap. The next time the engine is operated, thermal expansion of coolant will push any trapped air past radiator cap into the coolant reserve/overflow tank. Here it escapes to the atmosphere into the tank. When the engine cools down the coolant, it will be drawn from the reserve/overflow tank into the radiator to replace any removed air.

SERVICE PROCEDURES

COOLANT LEVEL CHECK—ROUTINE

NOTE: Do not remove radiator cap for routine coolant level inspections. The coolant level can be checked at coolant reserve/overflow tank.

The coolant reserve/overflow system provides a quick visual method for determining coolant level without removing radiator pressure cap. With engine idling and at normal operating temperature, observe coolant level in reserve/overflow tank. The coolant level should be between ADD and FULL marks.

COOLANT SERVICE

It is recommended that the cooling system be drained and flushed at 84,000 kilometers (52,500 miles), or 3 years, whichever occurs first. Then every two years, or 48,000 kilometers (30,000 miles), whichever occurs first.

ADDING ADDITIONAL COOLANT—ROUTINE

Do not remove radiator cap to add coolant to system. When adding coolant to maintain correct level, do so at coolant reserve/overflow tank. Use a 50/50 mixture of ethylene-glycol antifreeze containing Alugard 340-2 ™ and low mineral content water. Remove radiator cap only for testing or when refilling system after service. Removing cap unnecessarily can cause loss of coolant and allow air to enter system, which produces corrosion.

COOLANT LEVEL CHECK-SERVICE

The cooling system is closed and designed to maintain coolant level to top of radiator.

WARNING: DO NOT OPEN RADIATOR DRAINCOCK WITH ENGINE RUNNING OR WHILE ENGINE IS HOT AND COOLING SYSTEM IS UNDER PRESSURE.

When vehicle servicing requires a coolant level check in radiator, drain several ounces of coolant from radiator drain cock. Do this while observing coolant reserve/overflow system tank. The coolant level in reserve/overflow tank should drop slightly. If not, inspect for a leak between radiator and coolant reserve/overflow system connection. Remove radiator cap. The coolant level should be to top of radiator. If not and if coolant level in reserve/overflow tank is at ADD mark, check for:

- An air leak in coolant reserve/overflow tank or its hose
- An air leak in radiator filler neck
- Leak in pressure cap seal to radiator filler neck

DRAINING AND FILLING COOLING SYSTEM

DRAINING 2.5L 4-CYLINDER ENGINE

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

DO NOT remove the radiator cap when draining the coolant from the reserve/overflow tank. Open the radiator draincock and when the tank is empty, remove the radiator cap. The coolant does not have to be removed from the tank unless the system is being refilled with a fresh mixture.

SERVICE PROCEDURES (Continued)

(1) Drain the coolant from the radiator by loosening the draincock.

(2) Drain coolant from engine by removing drain plug at left rear side of block.

DRAINING 4.0L 6-CYLINDER ENGINE

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(1) Remove radiator pressure cap.

(2) For access to radiator draincock, remove radiator grille mounting screws and remove grill. Refer to Group 23, Body for procedures.

(3) Attach one end of a 24 inch long X 1/4 inch ID hose to the radiator draincock. Put the other end into a clean container. Open draincock and drain coolant from radiator.

(4) Drain coolant from engine by removing the drain plug and coolant temperature sensor on left side of block (Fig. 20).

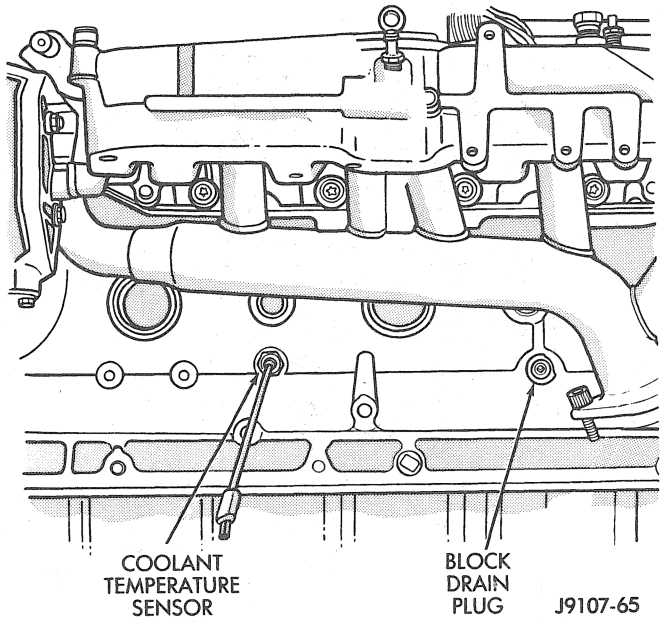


Fig. 20 Draining Coolant—4.0L 6-Cylinder Engine

REFILLING COOLING SYSTEM

(1) Tighten the radiator draincock and the cylinder block drain plug(s). If removed, install coolant temperature sensor (4.0L 6-cylinder engine).

(2) Fill system using a 50/50 mixture of water and antifreeze as described in the Coolant section of this group. Fill radiator to top and install radiator cap. Add sufficient coolant to reserve/overflow tank to raise level to FULL mark.

(3) With heater control unit in the HEAT position, operate engine with radiator cap in place.

(4) After engine has reached normal operating temperature, shut engine off and allow it to cool.

(5) Add coolant to reserve/overflow tank as necessary. **Only add coolant when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.**

REVERSE FLUSHING

CAUTION: The cooling system normally operates at 97-to-124 kPa (14- to-18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator fittings. Attach a section of radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: The cooling system normally operates at 97-to-124 kPa (14- to-18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When radiator is filled, apply air in short blasts allowing radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. For more information, refer to operating instructions supplied with flushing equipment. Have radiator cleaned more extensively by a radiator repair shop.

REVERSE FLUSHING ENGINE

Drain the cooling system. Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump. Attach a lead away hose to the water pump inlet fitting.

CAUTION: Be sure that the heater control valve is closed (heat off). This is done to prevent coolant flow with scale and other deposits from entering the heater core.

SERVICE PROCEDURES (Continued)

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose. For more information, refer to operating instructions supplied with flushing equipment.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing and install thermostat. Install the thermostat housing with a replacement gasket. Refer to Thermostat Replacement. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture.

CHEMICAL CLEANING

In some instances, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid the flushing operation.

CAUTION: Be sure instructions on the container are followed.

(5) Remove the oil cooler from vehicle.

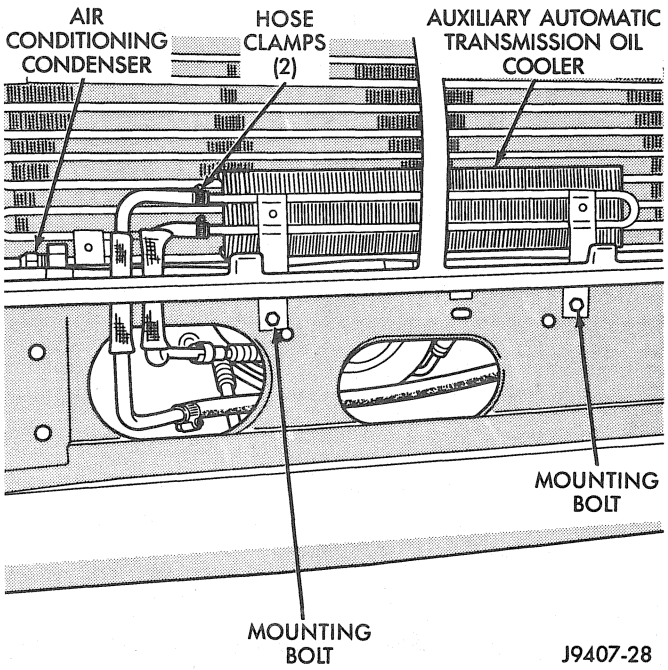


Fig. 21 Auxiliary Air-To-Oil Cooler—4.0L Engine

REMOVAL AND INSTALLATION

TRANSMISSION OIL COOLERS

WATER-TO-OIL COOLER

The internal transmission oil cooler located within the radiator is not serviceable. If it requires service, the radiator must be replaced.

Once the repaired or replacement radiator has been installed, fill the cooling system and inspect for leaks. Refer to the Refilling Cooling System and Testing Cooling System For Leaks sections in this group. If the transmission operates properly after repairing the leak, drain the transmission and remove the transmission oil pan. Inspect for sludge and/or rust. Inspect for a dirty or plugged inlet filter. If none of these conditions are found, the transmission and torque convertor may not require reconditioning. Refer to Group 21 for automatic transmission servicing.

AIR-TO-OIL COOLER

REMOVAL

(1) Remove the grill mounting screws and remove the grill. Refer to Group 23, Body for procedures.

(2) Place a drain pan below the transmission oil cooler.

(3) Remove the two hose clamps at oil cooler inlet and outlet tubes .

(4) Remove the two oil cooler mounting bolts (Fig. 21) (Fig. 22).

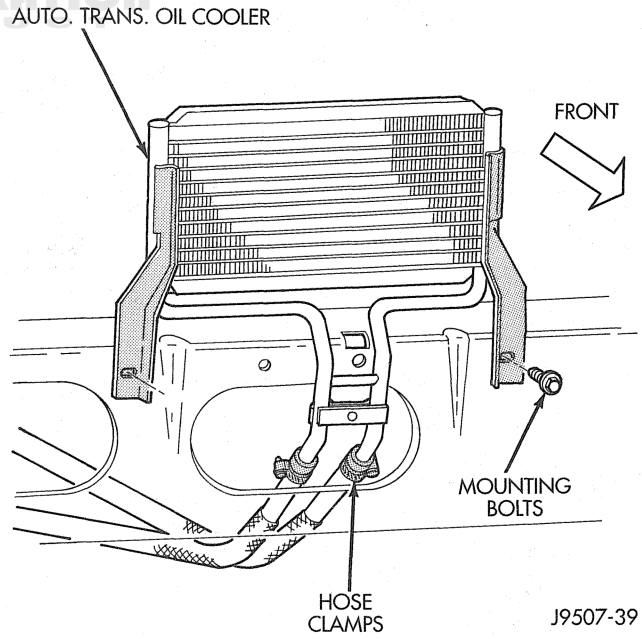


Fig. 22 Auxiliary Air-To-Oil Cooler2.5L Engine

INSTALLATION

(1) Position and secure oil cooler to vehicle. Tighten mounting bolts to 8 N·m (72 in. lbs.) torque.

(2) Secure inlet and outlet tubes with hose clamps. Tighten the two clamps to 2 N·m (15 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

COOLANT RESERVE TANK

REMOVAL

(1) Remove the tube clamp at the tank and remove tube.

(2) Remove the tank mounting bolts and remove tank (Fig. 23) (Fig. 24).

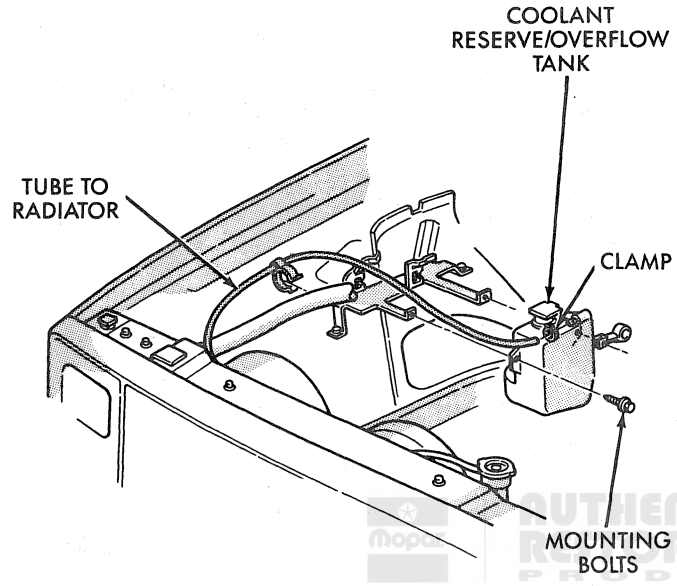


Fig. 23 Reserve/Overflow Tank—Except Right Hand Drive

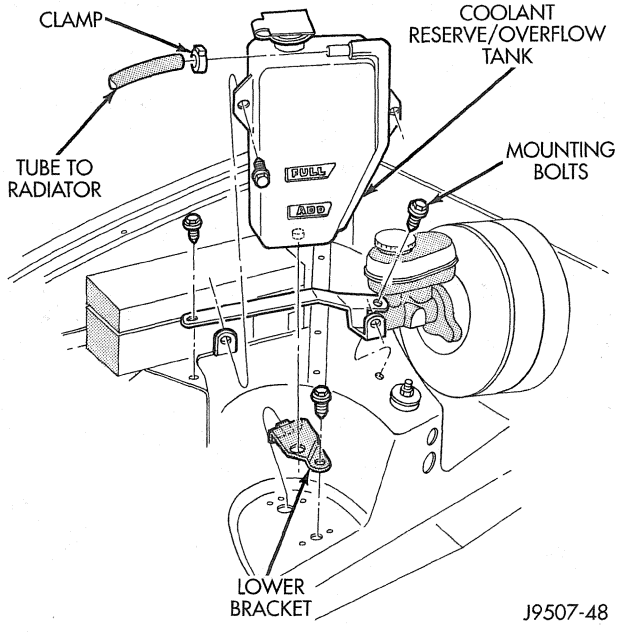


Fig. 24 Reserve/Overflow Tank—With Right Hand Drive

INSTALLATION

(1) Position tank and tighten to 2 N·m (17 in. lbs.) torque.

(2) Position tube and secure clamp.

WATER PUMPS

CAUTION: If the water pump is replaced because of mechanical damage, the fan blades and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

REMOVAL

The water pump can be removed without discharging the air conditioning system (if equipped).

CAUTION: All engines have a reverse (counterclockwise) rotating water pump. The letter R is stamped into the back of the water pump impeller (Fig. 25) to identify. Engines from previous model years, depending upon application, may be equipped with a forward (clockwise) rotating water pump. Installation of the wrong water pump will cause engine over heating.

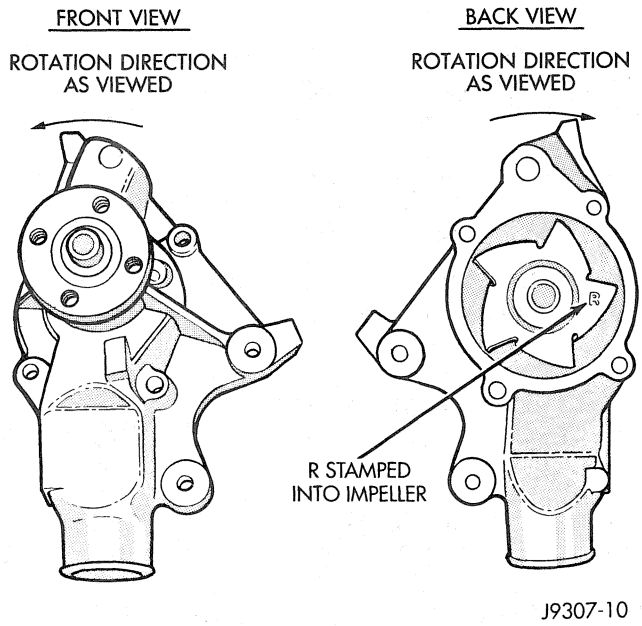


Fig. 25 Reverse Rotating Water Pump—Typical

The water pump impeller is pressed on the rear of the pump shaft and bearing assembly. The water pump is serviced only as a complete assembly.

WARNING: DO NOT REMOVE THE BLOCK DRAIN PLUG(S) OR LOOSEN RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

REMOVAL AND INSTALLATION (Continued)

DO NOT WASTE reusable coolant. If the solution is clean, drain coolant into a clean container for reuse.

(1) Disconnect negative battery cable at battery.

(2) Drain the cooling system.

(3) **Vehicles with 4.0L 6-cylinder engine equipped with A/C or heavy duty cooling system:**

(4) Loosen (but do not remove at this time) the four water pump pulley- to-water pump hub mounting bolts (Fig. 26).

(5) **Vehicles with 4.0L 6-cylinder engine without A/C or heavy duty cooling system; or any 2.5L 4-cylinder engines:**

(6) Loosen (but do not remove at this time) the four fan hub-to-water pump pulley mounting nuts (Fig. 27).

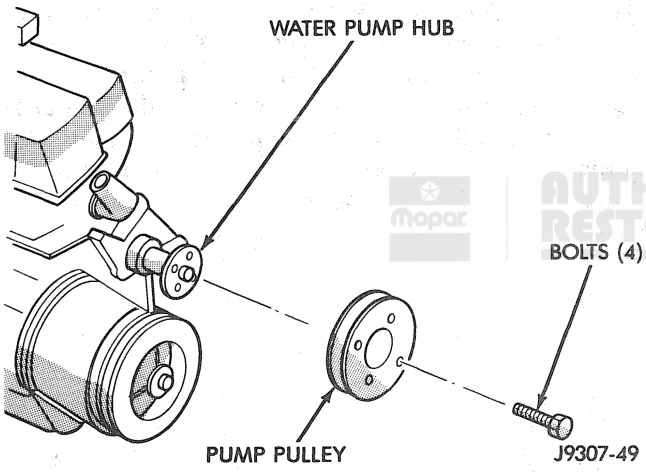


Fig. 26 Water Pump Pulley Bolts

NOTE: The engine accessory drive belt must be removed prior to removing the fan (if installed at pump) or fan pulley.

(7) Remove engine drive belt.

(8) Remove power steering pump (Fig. 28), refer to Group 19 Steering.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 7) SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 8). If replacement is necessary, use only an original equipment clamp with matching number or letter.

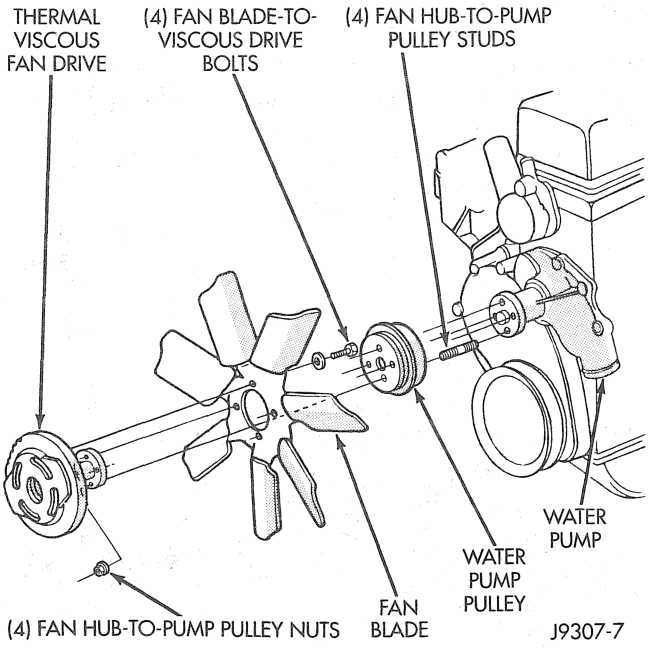


Fig. 27 Fan Mounting Nuts

(9) Remove lower radiator hose from water pump. Remove heater hose from water pump fitting.

(10) Remove four nuts or bolts previously loosened and remove the fan blade assembly and pulley (if fan is installed at pump), or remove the pulley from the vehicle.

(11) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

(12) Remove the four pump mounting bolts (Fig. 29) and remove pump from vehicle. Discard old gasket. Note that one of the four bolts is longer than the other bolts.

(13) If pump is to be replaced, the heater hose fitting must be removed. Note position of fitting before removal.

INSTALLATION

(1) If pump is being replaced, install the heater hose fitting to the pump. Use a sealant on the fitting such as Mopar™ Thread Sealant With Teflon. Refer to the directions on the package.

(2) Clean the gasket mating surfaces. If the original pump is used, remove any deposits or other foreign material. Inspect the cylinder block and water pump mating surfaces for erosion or damage from cavitation.

REMOVAL AND INSTALLATION (Continued)

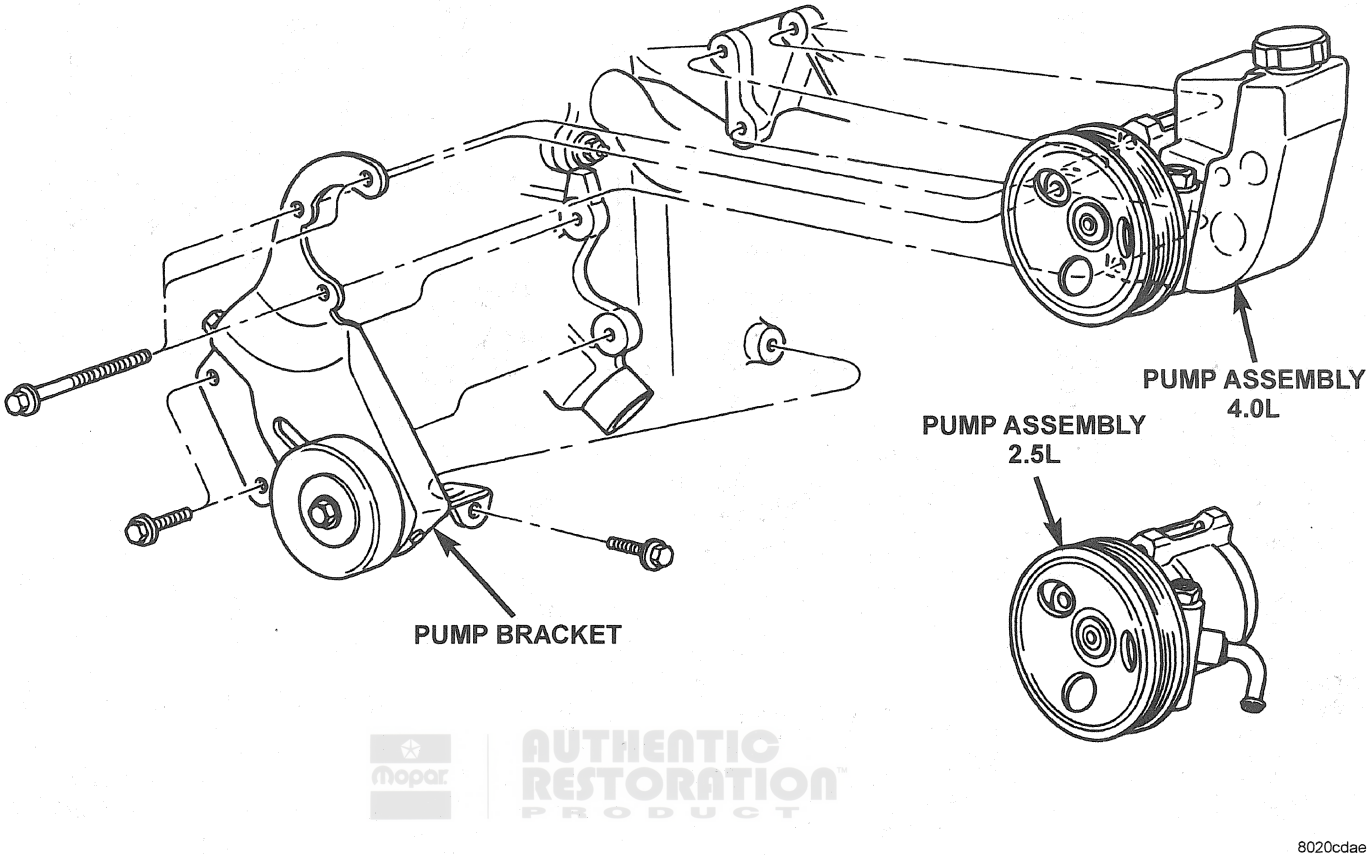


Fig. 28 Power Steering Pump Attachment

(3) Install the gasket and water pump. The silicone bead on the gasket should be facing the water pump. Also, the gasket is installed dry. Tighten mounting bolts to 30 N·m (22 ft. lbs.) torque. Rotate the shaft by hand to be sure it turns freely.

(4) Connect the radiator and heater hoses to the water pump.

(5) Position water pump pulley to water pump hub.

(6) If equipped with a water pump mounted fan, install fan and four nuts to water pump hub. If not equipped with a water pump mounted fan, install four pump hub bolts. Tighten bolts (or nuts) to 27 N·m (20 ft. lbs.) torque.

(7) Install power steering pump.

CAUTION: When installing the serpentine engine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to the Belt Removal and Installtion in this group for appropriate belt routing. You may also refer to the Belt Routing Label in the vehicle engine compartment.

(8) Adjust accessory drive belt, refer to Accessory Drive Belt removal and installation in this group.

(9) Fill cooling system with coolant and check for leaks. Refer to Refilling Cooling System in this group.

(10) Connect battery cable to battery.

(11) Start and warm the engine. Check for leaks.

THERMOSTAT

REMOVAL

WARNING: DO NOT LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(1) Drain the coolant from the radiator until the level is below the thermostat housing.

REMOVAL AND INSTALLATION (Continued)

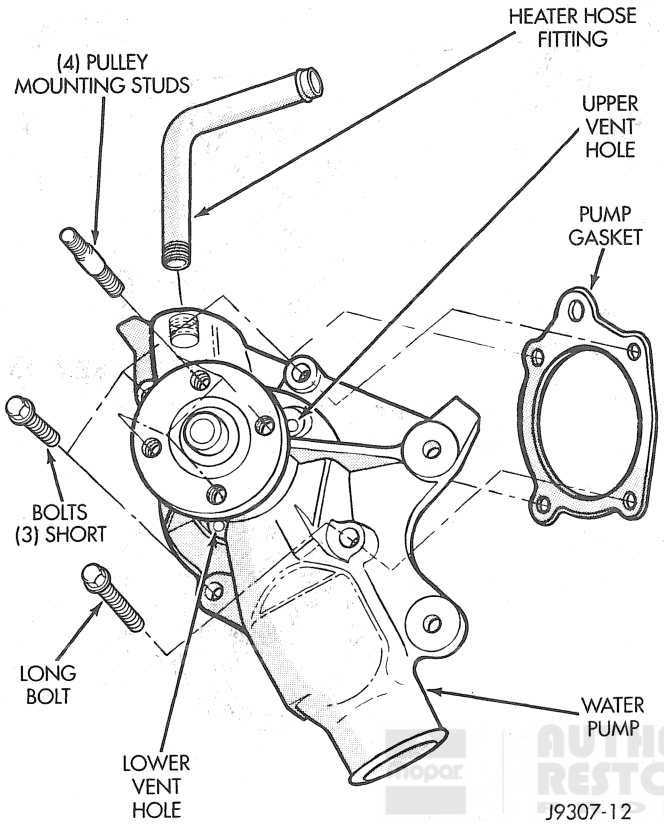


Fig. 29 Water Pump Remove/Install—Typical

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 7). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 8). If replacement is necessary, use only an original equipment clamp with matching number or letter.

(2) Remove radiator upper hose and heater hose at thermostat housing.

(3) Disconnect wiring connector at engine coolant temperature sensor.

(4) Remove thermostat housing mounting bolts, thermostat housing, gasket and thermostat (Fig. 30). Discard old gasket.

(5) Clean the gasket mating surfaces.

INSTALLATION

(1) Install the replacement thermostat so that the pellet, which is encircled by a coil spring, faces the engine. All thermostats are marked on the outer flange to indicate the proper installed position.

(a) Observe the recess groove in the engine cylinder head (Fig. 31).

(b) Position thermostat into this groove with arrow and air bleed hole on outer flange pointing up.

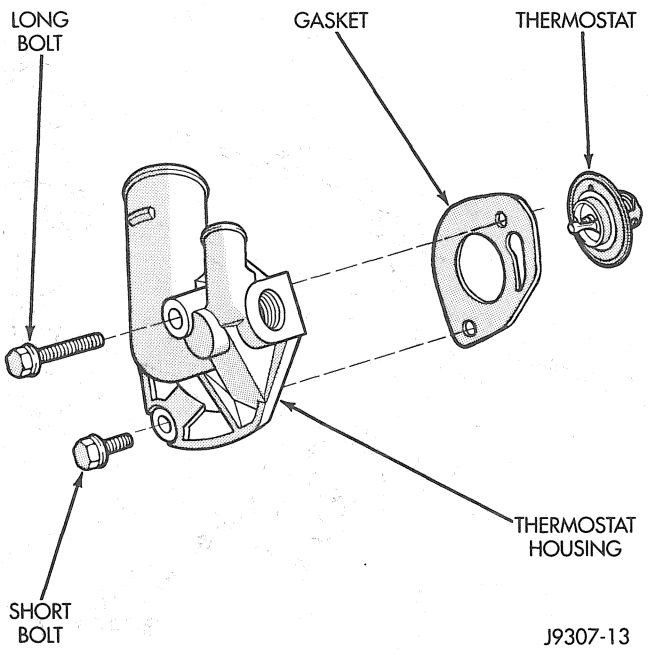


Fig. 30 Thermostat Removal/Installation

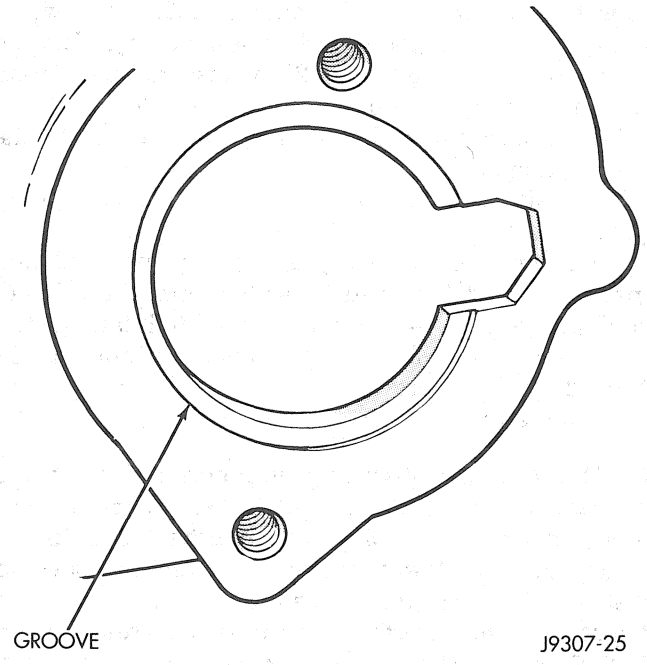


Fig. 31 Thermostat Recess

(2) Install replacement gasket and thermostat housing.

REMOVAL AND INSTALLATION (Continued)

CAUTION: Tightening the thermostat housing unevenly or with the thermostat out of its recess may result in a cracked housing.

(3) Tighten the housing bolts to 20 N·m (15 ft. lbs.) torque.
(4) Install hoses to thermostat housing.
(5) Install electrical connector to coolant temperature sensor.
(6) Be sure that the radiator draincock is tightly closed. Fill the cooling system to the correct level with the required coolant mixture. Refer to Refilling Cooling System in this group.
(7) Start and warm the engine. Check for leaks.

RADIATOR

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS, RADIATOR CAP, OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 7). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 8). If replacement is necessary, use only an original equipment clamp with matching number or letter.

2.5L 4-CYLINDER ENGINE

REMOVAL

(1) Disconnect negative battery cable at battery.
(2) Observe the previous **WARNINGS.** Remove radiator cap.
(3) Position drain pan under draincock. Open radiator draincock. Drain radiator.
(4) Remove radiator upper and lower hose clamps (Fig. 7) (Fig. 8). Remove hoses.
(5) Remove E-clip from alignment dowel at radiator lower mounting bracket (Fig. 32).
(6) Disconnect coolant reserve/overflow tank hose from radiator.
(7) Remove four radiator fan shroud mounting bolts (Fig. 32). Push shroud back against front of engine.
(8) If equipped, disconnect and plug automatic transmission fluid cooler lines. Refer to Group 21, Transmission for procedures.
(9) Remove two radiator top mounting bolts (Fig. 32).
(10) Air conditioning equipped
(a) Remove the radiator grille mounting screws and remove grill. Refer to Group 23, Body for procedures.
(b) Remove the air conditioning condenser-to-radiator mounting bolt. Use an open end wrench to remove bottom bolts (Fig. 33).
(11) Lift radiator straight up and out of vehicle. Take care not to damage radiator fins. When removing radiator, note position of the rubber seals located on the top, bottom and sides of radiator (Fig. 32). To prevent possible overheating, these seals must be installed to their original positions.

INSTALLATION

(1) Install radiator behind air conditioning condenser with bottom alignment dowel inserted into radiator lower mounting bracket (Fig. 32).
(2) Install E-clip to radiator alignment dowel (Fig. 32).
(3) Tighten the four condenser-to-radiator mounting bolts to 6.2 N·m (55 in. lbs.) torque.
(4) If removed, install radiator grille.
(5) Tighten radiator top mounting bolts to 6 N·m (55 in. lbs.) torque.
(6) If equipped, connect automatic transmission fluid cooler lines to radiator. Refer to Group 21, Transmission for procedures.
(7) Install the radiator fan shroud.
(8) Connect the coolant reserve/overflow tank hose.
(9) Connect radiator hoses and install hose clamps.
(10) Connect negative battery cable.
(11) Close the draincock.
(12) Fill cooling system with correct coolant.
(13) Install radiator cap.
(14) Check and adjust automatic transmission fluid level (if equipped).

4.0L 6-CYLINDER ENGINE

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

REMOVAL AND INSTALLATION (Continued)

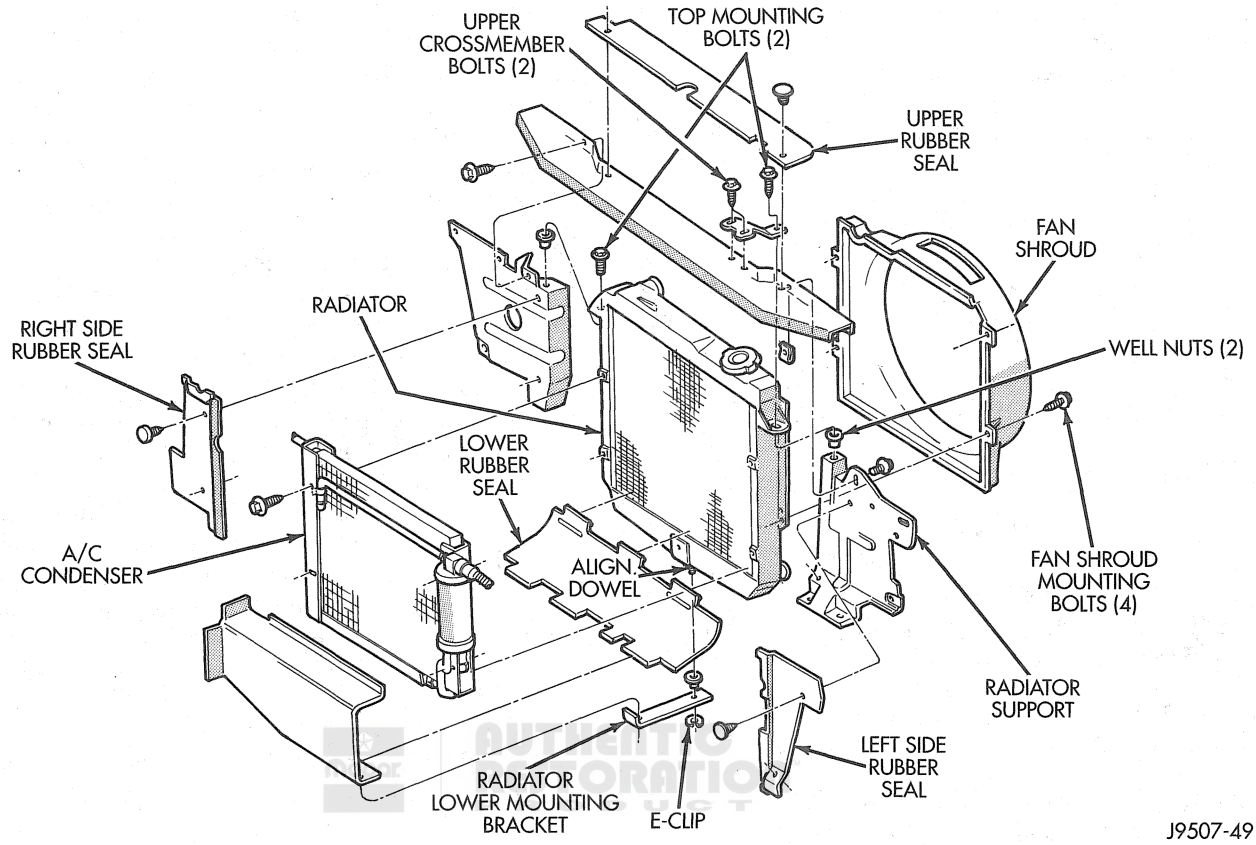


Fig. 32 Radiator Remove/Install—2.5L 4-Cylinder Engine

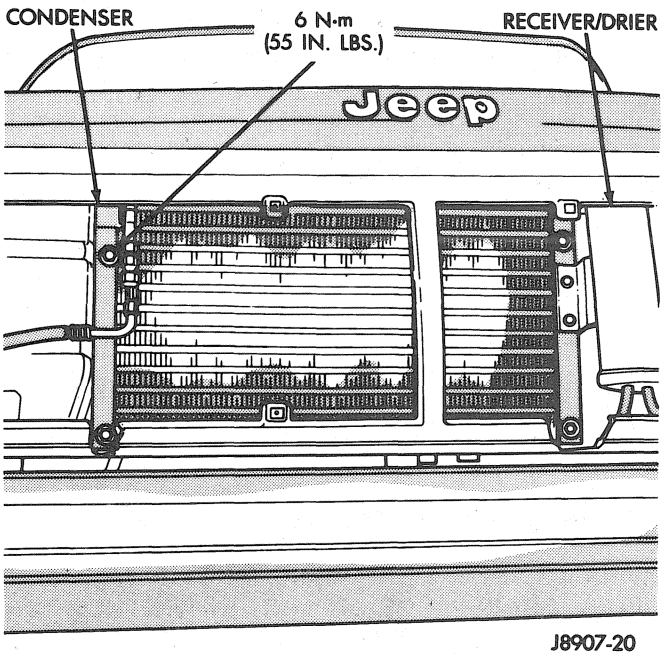


Fig. 33 Condenser Mounting Bolts—2.5L 4-Cylinder Engine—Typical

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 7). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 8). If replacement is necessary, use only an original equipment clamp with matching number or letter.

REMOVAL

(1) Disconnect negative battery cable at battery.
(2) Observe the previous **WARNINGS.**
(3) Remove pressure cap.
(4) For access to radiator draincock, remove radiator grille mounting screws and remove grill. Refer to Group 23, Body for procedures.
(5) Attach one end of a 24 inch long X 1/4 inch ID hose to the radiator draincock. Put the other end into a clean container. Open draincock and drain radiator.
(6) If equipped, disconnect auxiliary electric cooling fan electrical connector (Fig. 34).

REMOVAL AND INSTALLATION (Continued)

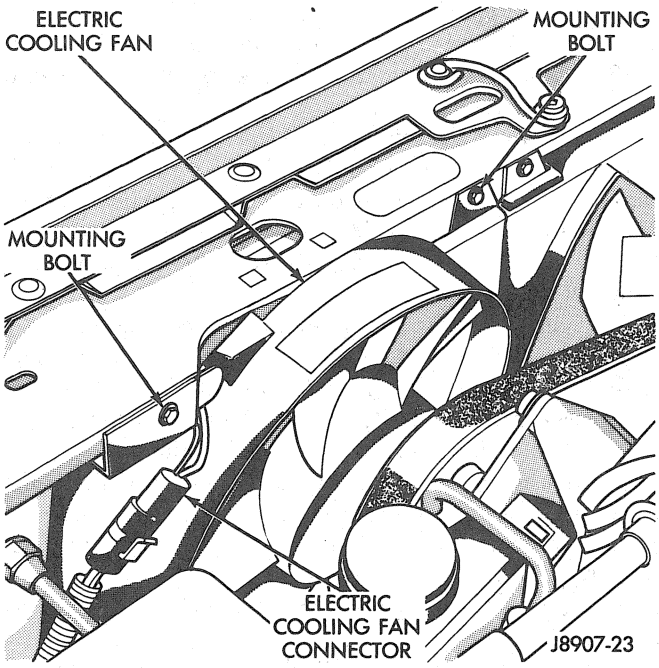


Fig. 34 Auxiliary Electric Cooling Fan Wiring Connector—Typical

(7) If equipped, remove two electric cooling fan mounting bolts. Lift cooling fan straight up until alignment tabs at the bottom are clear of slots in bracket at bottom of radiator (Fig. 35).

(8) Remove the two mechanical (non-electrical) fan shroud mounting bolts. Lift shroud straight up until alignment tabs at the bottom are clear of slots in bracket at bottom of radiator (Fig. 35). Place shroud over mechanical fan.

(9) If equipped, disconnect and plug automatic transmission fluid cooler lines. Refer to Group 21, Transmissions for procedures. If equipped with remote transmission cooler, remove line to cooler from bracket at bottom of radiator.

(10) Disconnect radiator upper and lower hoses clamps (Fig. 7) (Fig. 8). Disconnect radiator upper and lower hoses.

(11) Mark the position of the hood latch striker on the radiator crossmember and remove hood latch striker.

(12) Remove two radiator upper crossmember-to-isolator nuts (Fig. 35).

(13) Remove four radiator upper crossmember bolts (Fig. 35) and remove upper crossmember.

(14) If equipped with air conditioning, separate radiator from condenser by removing condenser-to-radiator mounting brackets (Fig. 36).

(15) Lift radiator straight up and out of engine compartment taking care not to damage fins.

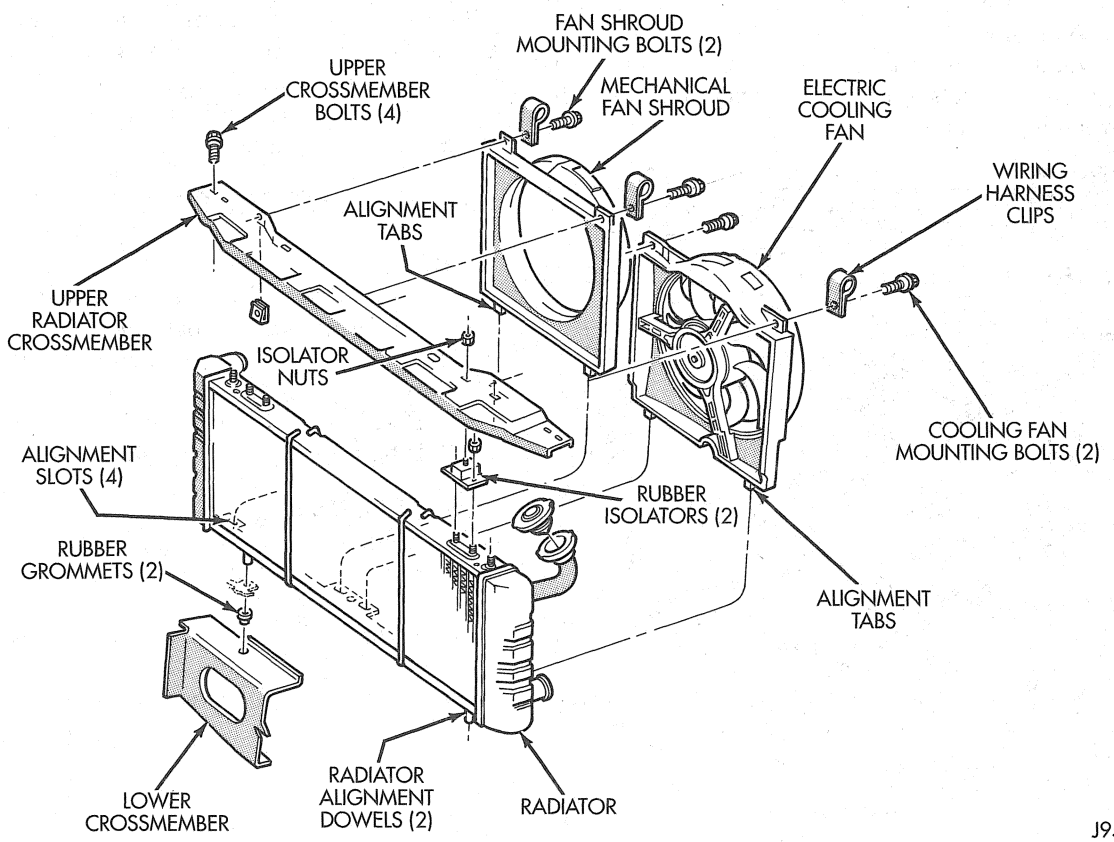


Fig. 35 Auxiliary Electric Cooling Fan and Fan Shroud—Typical

REMOVAL AND INSTALLATION (Continued)

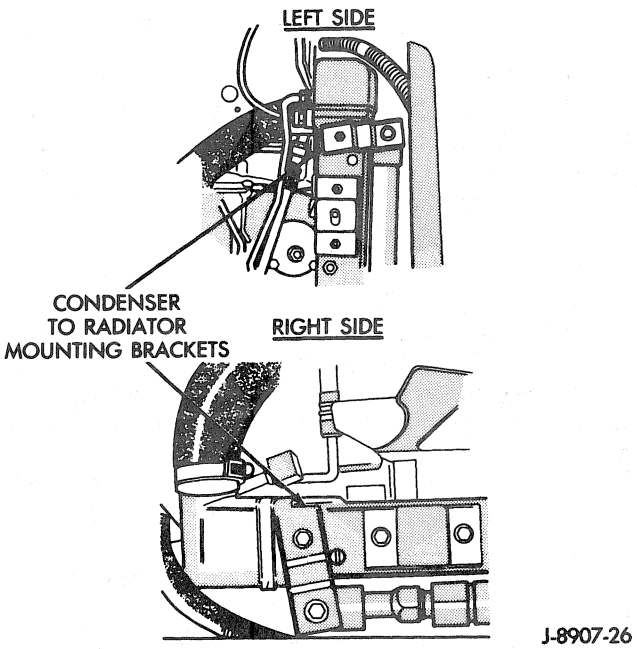


Fig. 36 Condenser-to-Radiator Mounting Brackets—4.0L 6- Cylinder Engine

INSTALLATION

The radiator is supplied with two alignment dowels (Fig. 35) (Fig. 37). They are located on the bottom tank and fit into rubber grommets in the radiator lower crossmember.

(1) Lower radiator into engine compartment. Position alignment dowels into rubber grommets in radiator lower crossmember (Fig. 35) (Fig. 37)

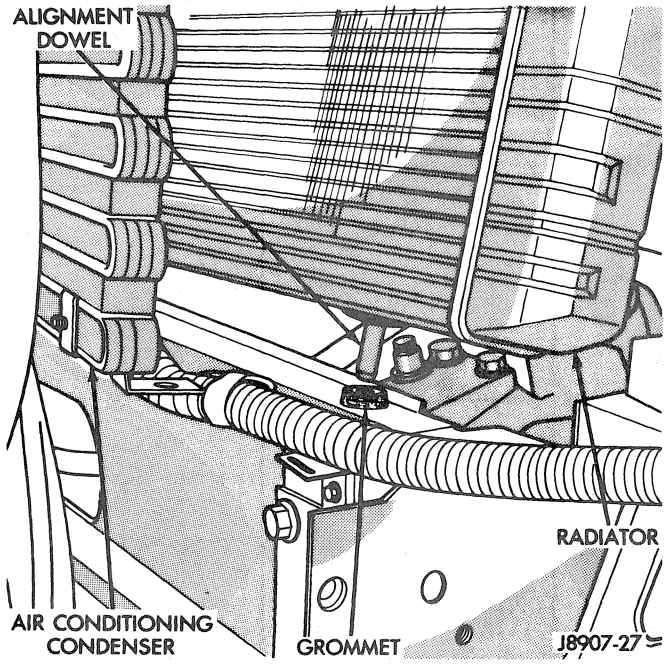


Fig. 37 Radiator Installation 4.0L 6-Cylinder Engine

(2) If equipped with air conditioning, attach condenser to radiator with mounting brackets (Fig. 36).

(3) Install radiator upper crossmember and four mounting bolts.

(4) Install radiator upper crossmember-to-isolator nuts. Tighten nuts to 10 N·m (86 in. lbs.) torque. If isolator-to-radiator nuts had been removed, tighten them to 5 N·m (47 in. lbs.) torque.

(5) Install hood latch striker. Note previously marked position.

(6) Connect radiator upper and lower hoses.

(7) If equipped, connect automatic transmission fluid cooler lines. Refer to Group 21, Transmissions for procedures. If equipped with remote cooler, attach cooler line to bracket at bottom of radiator.

(8) Install electric cooling fan (if equipped). Insert alignment tabs at bottom of fan shroud into slots in bracket at bottom of radiator. Tighten mounting bolts to 3 N·m (31 in. lbs.) torque.

(9) Connect electric cooling fan electrical connector.

(10) Install mechanical cooling fan shroud. Insert alignment tabs at bottom of shroud into slots in bracket at bottom of radiator. Tighten mounting bolts to 3 N·m (31 in. lbs.) torque.

(11) Close radiator draincock.

(12) Install grille.

(13) Connect negative battery cable.

(14) Fill cooling system with correct coolant. Refer to the Coolant section of this group.

(15) Install pressure cap.

(16) Check and adjust automatic transmission fluid level (if equipped).

AUXILIARY ELECTRIC COOLING FAN

REMOVAL

The auxiliary cooling fan is attached to the radiator upper crossmember behind the radiator.

(1) Remove the two fan mounting bolts from radiator upper crossmember (Fig. 38).

(2) Disconnect the electric fan connector.

(3) Lift fan straight up and out of vehicle.

INSTALLATION

(1) Align lower retaining tabs of fan shroud with slots in bracket at bottom of radiator. Push fan down into position.

(2) Tighten the mounting bolts to 4 N·m (31 in. lbs.) torque.

(3) Connect auxiliary cooling fan electrical connector.

REMOVAL AND INSTALLATION (Continued)

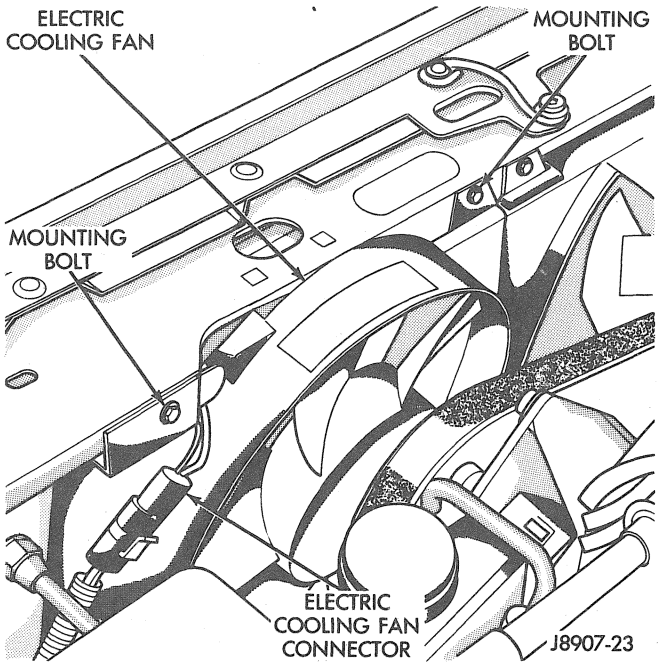


Fig. 38 Auxiliary Cooling Fan—Remove/Install—Typical

ENGINE BLOCK HEATER

REMOVAL

Refer to correct illustration (Fig. 39) (Fig. 40)when servicing block heater.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

(1) Drain coolant from radiator and engine cylinder block.

(2) Unplug power cord from block heater.

(3) Loosen screw in center of block heater (Fig. 39) (Fig. 40).

(4) Remove block heater from cylinder block.

INSTALLATION

(1) Thoroughly clean the engine core hole and the block heater seat.

(2) Insert block heater assembly into core hole with element loop pointing **Up.**

(3) Seat block heater flush against block face. Tighten mounting screw to 3.6 N·m (32 in. lbs.) torque.

(4) Fill cooling system with coolant. Pressurize system and inspect for leaks.

(5) Plug power cord into block heater. Route cord away from moving parts, linkages and exhaust system components. Secure cord in place with tie-straps.

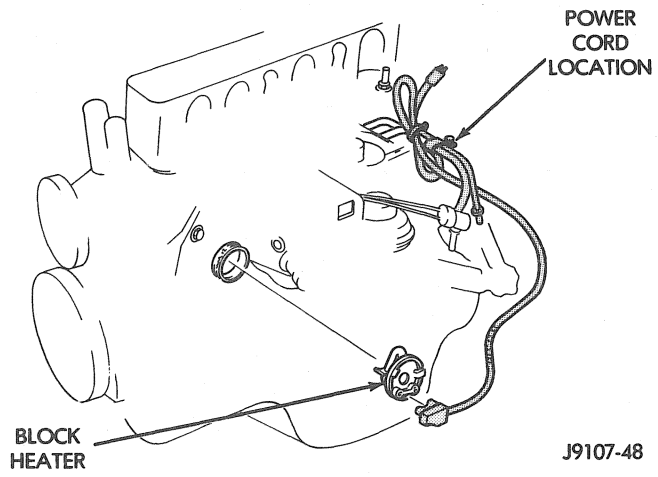


Fig. 39 Heater and Cord— 2.5L 4-Cylinder Engine

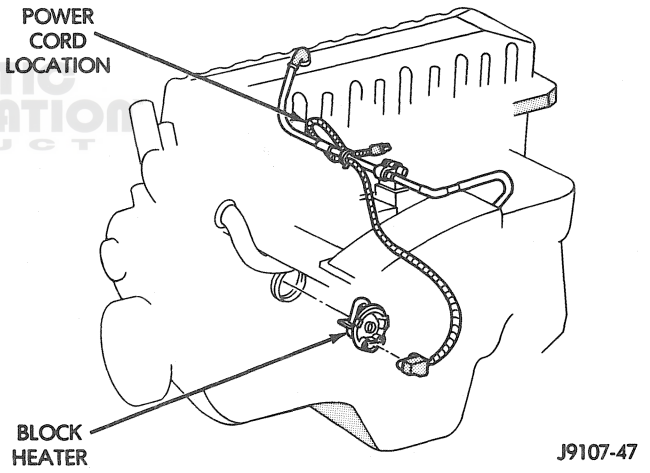


Fig. 40 Heater and Cord—4.0L 6-Cylinder Engine

ENGINE ACCESSORY DRIVE BELTS

Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. There are different types of adjustment gauges for checking either a serpentine or a V-type belt. Refer to the instructions supplied with the gauge. Use the correct gauge when checking belt tension. Place gauge in the middle of the section of belt being tested (between two pulleys) to check tension. Do not allow the gauge (or gauge adapter) to contact anything but the belt.

BELT SCHEMATICS

The belt routing schematics are published from the latest information available at the time of publication. **If anything differs between these schematics and the Belt Routing Label, use the**

REMOVAL AND INSTALLATION (Continued)

schematics on Belt Routing Label. This label is located in the engine compartment.

Refer to (Fig. 41) (Fig. 42) (Fig. 43) (Fig. 44)for proper belt routing on vehicles with conventional left hand drive. Refer to (Fig. 45) (Fig. 46)for proper belt routing on vehicles with right hand drive (RHD). Or, refer to the Belt Routing Label located in the vehicle engine compartment.

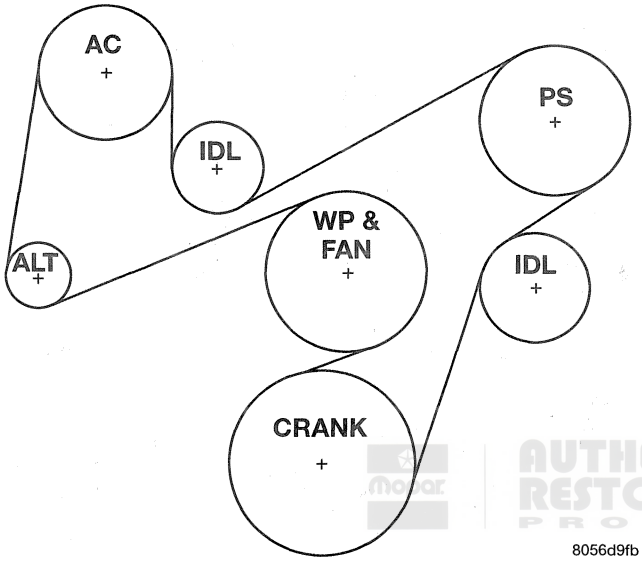


Fig. 41 Models with 2.5L Engine—With A/C

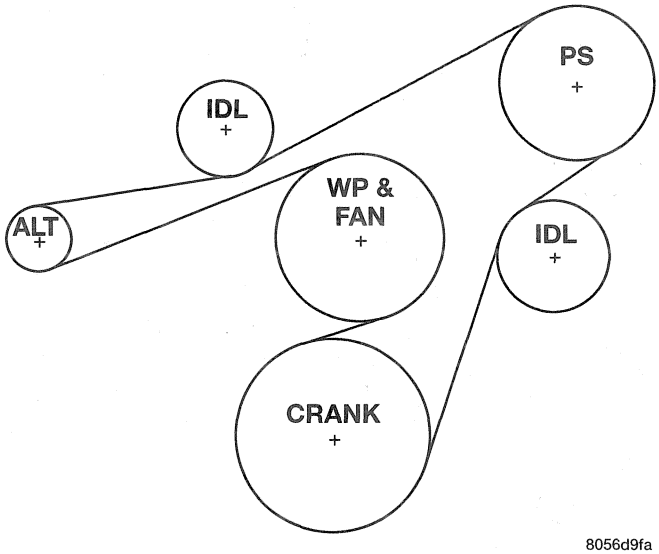


Fig. 42 Models with 2.5L Engine—Without A/C

BELT REPLACEMENT OR ADJUSTMENT—LEFT HAND DRIVE

The following procedures are for models equipped with conventional left hand drive. Also refer to Belt Replacement or Adjustment—With Right Hand Drive.

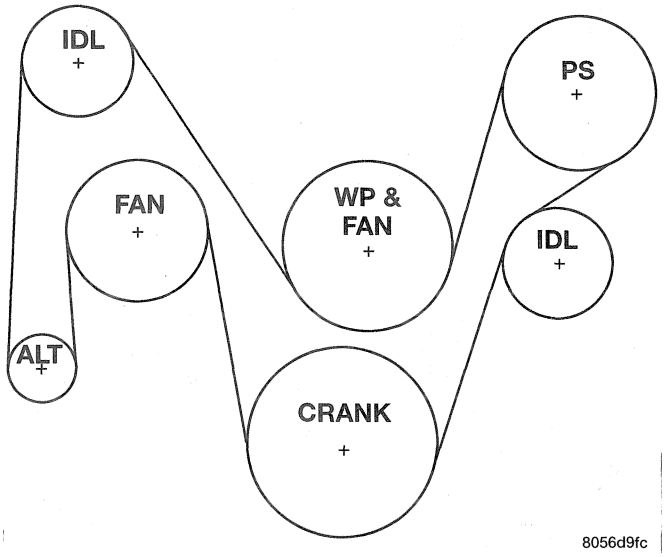


Fig. 43 Models with 4.0L Engine—Without A/C—Except RHD

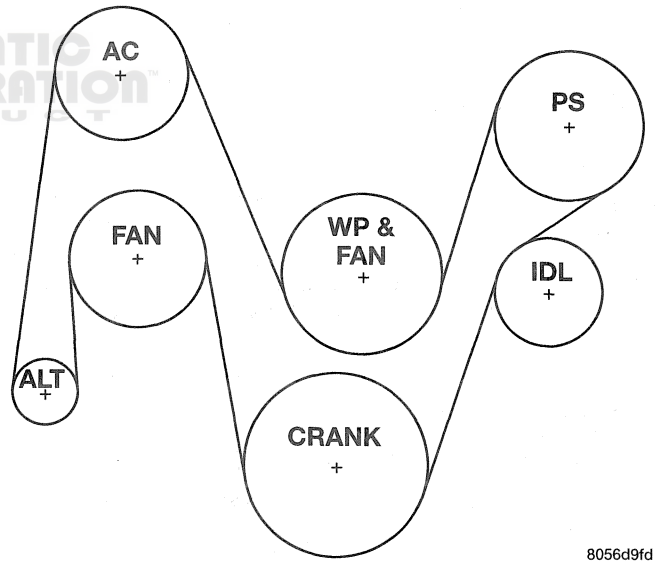


Fig. 44 Models With 4.0L Engine—With A/C—Except RHD

REMOVAL

Belt tension is adjusted at the power steering pump bracket and idler pulley assembly.

(1) Disconnect negative battery cable from battery.

(2) Loosen belt tension at power steering pump bracket and idler pulley (Fig. 47).

(3) Remove belt.

INSTALLATION

(1) Check condition of all pulleys.

REMOVAL AND INSTALLATION (Continued)

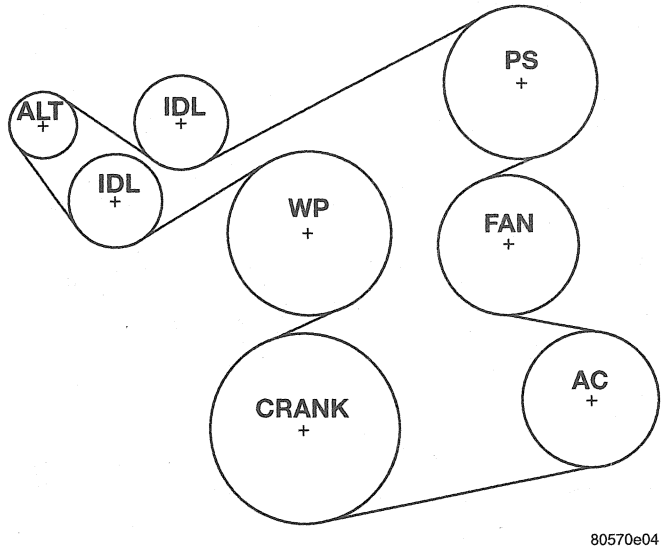


Fig. 45 Models With 4.0L Engine—With A/C—With RHD

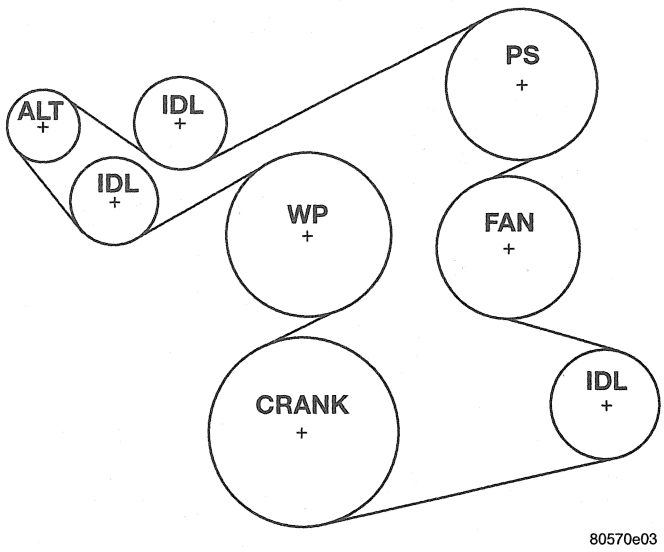


Fig. 46 Models With 4.0L Engine—Without A/C—With RHD

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to (Fig. 41) (Fig. 42) (Fig. 43) (Fig. 44) for correct belt routing.

(2) Install new belt. Refer to the end of this group for Drive Belt Tension specifications.

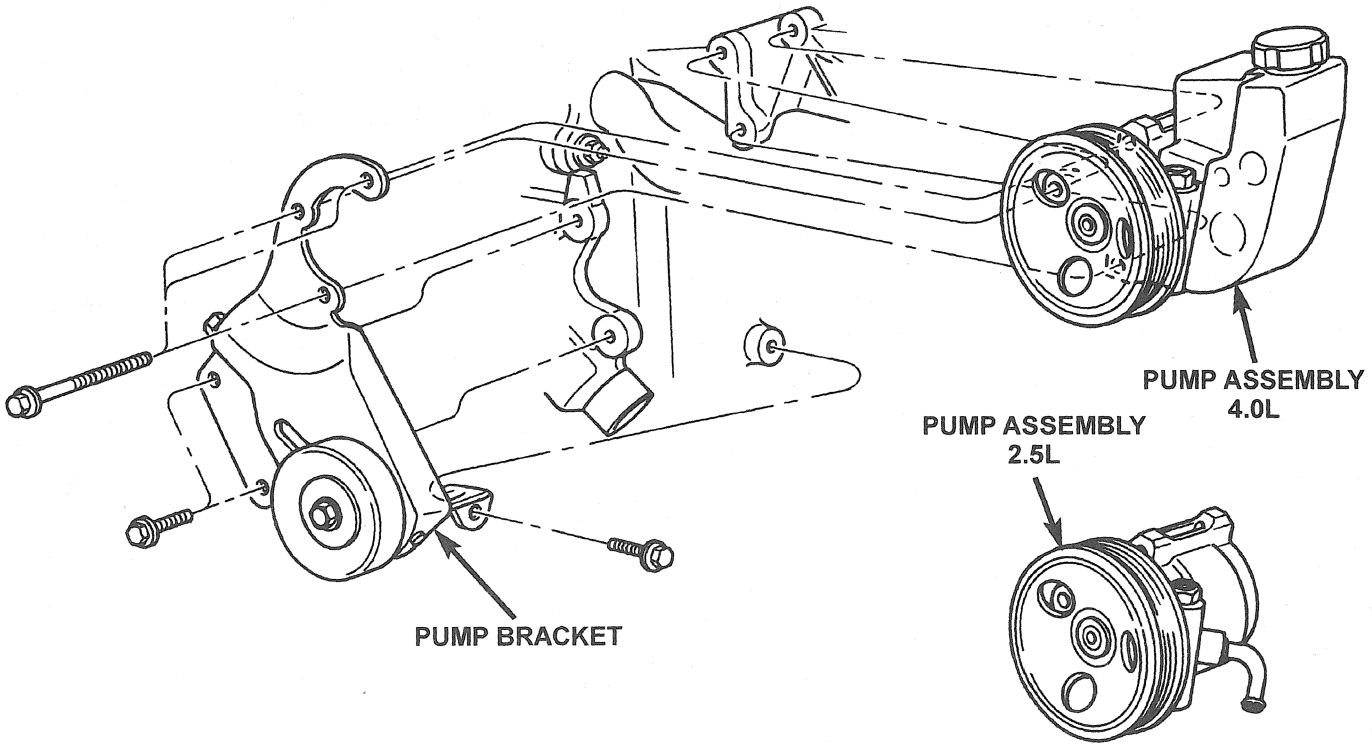


Fig. 47 Power Steering Pump Bracket and Idler Pulley

REMOVAL AND INSTALLATION (Continued)

(3) After power steering pump bracket and idler pulley has been tightened into position, recheck belt tension. Adjust if necessary.

BELT REPLACEMENT OR ADJUSTMENT—RIGHT HAND DRIVE

(1) Disconnect negative battery cable from battery.
(2) Loosen belt tension at generator adjust bracket (Fig. 48).
(3) Remove belt.

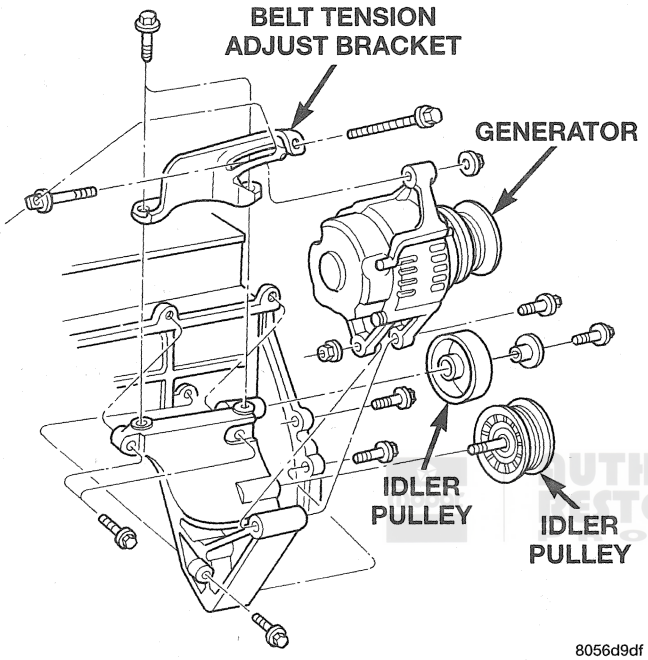


Fig. 48 Generator Belt Tension Adjust Bracket

INSTALLATION

(1) Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to (Fig. 45) (Fig. 46)for correct belt routing.

(2) Install new belt. Refer to the end of this group for Drive Belt Tension specifications.
(3) After generator and adjust bracket have been tightened into position, recheck belt tension. Adjust if necessary.

COOLING SYSTEM FANS

REMOVAL

Some engines have the mechanical fan/viscous fan drive assembly mounted directly to the water pump hub (Fig. 49). It may also be mounted to a hub/bearing attached to an aluminum bracket on the right front side of engine (Fig. 50).

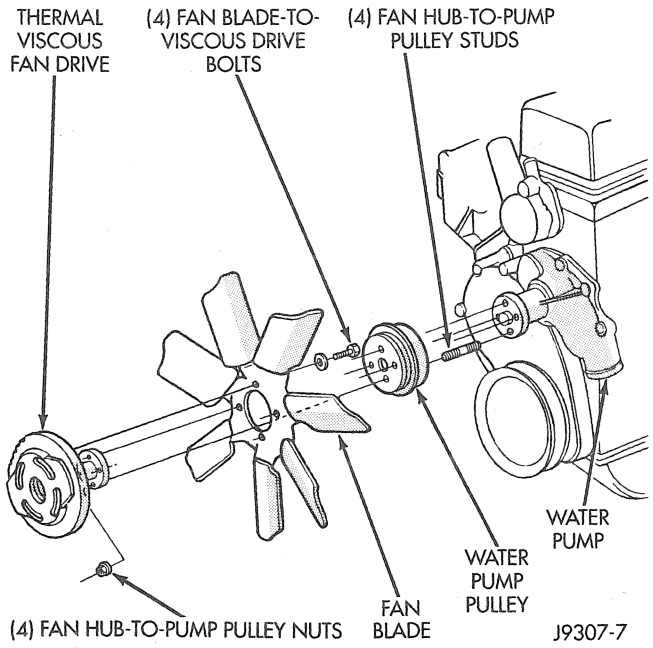


Fig. 49 Water Pump Mounted Cooling Fan

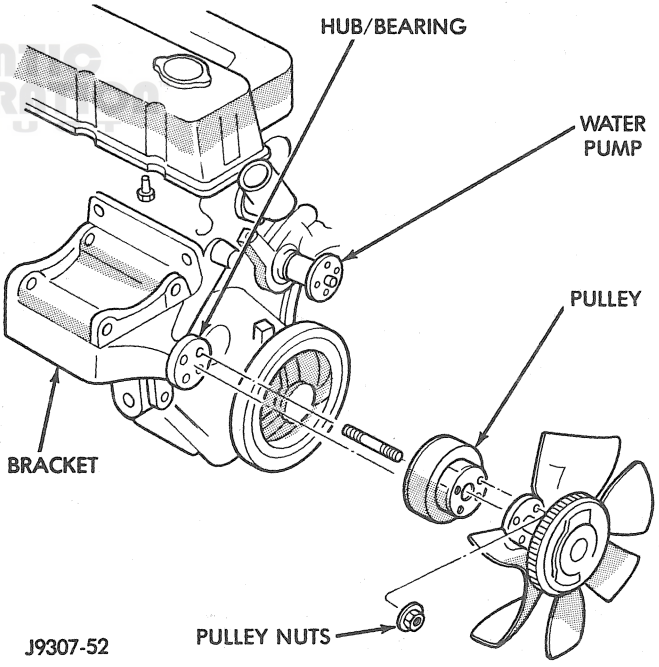


Fig. 50 Bracket Mounted Cooling Fan

(1) Loosen but do not remove at this time, the four fan hub mounting nuts (Fig. 49) (Fig. 50).
(2) Remove accessory serpentine drive belt. Refer to Belt Service in the Engine Accessory Drive Belt section of this group.
(3) Some models with certain engines may require the removal of the fan shroud to remove the viscous fan drive. The fan shroud and fan blade/viscous fan drive should be removed from the vehicle as one assembly.

REMOVAL AND INSTALLATION (Continued)

(4) Remove four fan hub mounting nuts (Fig. 49) (Fig. 50)and remove fan/viscous fan drive assembly from vehicle.

(5) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

INSTALLATION

(1) Assemble fan blade to viscous fan drive. Tighten mounting bolts to 27 N·m (20 ft. lbs.) torque.

(2) Position mounting flange of fan blade/viscous fan drive assembly onto hub. Install four nuts and tighten to 24 N·m (18 ft. lbs.) torque. Tighten the first two nuts 180 degrees apart. Then tighten last two nuts.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to appropriate Engine Accessory Drive Belt Schematic in this group for correct belt routing.

(3) Install accessory drive belts. Tension belts to specifications. Refer to the Specifications section at the end of this group.

VISCOUS FAN DRIVE REMOVAL/INSTALLATION

Refer to Cooling System Fan for removal and installation procedures of the viscous drive unit.

Viscous Fan Drive Fluid Pump Out Requirement:

After installing a **new** viscous fan drive, bring the engine speed up to approximately 2000 rpm and hold for approximately two minutes. This will ensure proper fluid distribution within the drive.

CLEANING AND INSPECTION

RADIATOR PRESSURE CAP

INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

RADIATOR CLEANING

The radiator and air conditioning fins should be cleaned when an accumulation of bugs, leaves etc. has occurred. Clean radiator fins are necessary for good heat transfer. With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

COOLING SYSTEM CLEANING

Drain cooling system and refill with water. Run engine with radiator cap installed until upper radiator hose is hot. Stop engine and drain water from system. If water is dirty, fill system with water, run engine and drain system. Repeat until water drains clean.

FAN BLADE INSPECTION

The fan blades cannot be repaired. If fan is damaged, it must be replaced. Inspect fan as follows:

(1) Remove fan blade and viscous fan drive as an assembly from the engine. Refer to preceding Removal procedure.

(2) Remove fan blade assembly from viscous fan drive unit (four bolts).

(3) Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.

WARNING: DO NOT ATTEMPT TO BEND OR STRAIGHTEN FAN BLADES IF NOT WITHIN SPECIFICATIONS.

(4) Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

COOLING SYSTEM HOSES

INSPECTION

Inspect the hoses at regular intervals. Replace hoses that are cracked, feel brittle when squeezed or swell excessively when the system is pressurized. The use of molded replacement hoses is recommended. When performing a hose inspection, inspect the radiator lower hose for proper position and condition of the spring.

SPECIFICATIONS

COOLING SYSTEM CAPACITIES

MODEL	ENGINE		COOLING CAPACITY		COOLING PACKAGE		RADIATOR		A/C	MECHANICAL FAN (VISCOUS DRIVE)			AUXILIARY* ELECTRIC FAN		
	2.5L	4.0L	QTS.	LITERS	STD.	HD.	ROWS OF TUBES	FINS PER INCH		DIA. (INCH)	NO. OF BLADES	BLADE PITCH (INCH)	DIA. (INCH)	NO. OF BLADES	BLADE PITCH (INCH)
XJ	•		10.0	9.5	•		1	15		16.0	5	2.5			
	•		10.0	9.5		•	1	20	•	16.0	5	2.5			
		•	12.0	11.4	•		1	19		15.0	7	1.88			
		•	12.0	11.4	•		1	19	•	15.0	7	1.88	11.0	6	1.75
		•	12.0	11.4		•	2	19		15.0	7	1.88	11.0	6	1.75
		•	12.0	11.4		•	2	19	•	15.0	7	1.88	11.0	6	1.75

* 4.0L ENGINE WITH HEAVY DUTY COOLING AND/OR AIR CONDITIONING

805dd843

Mopar AUTHENTIC RESTORATION PRODUCT

BELT TENSION

Belt tension must be adjusted. Refer to the following Belt Tension chart for specifications.

* **800-900 N (180-200 lbs. force)**
(With ** new serpentine belt)

* **623-712 N (140-160 lbs. force)**
(With ** used serpentine belt)

** Belt is considered new if it has been used 15 minutes or less.

* Specifications for use with a belt tension gauge. Refer to operating instructions supplied with gauge.

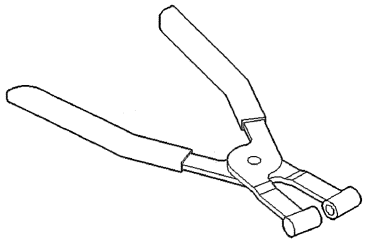
SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Generator Pivot Bolt	38 N·m (28 ft. lbs.)
Generator Rear Adj. Bolt	27 N·m (20 ft. lbs.)
Auto. Trans. Auxiliary Oil Cooler Mtg. Screws	2 N·m (18in. lbs.)
Auxilary Electric Cooling Fan Mtg. Screws	4 N·m (36 in. lbs.)
Condenser-to-Radiator Screws	6 N·m (55 in. lbs.)
Fan Blade Assy.-to-Viscous Fan Drive Bolts	24 N·m (18 ft. lbs.)
Viscous Fan Drive Assy.-to-Water Pump Nuts	27 N·m (20 ft. lbs.)
Fan Shroud (2.5L Engine) Mounting Bolts	2 N·m (20 in. lbs.)
Fan Shroud (4.0L Engine) Screws	4 N·m (20 in. lbs.)
Engine Cylinder Block Heater Mounting Screw	4 N·m (20 in. lbs.)
Radiator (4.0L Engine) Mounting Bolts	8 N·m (6 ft. lbs.)
Radiator (2.5L Engine) Mounting Bolts	6 N·m (55 in. lbs.)
Thermostat Housing Bolts	20 N·m (15 ft. lbs.)
Water Pump Bolts	30 N·m (22 ft. lbs.)
Isolator-to-Crossmember Nuts	10 N·m (86 in. lbs.)
Isolator-to-Radiator Nuts	5 N·m (47 in. lbs.)

SPECIAL TOOLS

COOLING SYSTEM



Hose Clamp Tool

AUTHENTIC RESTORATION PRODUCT

BATTERY

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
OVERVIEW	1
DESCRIPTION AND OPERATION	
BATTERY MOUNTING	3
BATTERY SIZE AND RATINGS	2
BATTERY	2
DIAGNOSIS AND TESTING	
BATTERY	3
BUILT-IN TEST INDICATOR	5
HYDROMETER TEST	5
IGNITION-OFF DRAW TEST	8
LOAD TEST	7
OPEN-CIRCUIT VOLTAGE TEST	6
SERVICE PROCEDURES	
BATTERY CHARGING	9
REMOVAL AND INSTALLATION	
BATTERY	11
SPECIFICATIONS	
BATTERY	13

GENERAL INFORMATION

OVERVIEW

The battery, starting, and charging systems operate with one another, and must be tested as a complete system. In order for the vehicle to start and charge properly, all of the components involved in these systems must perform within specifications.

Group 8A covers the battery, Group 8B covers the starting system, and Group 8C covers the charging system. Refer to Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams. We have separated these systems to make it easier to locate the information you are seeking within this Service Manual. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in these groups include the most basic conventional diagnostic methods to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of a induction milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. See the On-Board Diagnostics Test in Group 8C - Charging System for more information.

INTRODUCTION

This section covers battery diagnostic and service procedures only. For battery maintenance procedures, refer to Group 0 - Lubrication and Maintenance. While battery charging can be considered a maintenance procedure, battery charging information is located in this group. This was done because the battery must be fully-charged before any diagnosis can be performed.

The factory-installed low-maintenance battery has removable battery cell caps (Fig. 1). Water can be added to this battery. The battery is not sealed and has vent holes in the cell caps. The chemical composition within the low-maintenance battery reduces battery gassing and water loss at normal charge and discharge rates.

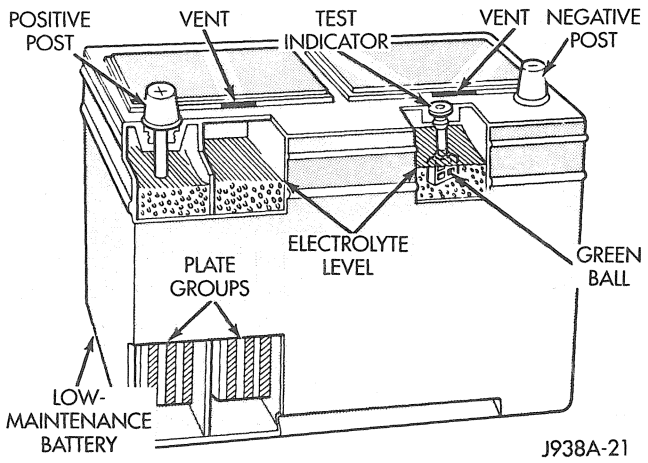


Fig. 1 Low-Maintenance Battery

Rapid loss of electrolyte can be caused by an overcharging condition. Be certain to diagnose the charging system before returning the vehicle to service. Refer to Group 8C - Charging System for more information.

The factory-installed battery also has a built-in test indicator (hydrometer). The color visible in the sight glass of the indicator will reveal the battery

condition. See Built-In Test Indicator in this group for more information.

It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal discharge, over-charging, or early battery failure must be diagnosed and corrected before a battery is replaced or returned to service.

DESCRIPTION AND OPERATION

BATTERY

The storage battery is a device used to store electrical energy potential in a chemical form. When an electrical load is applied to the battery terminals, an electrochemical reaction occurs within the battery. This reaction causes the battery to discharge electrical current.

The battery is made up of six individual cells that are connected in series. Each cell contains positively charged plate groups made of lead oxide, and negatively charged plate groups made of sponge lead. These dissimilar metal plates are submerged in a sulfuric acid and water solution called an electrolyte.

As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water.

The chemical changes within the battery are caused by the movement of excess, or free, electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery, the battery discharging process is reversed.

Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead oxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells.

For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

In addition to producing and storing electrical energy, the battery serves as a capacitor, or voltage stabilizer, for a vehicle's electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the vehicle's electrical components.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, the hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite.

If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

BATTERY SIZE AND RATINGS

The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.

In addition, there are two commonly accepted methods for rating and comparing battery performance. These ratings are called Cold Cranking Amperage (CCA) and Reserve Capacity (RC). Both ratings are described in more detail below.

The Group Size number, CCA rating, and RC rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA and RC ratings that equal or exceed the original equipment specification for the vehicle being serviced. See the Battery Classifications and Ratings chart in Specifications at the back of this group for more information.

COLD CRANKING AMPERAGE

The Cold Cranking Amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for 30 seconds at -17.7°C (0°F). Terminal voltage must not fall below 7.2 volts during or after the 30 second discharge. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.

RESERVE CAPACITY

The Reserve Capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.2 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7°C (80°F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.

DESCRIPTION AND OPERATION (Continued)

BATTERY MOUNTING

The battery is mounted to a molded plastic tray located in the right front corner of the engine compartment. Two T-bolts are held in formations on each side of the tray by push-on retainers, and extend upward on each side of the battery. A holddown strap fits across the top of the battery case and over the ends of the T-bolts. Two nuts secure the holddown strap to the T-bolts. One end of a support strap is located under the forward-most holddown strap nut, and the other end is secured to the upper radiator crossmember by a bolt.

The battery tray is fastened with nuts to three studs that protrude from the wheelhouse inner panel, forward of the right front wheel. A hole in the bottom of the battery tray is fitted with a battery temperature sensor on some models. Models without the battery temperature sensor have a plug fitted to this hole. Refer to Group 8C - Charging System for more information on the battery temperature sensor.

DIAGNOSIS AND TESTING

BATTERY

The battery must be completely charged and the top, posts, and terminal clamps should be properly cleaned before diagnostic procedures are performed. See Battery Charging in this group for more information.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

- **EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**
- **THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.**
- **IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.**

The condition of a battery is determined by two criteria:

1. **State-Of-Charge** - This can be determined by viewing the built-in test indicator, by checking the specific gravity of the electrolyte (hydrometer test), or by checking the battery voltage (open-circuit voltage test).
2. **Cranking Capacity** - This can be determined by performing a battery load test, which measures the ability of the battery to supply high-amperage current.

First, determine the battery state-of-charge. This can be done in one of three ways. If the battery has a built-in test indicator, use this test to determine the state-of-charge. If the battery has no test indicator, but has removable cell caps, perform the hydrometer test to determine the state-of-charge. If the cell caps are not removable, or a hydrometer is not available, perform the open-circuit voltage test to determine the state-of-charge.

The battery must be charged before proceeding with a load test if:

- The built-in test indicator has a black or dark color visible.
- The temperature corrected specific gravity is less than 1.235.
- The open-circuit voltage is less than 12.4 volts.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is faulty and must be replaced.

NOTE: Completely discharged batteries may take several hours to accept a charge. See Charging A Completely Discharged Battery in this group for more information.

A battery is fully-charged when:

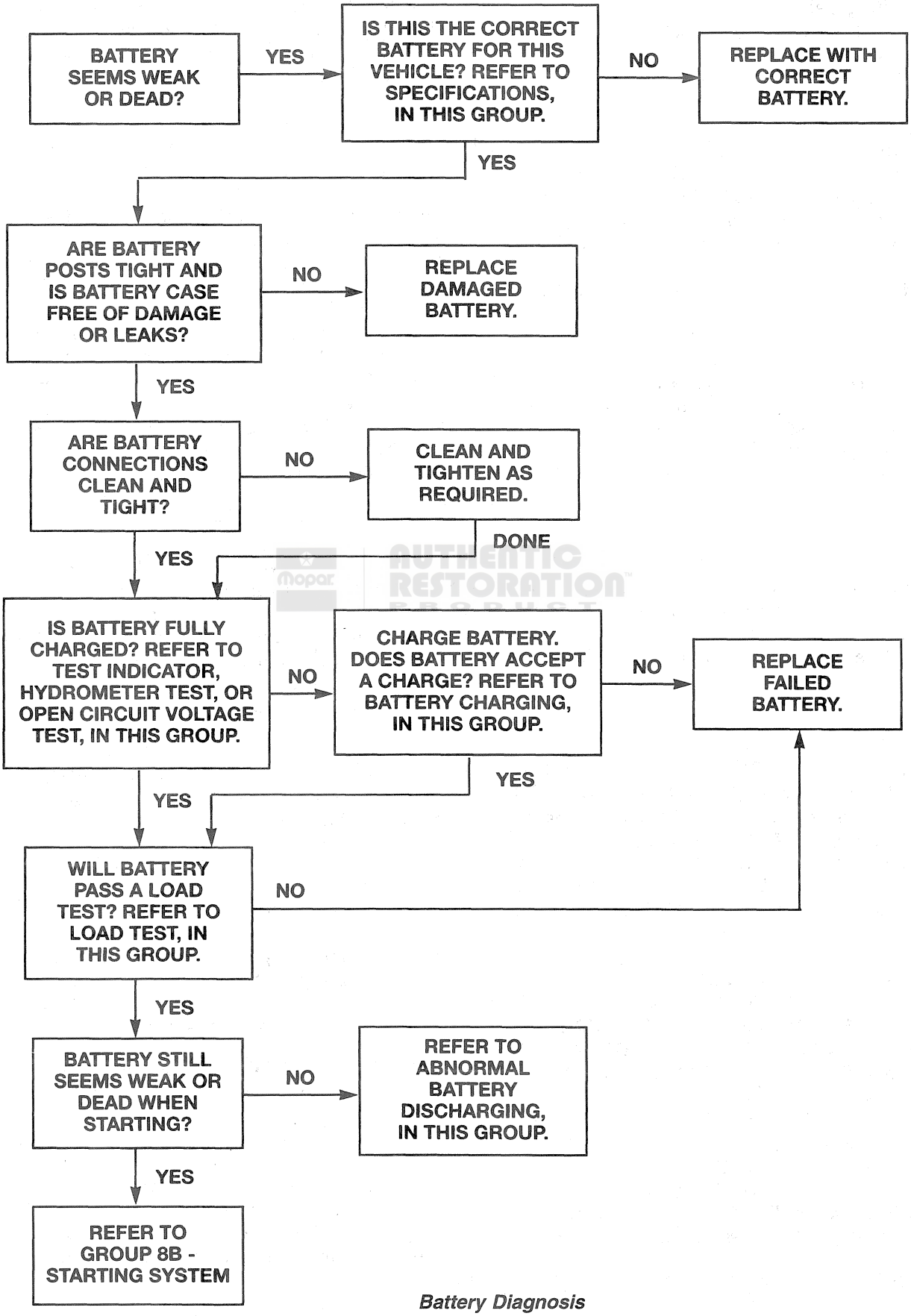
- All cells are gassing freely during charging.
- A green color is visible in the sight glass of the built-in test indicator.
- Three corrected specific gravity tests, taken at 1-hour intervals, indicate no increase in the specific gravity.
- Open-circuit voltage is 12.4 volts or greater.

ABNORMAL BATTERY DISCHARGING

Any of the following conditions can result in abnormal battery discharging:

1. Corroded or loose battery posts and terminal clamps.
2. A loose or worn generator drive belt.
3. Electrical loads that exceed the output of the charging system. This can be due to equipment installed after manufacture, or repeated short trip use.

DIAGNOSIS AND TESTING (Continued)



Battery Diagnosis

8001990e

DIAGNOSIS AND TESTING (Continued)

4. Slow driving speeds (heavy traffic conditions) or prolonged idling, with high-amperage draw systems in use.
5. A faulty circuit or component causing excessive ignition-off draw. See Ignition-Off Draw Test in this group for more information.
6. A faulty or incorrect charging system component.
7. A faulty or incorrect battery.

BUILT-IN TEST INDICATOR

A test indicator (hydrometer) built into the top of the battery case provides visual information for battery testing (Fig. 2). Like a hydrometer, the built-in test indicator measures the specific gravity of the electrolyte. The test indicator reveals the battery state-of-charge; however, it will not reveal the cranking capacity of the battery. A load test must be performed to determine the battery cranking capacity. See Load Test in this group for more information.

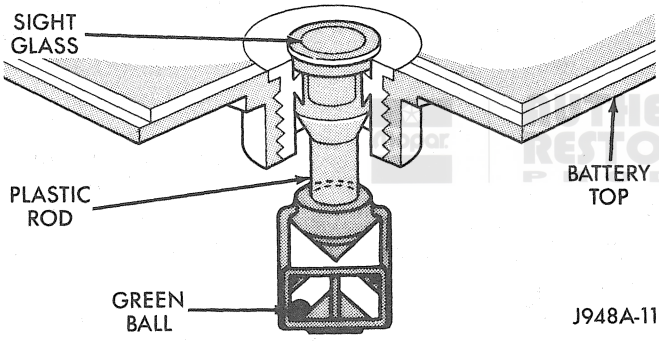


Fig. 2 Built-In Test Indicator

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

- **EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**
- **THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.**
- **IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.**

Before testing, visually inspect the battery for any damage (a cracked case or cover, loose posts, etc.) that would cause the battery to be faulty. In order to obtain correct indications from the built-in test indicator, it is important that the battery be level and have a clean sight glass. Additional light may be required to view the indicator. **Do not use open flame as a source of additional light.**

To read the built-in test indicator, look into the sight glass and note the color of the indicator (Fig. 3). Refer to the following description, as the color indicates:

- **Green** - indicates 75% to 100% state-of-charge. The battery is adequately charged for further testing or return to use. If the vehicle will not crank for a minimum of 15 seconds with a fully-charged battery, perform the Load Test.
- **Black or Dark** - indicates 0% to 75% state-of-charge. The battery is inadequately charged and must be charged until a green indication is visible in the sight glass (12.4 volts or more), before the battery is tested further or returned to service. See Battery Charging in this group for more information. Also see Abnormal Battery Discharging in this group for possible causes of the discharged condition.
- **Yellow or Bright** - indicates a low electrolyte level. The electrolyte level in the battery is below the test indicator. A maintenance-free battery with non-removable cell caps must be replaced if the electrolyte level is low. Water must be added to a low-maintenance battery with removable cell caps before it is charged. See Battery Charging in this group for more information. A low electrolyte level may be caused by an over-charging condition. Refer to Group 8C - Charging System to diagnose an over-charging condition.

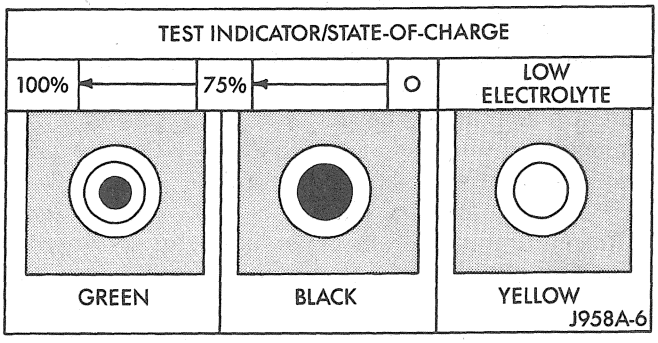


Fig. 3 Built-In Test Indicator Sight Glass

HYDROMETER TEST

The hydrometer test reveals the battery state-of-charge by measuring the specific gravity of the electrolyte. This test cannot be performed on maintenance-free batteries with non-removable cell caps. If the battery has non-removable cell caps, see

DIAGNOSIS AND TESTING (Continued)

Built-In Test Indicator or Open Circuit Voltage Test in this group.

Specific gravity is a comparison of the density of the electrolyte to the density of pure water. Pure water has a specific gravity of 1.000, and sulfuric acid has a specific gravity of 1.835. Sulfuric acid makes up approximately 35% of the electrolyte by weight, or 24% by volume.

In a fully-charged battery the electrolyte will have a temperature-corrected specific gravity of 1.260 to 1.290. However, a specific gravity of 1.235 or above is satisfactory for battery load testing and/or return to service.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

- **EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**
- **THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.**
- **IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.**

Before testing, visually inspect the battery for any damage (a cracked case or cover, loose posts, etc.) that would cause the battery to be faulty. Then remove the cell caps and check the electrolyte level. Add distilled water if the electrolyte level is below the top of the battery plates.

Refer to the hydrometer manufacturer's instructions for correct use of the hydrometer. Remove only enough electrolyte from the battery so that the float is off the bottom of the hydrometer barrel with pressure on the bulb released.

CAUTION: Exercise care when inserting the tip of the hydrometer into a cell to avoid damaging the plate separators. Damaged plate separators can cause early battery failure.

To read the hydrometer correctly, hold it with the top surface of the electrolyte at eye level. Hydrometer floats are generally calibrated to indicate the specific gravity correctly only at 26.7°C (80°F). When testing the specific gravity at any other temperature, a correction factor is required.

The correction factor is approximately a specific gravity value of 0.004, referred to as 4 points of specific gravity. For each 5.5°C above 26.7°C (10°F above 80°F), add 4 points. For each 5.5°C below 26.7°C (10°F below 80°F), subtract 4 points. Always correct the specific gravity for temperature variation. Test the specific gravity of the electrolyte in each battery cell.

EXAMPLE: A battery is tested at -12.2°C (10°F) and has a specific gravity of 1.240. Determine the actual specific gravity as follows:

(1) Determine the number of degrees above or below 26.7°C (80°F):

```
26.6°C - -12.2°C = 38.8°C (80°F - 10°F =
70°F)
```

(2) Divide the result from Step 1 by 5.5 (10):

```
38.8°C/5.5 = 7 (70°F/10 = 7)
```

(3) Multiply the result from Step 2 by the temperature correction factor (0.004):

```
7 X 0.004 = 0.028
```

(4) The temperature at testing was below 26.7°C (80°F); therefore, the temperature correction factor is subtracted:

```
1.240 - 0.028 = 1.212
```

The corrected specific gravity of the battery in this example is 1.212.

If the specific gravity of all cells is above 1.235, but the variation between cells is more than 50 points (0.050), the battery should be replaced. If the specific gravity of one or more cells is less than 1.235, charge the battery at a rate of approximately 5 amperes.

Continue charging until three consecutive specific gravity tests, taken at 1-hour intervals, are constant. If the cell specific gravity variation is more than 50 points (0.050) at the end of the charge period, replace the battery.

When the specific gravity of all cells is above 1.235, and the cell variation is less than 50 points (0.050), the battery may be load tested to determine its cranking capacity. See Load Test in this group for more information.

OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the state-of-charge of a battery. This test can be used in place of the hydrometer test, if a hydrometer is not available; or, for maintenance-free batteries with non-removable cell caps.

DIAGNOSIS AND TESTING (Continued)

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

• EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

• THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

• IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

Before proceeding with this test, completely charge the battery as described in Battery Charging in this group.

(1) Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn the headlamps on for 15 seconds, then allow up to five minutes for the battery voltage to stabilize.

(2) Remove both battery cables, negative cable first.

(3) Using a voltmeter connected to the battery posts (refer to the instructions provided with the voltmeter), measure the open-circuit voltage (Fig. 4).

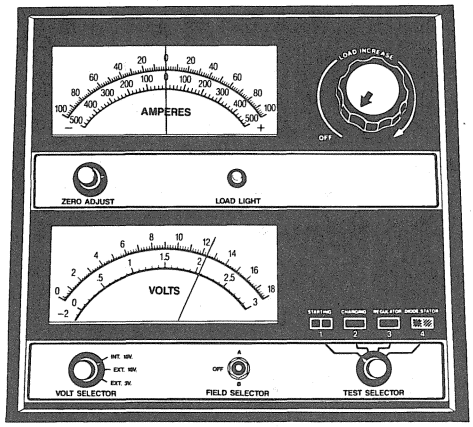


Fig. 4 Testing Open-Circuit Voltage

See the Open-Circuit Voltage chart. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity. See Load Test in this group for more information.

Open Circuit Voltage	
Open Circuit Volts	**Charge Percentage**
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

LOAD TEST

A battery load test will verify the battery cranking capacity. The test is based on the Cold Cranking Amperage (CCA) rating of the battery. See the Battery Classifications and Ratings chart in Specifications at the back of this group.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

• EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

• THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

• IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

Before proceeding with this test, completely charge the battery as described in Battery Charging in this group.

(1) Remove both battery cables, negative cable first. The battery top and posts should be clean.

(2) Connect a suitable volt-ammeter-load tester (Fig. 5) to the battery posts (Fig. 6). Refer to the operating instructions provided with the tester being used. Check the open-circuit voltage (no load) of the battery. Open-circuit voltage must be 12.4 volts or greater.

DIAGNOSIS AND TESTING (Continued)

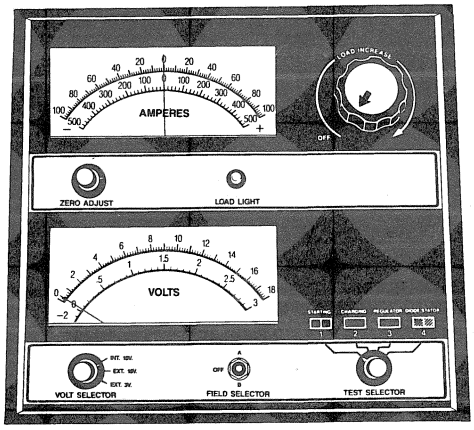


Fig. 5 Volt-Ammeter-Load Tester - Typical

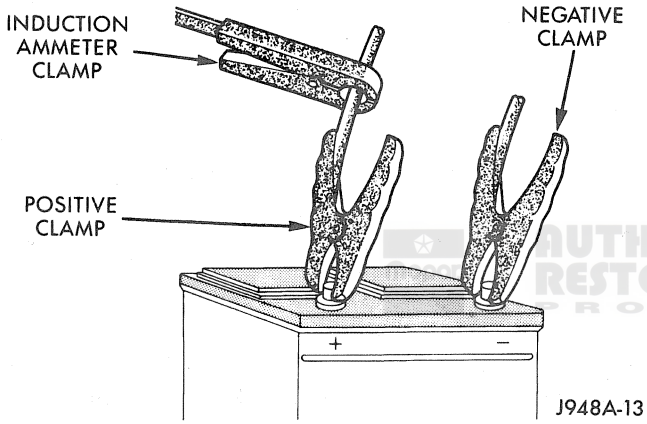


Fig. 6 Volt-Ammeter-Load Tester Connections

(3) Rotate the load control knob (carbon pile rheostat) to apply a 300 ampere load to the battery for 15 seconds, then return the control knob to the Off position (Fig. 7). This will remove the surface charge from the battery.

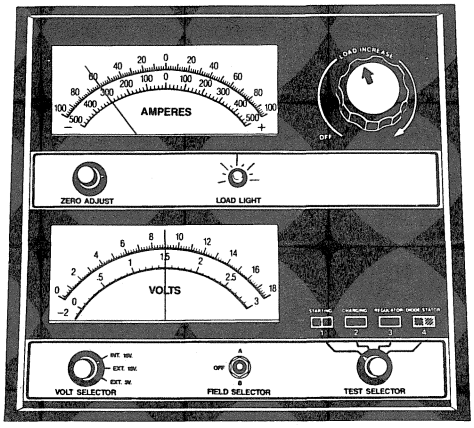


Fig. 7 Remove Surface Charge from Battery

(4) Allow the battery to stabilize to open-circuit voltage. It may take up to five minutes for the battery voltage to stabilize.

(5) Rotate the load control knob to maintain a load equal to 50% of the battery's CCA rating (Fig. 8). After 15 seconds, record the loaded voltage reading, then return the load control knob to the Off position.

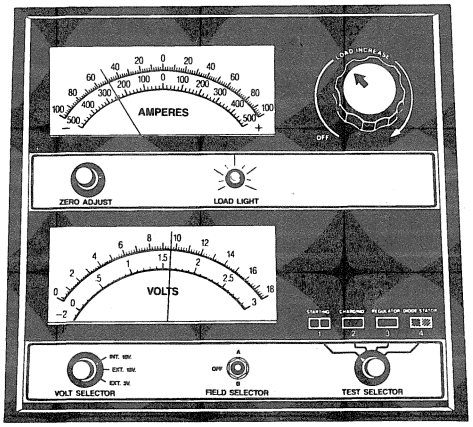


Fig. 8 Load 50% CCA Rating - Note Voltage

(6) The voltage drop will vary with the battery temperature at the time of the load test. The battery temperature can be estimated by using the ambient temperature during the past several hours. If the battery has been charged, boosted, or loaded a few minutes prior to the test, the battery will be somewhat warmer. See the Load Test Temperature chart for the proper loaded voltage reading.

Load Test Temperature		
Minimum Voltage	Temperature	
	°F	°C
9.6 volts	70° and above	21° and above
9.5 volts	60°	16°
9.4 volts	50°	10°
9.3 volts	40°	4°
9.1 volts	30°	-1°
8.9 volts	20°	-7°
8.7 volts	10°	-12°
8.5 volts	0°	-18°

(7) If the voltmeter reading falls below 9.6 volts, at a minimum battery temperature of 21°C (70°F), the battery is faulty and must be replaced.

IGNITION-OFF DRAW TEST

Ignition-Off Draw (IOD) refers to power being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from 5 to 20 milliamperes (0.005 - 0.020 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper

DIAGNOSIS AND TESTING (Continued)

working order. The 20 milliamperes are needed to supply Powertrain Control Module (PCM) memory, digital clock memory, and electronically tuned radio memory.

A vehicle that has not been operated for approximately 20 days, may discharge the battery to an inadequate level. When a vehicle will not be used for 20 days or more (stored), remove the IOD fuse from the Power Distribution Center (PDC). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on
- Faulty or improperly adjusted switches
- An internally shorted generator
- Intermittent shorts in the wiring.

If the IOD is over 20 milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service.

DIAGNOSIS

CAUTION: Testing for high-amperage IOD must be performed first to prevent damage to most milliampere meters.

(1) Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with a illuminated entry system or electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to three minutes.

(2) Determine that the underhood lamp is operating properly, then disconnect the lamp or remove the bulb.

(3) Disconnect the battery negative cable.

(4) Connect a typical 12-volt test lamp (low-wattage bulb) between the disconnected battery negative cable clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The test lamp may light brightly for up to three minutes, or may not light at all, depending upon the vehicle's electrical equipment. The term "brightly," as used throughout the following tests, implies the brightness of the test lamp will be the same as if it were connected across the battery. The test lamp must be securely clamped to the battery negative cable clamp and the battery negative terminal post. If the continuity between the battery negative terminal post and cable clamp is lost during any part of the IOD test, the electronic timer function will be activated and all tests must be repeated.

(5) After three minutes, the test lamp should turn off or be dimly lit, depending upon the vehicle's electrical equipment. If the test lamp remains brightly lit, do not disconnect it. Remove each fuse or circuit breaker (refer to Group 8W - Wiring Diagrams for more information) until the test lamp is either off, or dimly lit. This will isolate each circuit and identify the source of the high-amperage IOD. If the test lamp is still brightly lit after disconnecting each fuse and circuit breaker, disconnect the wiring harness from the generator. If the test lamp now turns off or is dimly lit, refer to Group 8C - Charging System to diagnose the faulty charging system. Do not disconnect the test lamp. After the high-amperage IOD has been corrected, the low-amperage IOD may be checked. It is now safe to install a milliampere meter to check the low-amperage IOD.

(6) With the test lamp still connected securely, clamp a milliampere meter between the battery negative terminal post and the negative cable clamp.

CAUTION: Do not open any doors, or turn on any electrical accessories, with the test lamp disconnected or the milliampere meter may be damaged.

(7) Disconnect the test lamp. Observe the milliampere meter. The current draw should not exceed 20 milliamperes (0.020 ampere). If the draw exceeds 20 milliamperes, isolate each circuit by removing the circuit breakers and fuses. The milliampere meter reading will drop when the source of the draw is disconnected. Repair this circuit as required, whether it is a wiring short, incorrect switch adjustment or a component failure.

SERVICE PROCEDURES

BATTERY CHARGING

A battery is fully-charged when:

- All cells are gassing freely during battery charging.
- A green color is visible in the sight glass of the built-in test indicator.
- Three corrected specific gravity tests, taken at 1-hour intervals, indicate no increase in the specific gravity.
- Open-circuit voltage is 12.4 volts or above.

SERVICE PROCEDURES (Continued)

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

- **EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**
- **THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.**
- **IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.**

CAUTION: Always disconnect the battery negative cable before charging a battery. Do not exceed 16.0 volts while charging a battery. Damage to the vehicle electrical system components may result.

- **Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery over-charging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from over-charging.**
- **The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.**

Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the charger and/or battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the charger will not operate. This makes it appear that the battery will not accept charging current. Refer to the instructions provided with the battery charger to bypass the polarity-sensing circuitry.

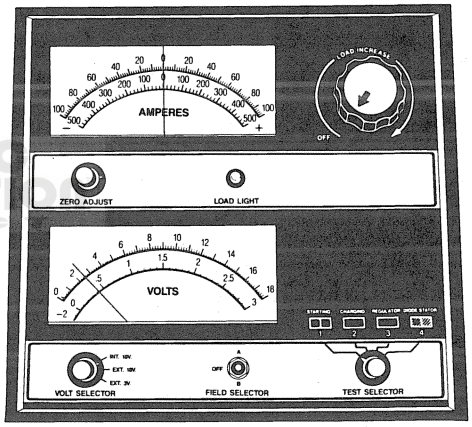
After the battery has been charged to 12.4 volts or greater, perform a load test to determine the battery cranking capacity. If the battery will endure a load test, return the battery to use. If the battery will not endure a load test, it is faulty and must be replaced.

Clean and inspect the battery holddowns, tray, terminals, posts, and top before completing service. See the Battery Removal and Installation procedures in this group for more information.

CHARGING A COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

(1) Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt (Fig. 9). If the reading is below 10 volts, the charge current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many chargers.



898A-12

Fig. 9 Voltmeter Accurate to 1/10 Volt Connected

(2) Disconnect the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the charger and/or battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the charger will not operate. This makes it appear that the battery will not accept charging current. Refer to the instructions provided with the battery charger to bypass the polarity-sensing circuitry.

(3) Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charger current at various voltages is shown in the Charge Rate chart. If the charge current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charge current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

SERVICE PROCEDURES (Continued)

Charge Rate	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18°C (0°F) than at 27°C (80°F). When a fast charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A charger that supplies only 5 amperes will require a longer charging time. A charger that supplies 20 amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

WARNING: NEVER EXCEED 20 AMPERES WHEN CHARGING A COLD (-1°C/30°F) BATTERY. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

Battery Charging Timetable			
Charging Amperage	5 Amperes	10 Amperes	20 Amperes
Open Circuit Voltage	Hours Charging at 21°C (70°F)		
12.25 to 12.39	6 hours	3 hours	1.5 hours
12.00 to 12.24	8 hours	4 hours	2 hours
11.95 to 11.99	12 hours	6 hours	3 hours
10.00 to 11.94	14 hours	7 hours	3.5 hours
less than 10.00	See Charging Completely Discharged Battery		

REMOVAL AND INSTALLATION

BATTERY

(1) Turn the ignition switch to the Off position. Make sure all electrical accessories are off.

(2) Loosen the cable terminal clamps and remove both battery cables, negative cable first. If necessary, use a puller to remove the terminal clamps from the battery posts (Fig. 10).

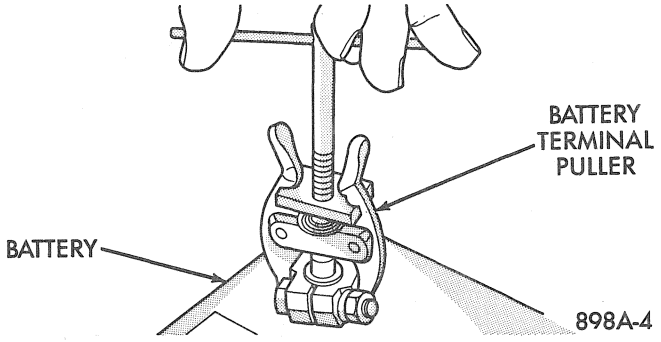


Fig. 10 Remove Battery Terminal Clamp

(3) Inspect the cable terminal clamps for corrosion and damage. Remove any corrosion using a wire brush or a post and terminal cleaning tool, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 11). Replace any cable that has damaged or deformed terminal clamps.

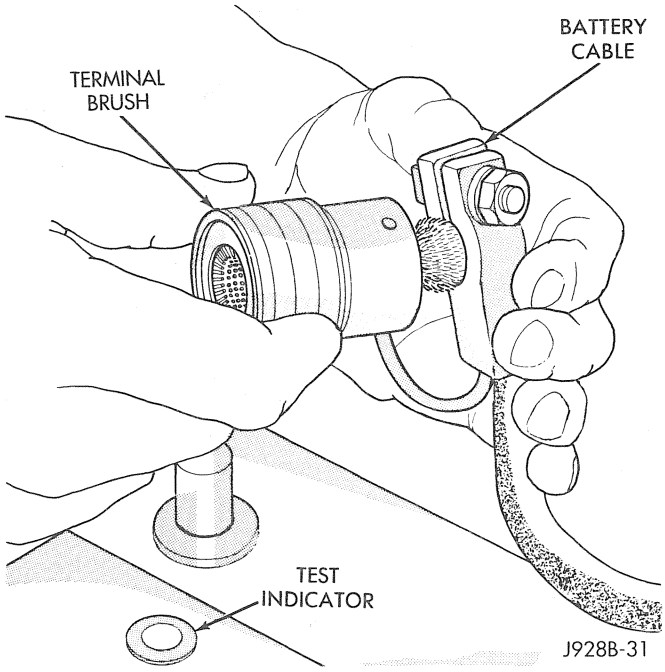


Fig. 11 Clean Battery Cable Terminal Clamp

REMOVAL AND INSTALLATION (Continued)

WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. SAFETY GLASSES SHOULD ALSO BE WORN. IF THE BATTERY IS CRACKED OR LEAKING, THE ELECTROLYTE CAN BURN THE SKIN AND EYES.

(4) Remove the battery holddowns (Fig. 12) and remove the battery from the vehicle.

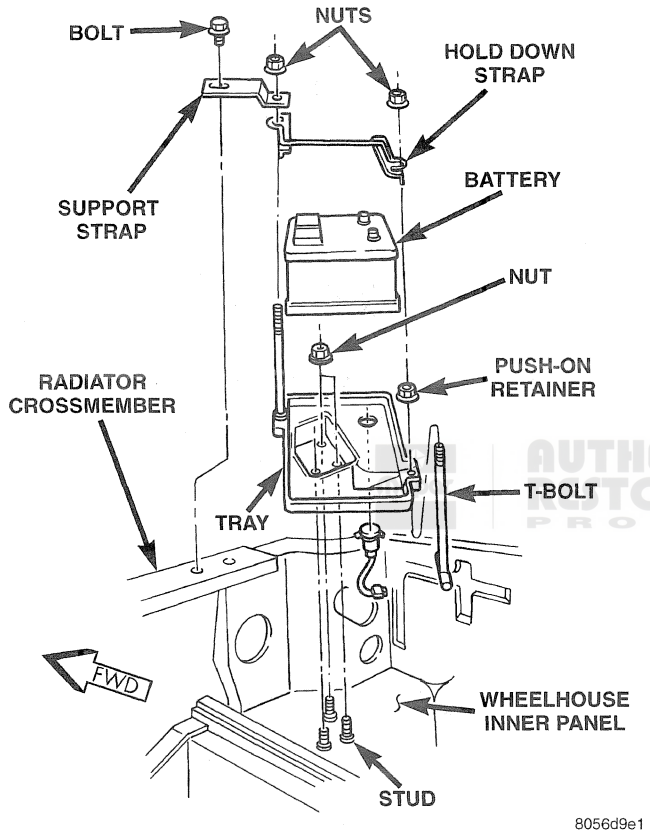


Fig. 12 Battery Holddown

(5) Inspect the battery tray and holddowns for corrosion or damage. Remove any corrosion using a wire brush and a sodium bicarbonate (baking soda) and warm water cleaning solution. Paint any exposed bare metal and replace any damaged parts.

(6) Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminal posts for looseness. Batteries with damaged cases or loose posts must be replaced.

(7) Check the electrolyte level in the battery. Use a putty knife or another suitable wide flat-bladed tool to pry the cell caps off (Fig. 13). Do not use a screwdriver. Add distilled water to each cell until the liquid reaches the bottom of the vent well. DO NOT OVERFILL.

(8) Inspect the battery built-in test indicator sight glass for an indication of the battery condition. If the

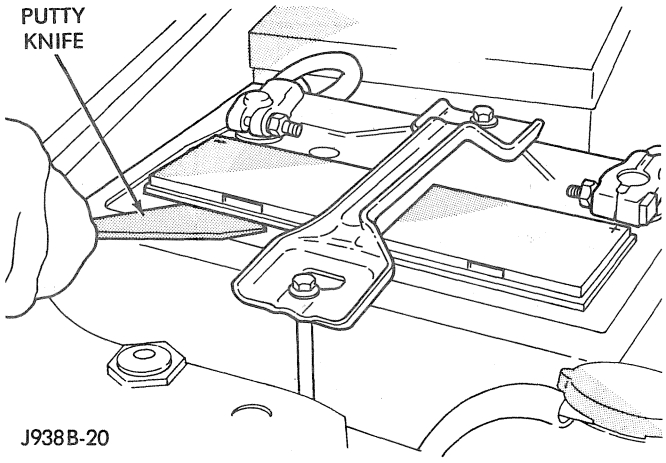


Fig. 13 Removing Cell Caps

battery is discharged, charge as required. See Built-In Test Indicator and Battery Charging in this group for more information.

(9) If the battery is to be reinstalled, clean the outside of the battery case and the top cover with a sodium bicarbonate (baking soda) and warm water cleaning solution to remove any acid film (Fig. 14). Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, see the Battery Ratings and Classifications chart in Specifications at the back of this group. Confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.

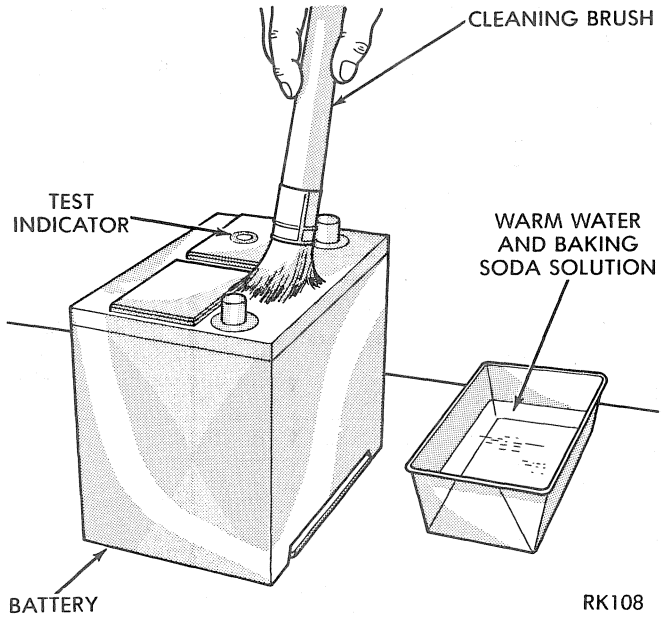


Fig. 14 Clean Battery

(10) Clean any corrosion from the battery terminal posts with a wire brush or a post and terminal

REMOVAL AND INSTALLATION (Continued)

cleaner, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 15).

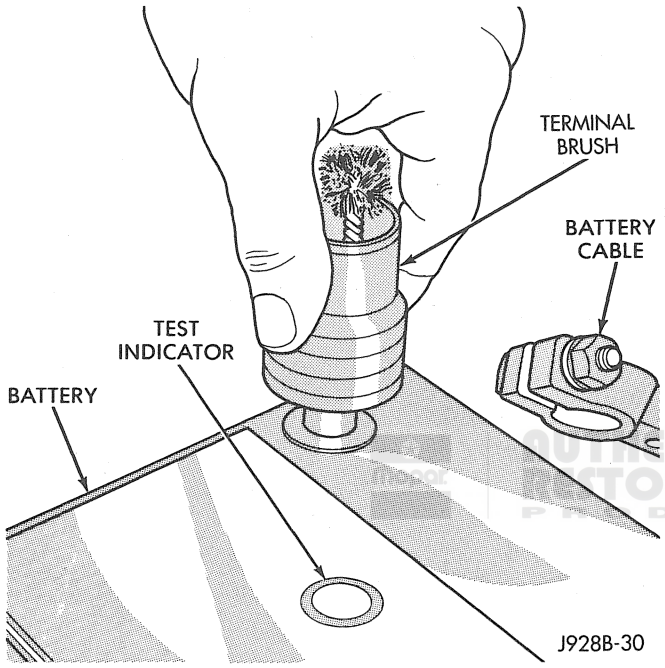


Fig. 15 Clean Battery Terminal Post

(11) Position the battery in the tray. Ensure that the positive and negative terminal posts are correctly positioned. The cable terminal clamps must reach the correct battery post without stretching the cables (Fig. 16).

(12) Loosely install the battery holddown hardware. Ensure that the battery base is correctly positioned in the tray, then tighten the holddowns to 2.2 N·m (20 in. lbs.).

CAUTION: Be certain that the battery cables are connected to the correct battery terminals. Reverse polarity may damage electrical components.

(13) Place an oiled felt washer on the battery positive terminal post.

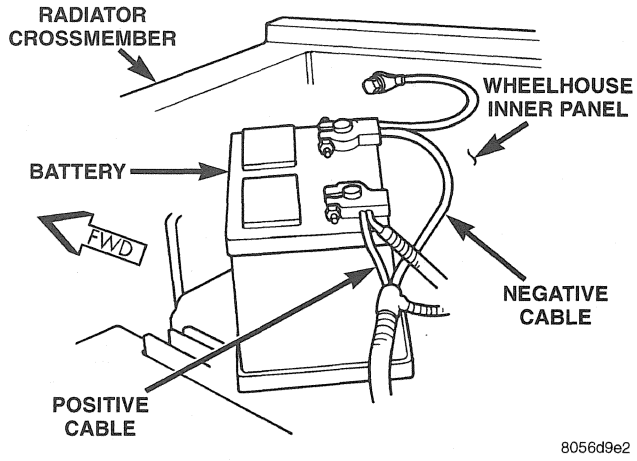


Fig. 16 Battery Cables

(14) Install and tighten the battery positive cable terminal clamp. Then install and tighten the negative cable terminal clamp. Tighten both cable terminal clamp bolts to 8.5 N·m (75 in. lbs.).

(15) Apply a thin coating of petroleum jelly or chassis grease to the exposed surfaces of the cable terminal clamps and battery terminal posts.

SPECIFICATIONS

BATTERY

Battery Classifications and Ratings			
BCI Group Size Classification	Cold Cranking Amperage	Reserve Capacity	Load Test Amperage
58	430	80 Minutes	215
58	500	85 Minutes	250

STARTING SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
OVERVIEW	1
DESCRIPTION AND OPERATION	
STARTER RELAY	2
STARTER	2
STARTING SYSTEM	1
DIAGNOSIS AND TESTING	
COLD CRANKING TEST	4
CONTROL CIRCUIT TESTS	5
FEED CIRCUIT TESTS	4
STARTER NOISE - 2.5L ENGINE	7
STARTING SYSTEM	2
REMOVAL AND INSTALLATION	
STARTER RELAY	8
STARTER	7
SPECIFICATIONS	
STARTING SYSTEM	9

GENERAL INFORMATION

OVERVIEW

The battery, starting, and charging systems operate with one another, and must be tested as a complete system. In order for the vehicle to start and charge properly, all of the components involved in these systems must perform within specifications.

Group 8A covers the battery, Group 8B covers the starting system, and Group 8C covers the charging system. Refer to Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams. We have separated these systems to make it easier to locate the information you are seeking within this Service Manual. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in these groups include the most basic conventional diagnostic methods to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of a induction milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. See the On-Board Diagnostics Test in Group 8C - Charging System for more information.

INTRODUCTION

The starting system consists of:

- Battery
- Starter relay
- Starter with an integral solenoid
- Ignition switch
- Park/neutral position switch (automatic transmission)
- Wiring harness and connections.

This group covers diagnosis of the complete starting system, except the battery. However, this group only covers service procedures for the starter and starter relay. Service procedures for other starting system components can be located as follows:

- Battery - refer to Group 8A - Battery for the diagnostic and service procedures
- Ignition switch - refer to Group 8D - Ignition Systems for the service procedures
- Park/neutral position switch - refer to Group 21 - Transmission for the service procedures
- Wiring harness and connections - refer to Group 8W - Wiring Diagrams for the service procedures.

DESCRIPTION AND OPERATION

STARTING SYSTEM

The starting system components form two separate circuits. A high-amperage feed circuit that feeds the starter between 150 and 350 amperes, and a low-amperage control circuit that operates on less than 20 amperes.

Battery voltage is supplied through the low-amperage control circuit to the coil battery terminal of the starter relay when the ignition switch is turned to the Start position.

If the vehicle is equipped with an automatic transmission, the park/neutral position switch is installed in series between the starter relay coil ground terminal and ground. This normally open switch closes only with the automatic transmission gear selector in the Neutral or Park positions. In vehicles with a manual transmission, the starter relay coil ground terminal is always grounded.

DESCRIPTION AND OPERATION (Continued)

With the starter relay coil now energized, the normally open relay contacts close. The relay contacts connect the relay common feed terminal to the relay normally open terminal. The closed relay contacts energize the starter solenoid coil windings.

The energized solenoid pull-in coil pulls in the solenoid plunger. The solenoid plunger pulls the shift lever in the starter. This engages the starter overrunning clutch and pinion gear with the starter ring gear on the flywheel (manual transmission) or torque converter drive plate (automatic transmission).

As the solenoid plunger reaches the end of its travel, the solenoid contact disc completes the high-amperage starter feed circuit and energizes the solenoid plunger hold-in coil. Current now flows between the solenoid battery terminal and the starter motor, energizing the starter.

Once the engine starts, the overrunning clutch protects the starter from damage by allowing the starter pinion gear to spin faster than the pinion shaft. When the driver releases the ignition switch to the On position, the starter relay coil is de-energized. This causes the relay contacts to open. When the relay contacts open, the starter solenoid plunger hold-in coil is de-energized.

When the solenoid plunger hold-in coil is de-energized, the solenoid plunger return spring returns the plunger to its relaxed position. This causes the contact disc to open the starter feed circuit, and the shift lever to disengage the overrunning clutch and pinion gear from the starter ring gear.

STARTER

The starter motor incorporates several features to create a reliable, efficient, compact and lightweight unit. A planetary gear system (intermediate transmission) is used between the electric motor and the pinion gear. This feature makes it possible to reduce the dimensions of the starter. At the same time, it allows higher armature rotational speed and delivers increased torque through the pinion gear to the starter ring gear on the flywheel (manual transmission) or torque converter drive plate (automatic transmission).

The use of a permanent magnet field also reduces the size and weight of the starter. The permanent magnet field consists of four high-strength permanent magnets. The magnets are aligned according to their polarity, and are permanently mounted in the starter field frame.

The starter motors for all engines are activated by a solenoid mounted to the overrunning clutch housing. However, the starter motor and solenoid are serviced only as a complete assembly. If either component fails, the entire assembly must be replaced.

CAUTION: Permanent magnet starters are highly sensitive to hammering, shocks, and external pressure. The permanent magnets may be damaged and the starter rendered unserviceable, if subjected to any of these conditions.

- **The starter motor must not be clamped in a vise by the starter field frame. Doing so may damage the permanent magnets. The starter should only be clamped by the mounting flange.**
- **Do not connect the starter motor incorrectly when testing. Reverse polarity may damage the permanent magnets and render the starter unserviceable.**

STARTER RELAY

The starter relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The starter relay is a electro-mechanical device that switches current to the pull-in coil of the starter solenoid when the ignition switch is turned to the Start position. See the Diagnosis and Testing section of this group for more information on the starter relay.

The starter relay is located in the Power Distribution Center (PDC), in the engine compartment. Refer to the PDC label for relay identification and location.

DIAGNOSIS AND TESTING

STARTING SYSTEM

For circuit descriptions and diagrams, refer to 8W-21 - Starting System in Group 8W - Wiring Diagrams.

INSPECTION

Before removing any unit from the starting system for repair or diagnosis, perform the following inspections:

- **Battery** - Visually inspect the battery for indications of physical damage and loose or corroded cable connections. Determine the state-of-charge and cranking capacity of the battery. Charge or replace the battery, if required. Refer to Group 8A - Battery for more information.
- **Ignition Switch** - Visually inspect the ignition switch for indications of physical damage and loose or corroded wiring connections.
- **Park/Neutral Position Switch** - Visually inspect the park/neutral position switch for indications of physical damage and loose or corroded wiring connections.

DIAGNOSIS AND TESTING (Continued)

• **Starter Relay** - Visually inspect the starter relay for indications of physical damage and loose or corroded terminal connections.

• **Starter** - Visually inspect the starter for indications of physical damage and loose or corroded wiring connections.

• **Starter Solenoid** - Visually inspect the starter solenoid for indications of physical damage and loose or corroded wiring connections.

• **Wiring** - Visually inspect the wiring for damage. Repair or replace the faulty wiring, as required.

Starting System Diagnosis		
CONDITION	**POSSIBLE CAUSE**	**CORRECTION**
STARTER FAILS TO ENGAGE.	1. Battery discharged or faulty. 2. Starting circuit wiring faulty. 3. Starter relay faulty. 4. Ignition switch faulty. 5. Park/Neutral position switch (auto trans) faulty or misadjusted. 6. Starter solenoid faulty. 7. Starter assembly faulty.	1. Refer to Group 8A - Battery. Charge or replace battery, if required. 2. See Cold Cranking Test, in this group. Test and repair feed and/or control circuits, if required. 3. See Relay Test, in this group. Replace relay, if required. 4. See Ignition Switch Test, in this group. Replace switch, if required. 5. See Park/Neutral Position Switch Test, in this group. Replace switch, if required. 6. See Solenoid Test, in this Group. Replace starter assembly, if required. 7. If all other starting system components and circuits check OK, replace starter assembly.
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. Battery discharged or faulty. 2. Starting circuit wiring faulty. 3. Starter assembly faulty. 4. Engine seized.	1. Refer to Group 8A - Battery. Charge or replace battery, if required. 2. See Cold Cranking Test, in this group. Test and repair feed and/or control circuits, if required. 3. If all other starting system components and circuits check OK, replace starter assembly. 4. Refer to Group 9 - Engine, for diagnostic and service procedures.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. Broken teeth on starter ring gear. 2. Starter assembly faulty.	1. Remove starter as described in this group. Inspect ring gear on torque converter or flywheel and replace, if required. 2. If all other starting system components and circuits check OK, replace starter assembly.
STARTER DOES NOT DISENGAGE.	1. Starter improperly installed. 2. Starter relay faulty. 3. Ignition switch faulty. 4. Starter assembly faulty.	1. Install starter as described in this group. Tighten starter mounting hardware to correct torque specifications. 2. See Relay Test, in this group. Replace relay, if required. 3. See Ignition Switch Test, in this group. Replace switch, if required. 4. If all other starting system components and circuits check OK, replace starter assembly.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING (Continued)

COLD CRANKING TEST

For circuit descriptions and diagrams, refer to 8W-21 - Starting System in Group 8W - Wiring Diagrams. The battery must be fully-charged and load-tested before proceeding. Refer to Group 8A - Battery for more information.

(1) Connect a suitable volt-ampere tester to the battery terminals (Fig. 1). Refer to the operating instructions provided with the tester being used.

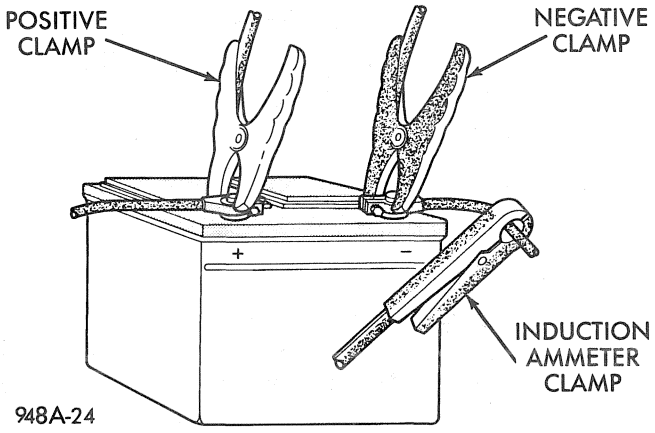


Fig. 1 Volts-Amps Tester Connections - Typical

(2) Fully engage the parking brake.

(3) Place the manual transmission gearshift selector lever in the Neutral position, or the automatic transmission gearshift selector lever in the Park position.

(4) Verify that all lamps and accessories are turned off.

(5) Unplug the Automatic Shut-Down (ASD) relay to prevent the engine from starting. The ASD relay is located in the Power Distribution Center (PDC). Refer to the PDC label for ASD relay identification and location.

(6) Rotate and hold the ignition switch in the Start position. Note the cranking voltage and current (amperage) draw.

(a) If the voltage reads above 9.6 volts and the current (amperage) draw reads above specifications, see the Feed Circuit Tests in this group.

(b) If the voltage reads 12.5 volts or greater and the current (amperage) draw reads below specifications, see the Control Circuit Tests in this group.

NOTE: A cold engine will increase the starter current (amperage) draw reading, and reduce the battery voltage reading.

FEED CIRCUIT TESTS

The starter feed circuit tests (voltage drop method) will determine if there is excessive resistance in the high-amperage circuit. For circuit descriptions and diagrams, refer to 8W-21 - Starting System in Group 8W -Wiring Diagrams.

When performing these tests, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached.

Example: When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable clamp and the cable connector at the starter solenoid. If you probe the battery positive terminal post and the cable connector at the starter solenoid, you are reading the combined voltage drop in the battery positive cable clamp-to-terminal post connection and the battery positive cable.

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing the tests, be certain the following procedures are accomplished:

- Battery is fully-charged. Refer to Group 8A - Battery for more information.
- Fully engage the parking brake.
- Place the manual transmission gearshift selector lever in the Neutral position. Place the automatic transmission gearshift selector lever in the Park position.
- Unplug the Automatic Shut-Down (ASD) relay to prevent the engine from starting. The relay is located in the Power Distribution Center (PDC). Refer to the PDC label for ASD relay identification and location.

(1) Connect the positive lead of the voltmeter to the battery negative terminal post. Connect the negative lead of the voltmeter to the battery negative cable clamp (Fig. 2). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor contact between the cable clamp and the terminal post.

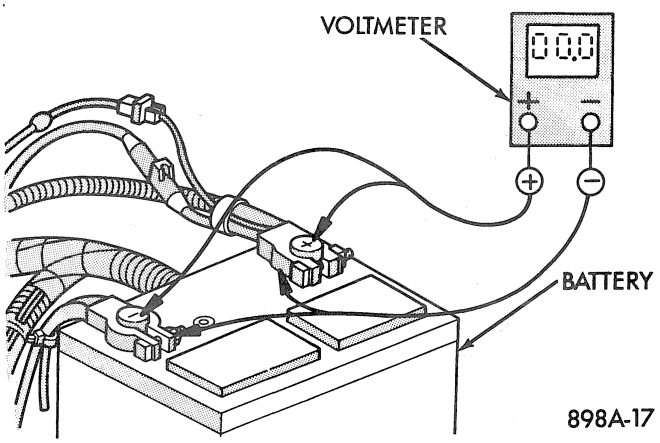


Fig. 2 Test Battery Connection Resistance - Typical

(2) Connect the positive lead of the voltmeter to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is

DIAGNOSIS AND TESTING (Continued)

detected, correct the poor contact between the cable clamp and the terminal post.

(3) Connect the voltmeter to measure between the battery positive terminal post and the starter solenoid battery terminal stud (Fig. 3). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery cable connection at the solenoid. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.

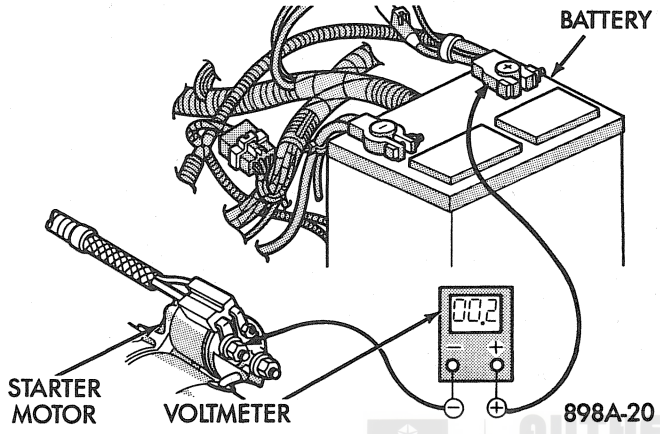


Fig. 3 Test Battery Positive Cable Resistance - Typical

(4) Connect the voltmeter to measure between the battery negative terminal post and a good clean ground on the engine block (Fig. 4). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable attachment on the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.

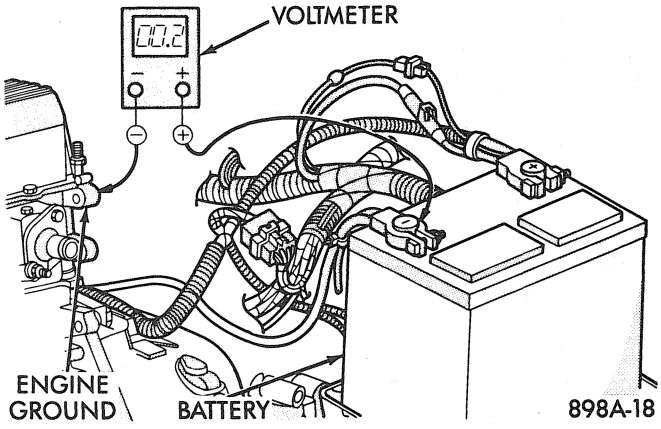


Fig. 4 Test Ground Circuit Resistance -Typical

(5) Connect the positive lead of the voltmeter to the starter housing. Connect the negative lead of the voltmeter to the battery negative terminal post (Fig. 5). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, correct the poor starter to engine block ground contact.

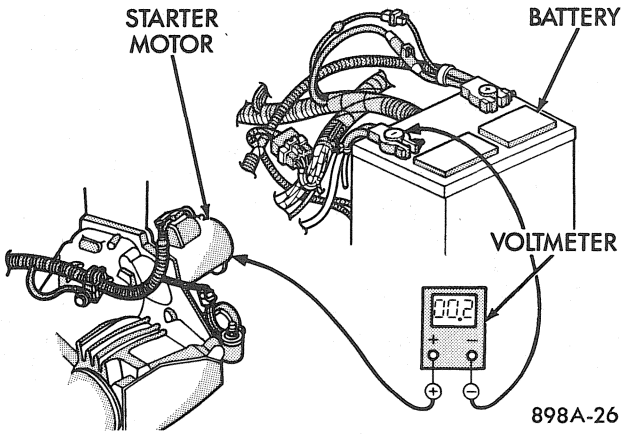


Fig. 5 Test Starter Ground - Typical

If the resistance tests detect no feed circuit problems, remove the starter and see the Solenoid Test in this group.

CONTROL CIRCUIT TESTS

For circuit descriptions and diagrams, refer to 8W-21 - Starting System in Group 8W - Wiring Diagrams. The starter control circuit consists of:

- Battery
- Starter relay
- Starter solenoid
- Ignition switch
- Park/neutral position switch (automatic transmission)
- Wiring harness and connections.

Test procedures for these components should be performed in the order in which they are listed, as follows:

SOLENOID TEST

Remove the starter as described in this group. Then proceed as follows:

(1) Disconnect the wire from the solenoid field coil terminal.

(2) Check for continuity between the solenoid terminal and the field coil terminal with a continuity tester (Fig. 6). There should be continuity. If OK, go to Step 3. If not OK, replace the faulty starter assembly.

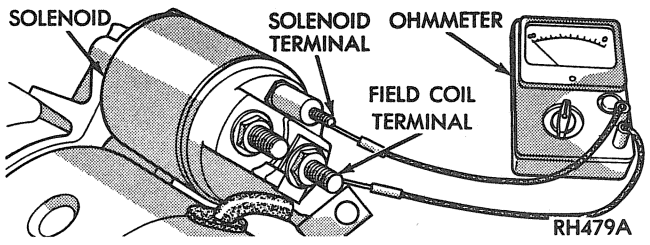


Fig. 6 Continuity Test Between Solenoid Terminal and Field Coil Terminal

DIAGNOSIS AND TESTING (Continued)

(3) Check for continuity between the solenoid terminal and the solenoid case (Fig. 7). There should be continuity. If OK, go to Step 4. If not OK, replace the faulty starter assembly.

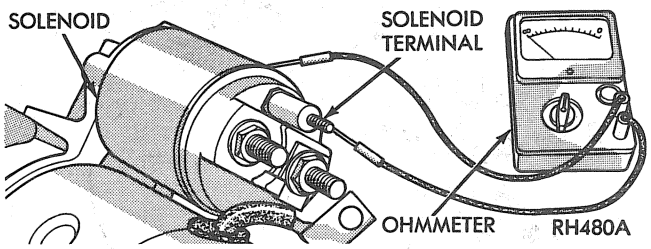


Fig. 7 Continuity Test Between Solenoid Terminal and Solenoid Case

(4) Connect the solenoid field coil wire to the field coil terminal.

(5) Install the starter as described in this group.

RELAY TEST

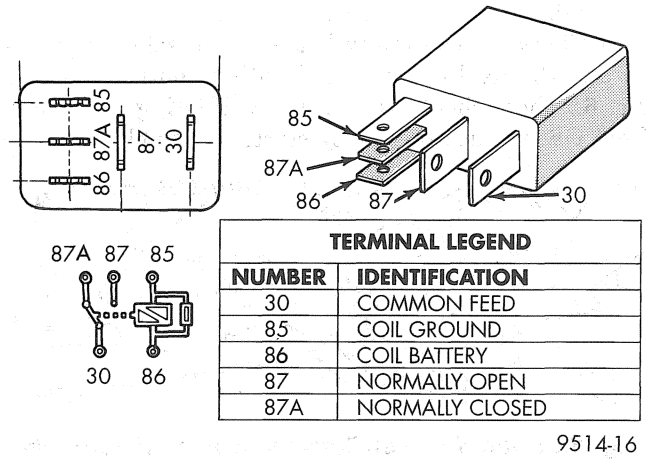
The starter relay is located in the Power Distribution Center (PDC), in the engine compartment. Refer to the PDC label for starter relay identification and location.

Remove the starter relay from the PDC to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Test in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Starter Relay

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the PDC fuse as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the starter solenoid field coils. There should be continuity between the cavity for relay terminal 87 and the starter solenoid terminal at all times. If OK, go to Step 4. If not OK, repair the open circuit to the starter solenoid as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is energized when the ignition switch is held in the Start position. Check for battery voltage at the cavity for relay terminal 86 with the ignition switch in the Start position, and no voltage when the ignition switch is released to the On position. If OK, go to Step 5. If not OK, check for an open or short circuit to the ignition switch and repair, if required. If the circuit to the ignition switch is OK, see the Ignition Switch Test in this group.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. On vehicles with an automatic transmission, it is grounded through the park/neutral position switch only when the gearshift selector lever is in the Park or Neutral positions. On vehicles with a manual transmission, it is grounded at all times. Check for continuity to ground at the cavity for relay terminal 85. If not OK with an automatic transmission, check for an open or short circuit to the park/neutral position switch and repair, if required. If the circuit to the park/neutral position switch is OK, see the Park/Neutral Position Switch Test in this group. If not OK with a manual transmission, repair the circuit to ground as required.

PARK/NEUTRAL POSITION SWITCH TEST

For testing of the park/neutral position switch, refer to Group 21 - Transmission.

IGNITION SWITCH TEST

(1) Disconnect the battery negative cable.

(2) Remove the steering column shrouds and disconnect the ignition switch harness connector. Refer to Group 8D - Ignition Systems for the procedures.

(3) With ignition switch in the On position, check for continuity between ignition switch terminals 1 and 7. These are the terminals at each end of the switch connector. There should be no continuity. If OK, go to Step 4. If not OK, replace the faulty switch.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
1. VERY HIGH FREQUENCY WHINE BEFORE ENGINE STARTS; ENGINE STARTS OK.	1. Excessive distance between pinion gear and flywheel/drive plate gear.	1. Move starter motor toward flywheel/drive plate by removing shim(s), if possible.
2. VERY HIGH FREQUENCY WHINE AFTER ENGINE STARTS WITH IGNITION KEY RELEASED. ENGINE STARTS OK.	2. Insufficient distance between starter motor pinion gear and flywheel/drive plate runout can cause noise to be intermittent.	2. Shim starter motor away from flywheel/drive plate. Inspect flywheel/drive plate for damage; bent, unusual wear, and excessive runout. Replace flywheel/drive plate as necessary.
3. A LOUD "WHOOP" AFTER ENGINE STARTS WHILE STARTER MOTOR IS ENGAGED.	3. Most probably cause is defective overrunning clutch.	3. Replace starter motor.
4. A "RUMBLE," "GROWL," OR "KNOCK" AS STARTER MOTOR COASTS TO STOP AFTER ENGINE STARTS.	4. Most probable cause is bent or unbalanced starter motor armature.	4. Replace starter motor.

NOTE: A high frequency whine during cranking is normal for this starter motor.

J958A-5

Fig. 8 Starter Noise Diagnosis

(4) With the ignition switch held in the Start position, check for continuity between ignition switch terminals 1 and 7. There should be continuity. If not OK, replace the faulty switch.

STARTER NOISE - 2.5L ENGINE

See the Starter Noise Diagnosis chart (Fig. 8). If the complaint is similar to Conditions 1 and 2 in the chart, correction can be made by shimming the starter using the following procedures:

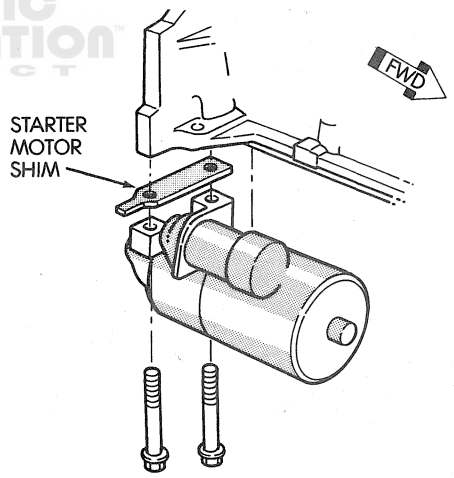
CAUTION: Disconnect the battery negative cable to prevent the engine from starting.

(1) If the complaint is similar to Condition 1, the starter must be moved toward the starter ring gear by removing shims (Fig. 9).

NOTE: The shim thickness is 0.381 mm (0.015 in.), and the shims may be stacked if additional thickness is required.

(2) If the complaint is similar to Condition 2, the starter must be moved away from the starter ring gear. This is done by installing shim(s) across both starter mounting pads. More than one shim may be required.

NOTE: This is a condition that will generally cause broken starter (flywheel/drive plate) ring gear teeth or broken starter housings.



J908C-1

Fig. 9 Starter Shim

REMOVAL AND INSTALLATION

STARTER

2.5L ENGINE

(1) Disconnect the battery negative cable.

(2) Remove the exhaust clamp from the bracket (Fig. 10).

(3) If equipped with an automatic transmission, remove the nut and bolt from the forward end of the brace rod.

(4) If equipped with an automatic transmission, remove the nut from the lower end of the brace rod.

(5) If equipped with an automatic transmission, remove the brace rod and bracket.

REMOVAL AND INSTALLATION (Continued)

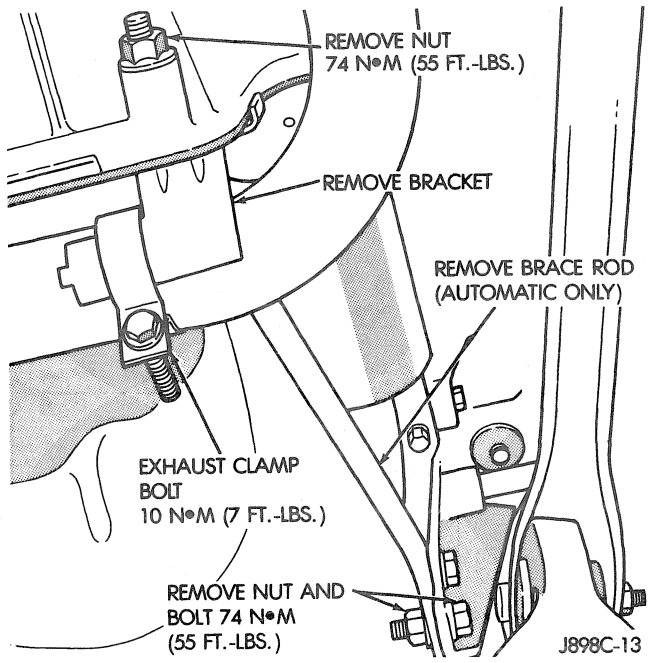


Fig. 10 Exhaust Clamp and Brace Remove

(6) If equipped with a manual transmission, remove the nut, bolt, and bracket from the bellhousing.

(7) Disconnect the battery and solenoid leads from the starter solenoid (Fig. 11).

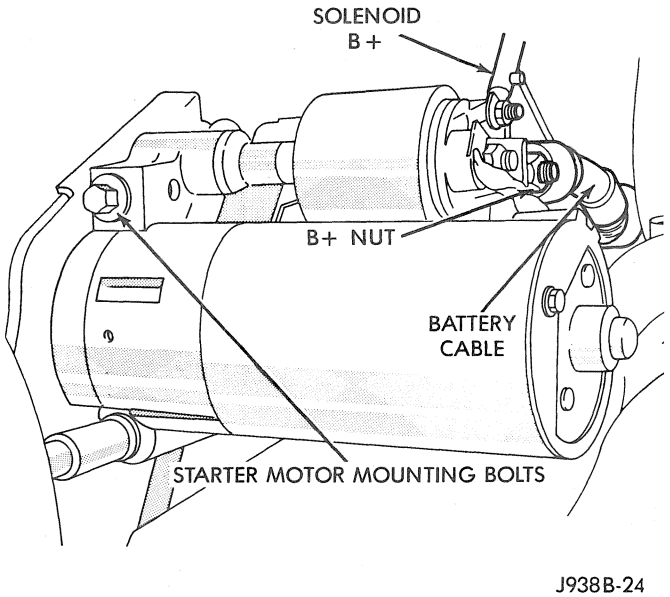


Fig. 11 Starter Remove/Install - 2.5L Engine

(8) Remove the starter mounting bolts, starter motor and any shims.

NOTE: The shim thickness is 0.381 mm (0.015 in.). The shims may be stacked if additional thickness is required. See the diagnosis for Starter Noise -2.5L Engine in this group for more information.

(9) Reverse the removal procedures to install. Tighten the starter hardware as follows:

- Starter mounting bolts - 45 N·m (33 ft. lbs.)
- Battery lead terminal nut - 10 N·m (90 in. lbs.)
- Solenoid lead terminal nut - 6 N·m (55 in. lbs.).

4.0L ENGINE

(1) Disconnect the battery negative cable.

(2) Raise and support the vehicle.

(3) Disconnect the battery and solenoid leads from the starter solenoid.

(4) Remove starter lower mounting bolt (Fig. 12).

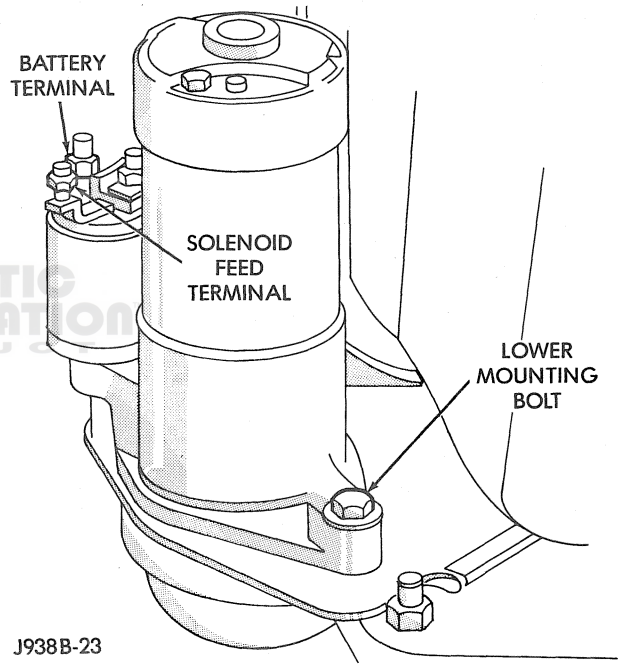


Fig. 12 Starter Remove/Install - 4.0L Engine

(5) Remove the starter upper mounting bolt and remove the starter.

(6) Reverse the removal procedures to install. Tighten the starter hardware as follows:

- Starter upper mounting bolt - 55 N·m (40 ft. lbs.)
- Starter lower mounting bolt - 41 N·m (30 ft. lbs.)
- Battery lead terminal nut - 10 N·m (90 in. lbs.)
- Solenoid lead terminal nut - 6 N·m (55 in. lbs.).

STARTER RELAY

(1) Disconnect the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 13).

(3) Refer to the label on the PDC for starter relay identification and location.

(4) Remove the starter relay by unplugging it from the PDC.

REMOVAL AND INSTALLATION (Continued)

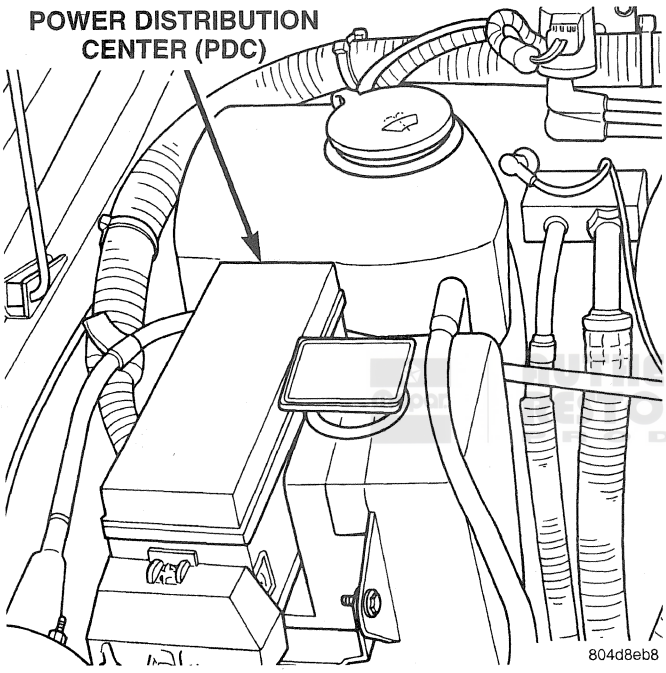


Fig. 13 Power Distribution Center

(5) Install the starter relay by aligning the relay terminals with the cavities in the PDC and plugging the relay in.
(6) Install the PDC cover.
(7) Connect the battery negative cable.
(8) Test the relay operation.

SPECIFICATIONS

STARTING SYSTEM

Starter and Solenoid	
Manufacturer	Mitsubishi
Engine Application	2.5L, 4.0L
Power Rating	1.2 Kilowatt - 2.5L 1.4 Kilowatt - 4.0L
Voltage	12 Volts
Number of Fields	4
Number of Poles	4
Number of Brushes	4
Drive Type	Planetary Gear Reduction
Free Running Test Voltage	11.2 Volts
Free Running Test Maximum Amperage Draw	90 Amperes - 2.5L 80 Amperes - 4.0L
Free Running Test Minimum Speed	2600 RPM - 2.5L 2500 RPM - 4.0L
Solenoid Closing Maximum Voltage	7.8 Volts
*Cranking Amperage Draw Test	130 Amperes - 2.5L 160 Amperes - 4.0L
*Test at operating temperature. Cold engine, tight (new) engine, or heavy oil will increase starter amperage draw.	

CHARGING SYSTEM

CONTENTS

page

GENERAL INFORMATION
OVERVIEW 1
DESCRIPTION AND OPERATION
BATTERY TEMPERATURE SENSOR 2
CHARGING SYSTEM OPERATION 1
GENERATOR 2
VOLTAGE REGULATOR 2
DIAGNOSIS AND TESTING
BATTERY TEMPERATURE SENSOR 6
CHARGING SYSTEM RESISTANCE TESTS 3
CHARGING SYSTEM 2
CURRENT OUTPUT TEST 3
ON-BOARD DIAGNOSTIC SYSTEM TEST 6
REMOVAL AND INSTALLATION
BATTERY TEMPERATURE SENSOR 8
GENERATOR 7
SPECIFICATIONS
GENERATOR RATINGS 8
TORQUE SPECIFICATIONS 8

GENERAL INFORMATION

OVERVIEW

The battery, starting, and charging systems operate with one another, and must be tested as a complete system. In order for the vehicle to start and charge properly, all of the components involved in these systems must perform within specifications.

Group 8A covers the battery, Group 8B covers the starting system, and Group 8C covers the charging system. Refer to Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams. We have separated these systems to make it easier to locate the information you are seeking within this Service Manual. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in these groups include the most basic conventional diagnostic methods to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of a induction milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. See the On-Board Diagnostics Test in Group 8C - Charging System for more information.

DESCRIPTION AND OPERATION

CHARGING SYSTEM OPERATION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to Group 8D, Ignition System for information)
- Battery (refer to Group 8A, Battery for information)
- Battery temperature sensor
- Voltmeter (refer to Group 8E, Instrument Panel and Gauges for information)
- Wiring harness and connections (refer to Group 8W, Wiring for information)

The charging system is turned on and off with the ignition switch. When the ignition switch is turned to the ON position, battery voltage is applied to the generator rotor through one of the two field terminals to produce a magnetic field. The generator is driven by the engine through a serpentine belt and pulley arrangement.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry, contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

A battery temperature sensor located in the battery tray housing, is used to sense battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including the EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in

DESCRIPTION AND OPERATION (Continued)

electronic memory for any failure it detects. See On-Board Diagnostic System Test in this group for more information.

GENERATOR

The generator is belt-driven by the engine using a serpentine type drive belt. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

The Y type stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicle electrical system through the generator battery and ground terminals.

Although the generators appear the same externally, different generators with different output ratings are used on this vehicle. This will depend upon engine size and optional equipment. Be certain that the replacement generator has the same output rating as the original unit. See Generator Ratings in the Specifications section at the back of this group for amperage ratings.

Noise emitting from the generator may be caused by: worn, loose or defective bearings; a loose or defective drive pulley; incorrect, worn, damaged or misadjusted fan drive belt; loose mounting bolts; a misaligned drive pulley or a defective stator or diode.

BATTERY TEMPERATURE SENSOR

The battery temperature sensor is used to determine the battery temperature and control battery charging rate. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. System voltage will be higher at colder temperatures and is gradually reduced at warmer temperatures.

The sensor is located under the vehicle battery, and is attached to the battery tray (Fig. 1).

VOLTAGE REGULATOR

The voltage regulator is not a separate component. It is actually a voltage regulating circuit located within the PCM. This EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

Operation: The amount of DC current produced by the generator is controlled by EVR circuitry contained within the PCM. This circuitry is connected in series with the generators second rotor field terminal and its ground.

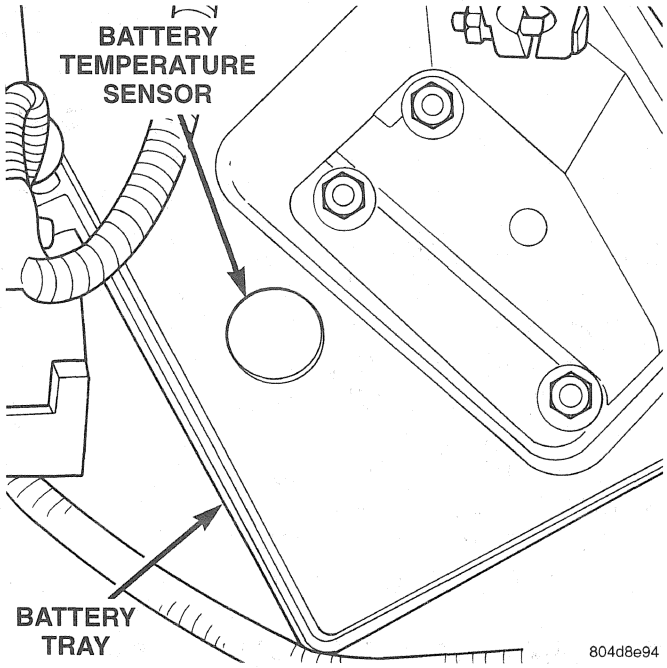


Fig. 1 Battery Temperature Sensor

Voltage is regulated by cycling the ground path to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage and battery temperature (refer to Battery Temperature Sensor for more information). It then compensates and regulates generator current output accordingly. Also see Charging System Operation for additional information.

DIAGNOSIS AND TESTING

CHARGING SYSTEM

When the ignition switch is turned to the ON position, battery potential will register on the voltmeter. During engine cranking a lower voltage will appear on the meter. With the engine running, a voltage reading higher than the first reading (ignition in ON) should register.

The following procedures may be used to diagnose the charging system if:

- the voltmeter does not operate properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running
- a faulty or improperly adjusted switch that allows a lamp to stay on. See Ignition-Off Draw Test in Group 8A, Battery for more information.

DIAGNOSIS AND TESTING (Continued)

INSPECTION

(1) Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.

(2) Inspect all fuses in the fuseblock module and Power Distribution Center (PDC) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.

(3) Inspect the electrolyte level in the battery. Replace battery if electrolyte level is low.

(4) Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications.

(5) Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications in Group 7, Cooling System.

(6) Inspect automatic belt tensioner (if equipped). Refer to Group 7, Cooling System for information.

(7) Inspect connections at generator field, battery output, and ground terminals. Also check ground connection at engine. They should all be clean and tight. Repair as required.

CHARGING SYSTEM RESISTANCE TESTS

These tests will show the amount of voltage drop across the generator output wire, from the generator output (B+) terminal (Fig. 2) to the battery positive post. They will also show the amount of voltage drop from the ground (-) terminal on the generator (Fig. 2) to the battery negative post.

A voltmeter with a 0–18 volt DC scale should be used for these tests. By repositioning the voltmeter test leads, the point of high resistance (voltage drop) can easily be found.

PREPARATION

(1) Before starting test, make sure battery is in good condition and is fully-charged. See Group 8A, Battery for more information.

(2) Check condition of battery cables at battery. Clean if necessary.

(3) Start the engine and allow it to reach normal operating temperature.

(4) Shut engine off.

(5) Connect an engine tachometer.

(6) Fully engage the parking brake.

TEST

(1) Start engine.

(2) Place heater blower in high position.

(3) Turn on headlamps and place in high-beam position.

(4) Turn vehicle interior lamps on.

(5) Start engine. Bring engine speed up to 2400 rpm and hold.

(6) Testing (+) circuitry:

(a) Touch the negative lead of voltmeter directly to battery positive post.

(b) Touch the positive lead of voltmeter to the B+ output terminal stud on the generator (not the terminal mounting nut). Voltage should be no higher than 0.6 volts. If voltage is higher than 0.6 volts, touch test lead to terminal mounting stud nut and then to the wiring connector. If voltage is now below 0.6 volts, look for dirty, loose or poor connection at this point. Also check condition of the generator output wire-to-battery bullet connector. Refer to Group 8, Wiring for connector location. A voltage drop test may be performed at each (+) connection in this circuit to locate the excessive resistance.

(7) Testing (-) circuitry:

(a) Touch the negative lead of voltmeter directly to battery negative post.

(b) Touch the positive lead of voltmeter to the ground terminal stud on the generator case (not the terminal mounting nut). Voltage should be no higher than 0.3 volts. If voltage is higher than 0.3 volts, touch test lead to terminal mounting stud nut and then to the wiring connector. If voltage is now below 0.3 volts, look for dirty, loose or poor connection at this point. A voltage drop test may be performed at each (-) connection in this circuit to locate the excessive resistance. This test can also be performed between the generator case and the engine. If test voltage is higher than 0.3 volts, check for corrosion at generator mounting points or loose generator mounting.

CURRENT OUTPUT TEST

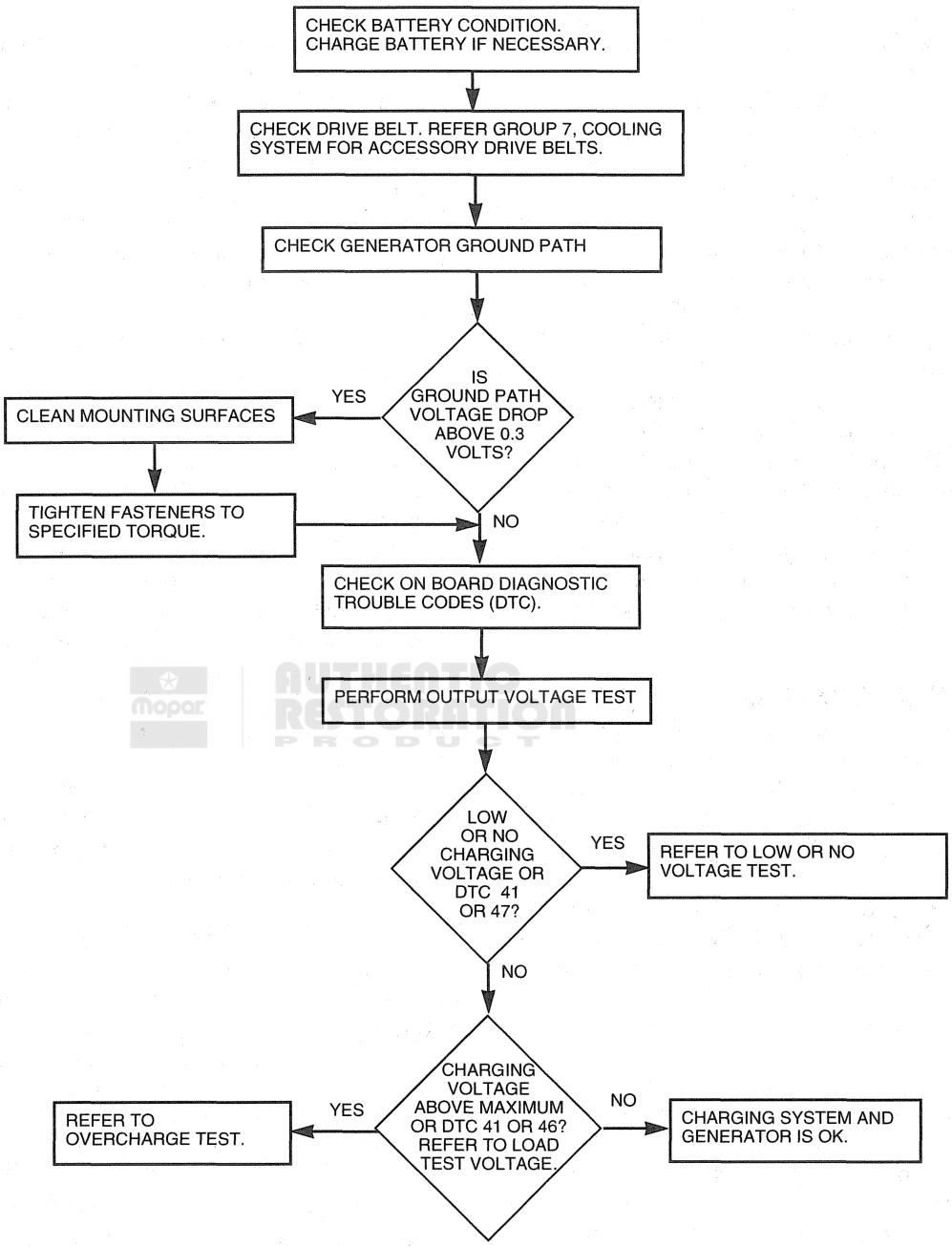
The current output test will determine if the charging system can deliver its minimum test current (amperage) output. Refer to the Specifications section at the end of this group for minimum test current (amperage) requirements.

The first part of this test (Test 1) will determine the combined amperage output of both the generator and the Electronic Voltage Regulator (EVR) circuitry. The second part of this test (Test 2) will determine only generator amperage and **will not** include analysis of EVR circuitry. EVR circuitry is located within the Powertrain Control Module (PCM). To test voltage regulator circuitry, refer to the appropriate Powertrain Diagnostic Procedures service manual.

PREPARATION

(1) Determine if any Diagnostic Trouble Codes (DTC's) exist. To determine a DTC, refer to On-Board Diagnostics in this group. For repair, refer to the appropriate Powertrain Diagnostic Procedures manual.

DIAGNOSIS AND TESTING (Continued)



803f58b7

Charging System Test

DIAGNOSIS AND TESTING (Continued)

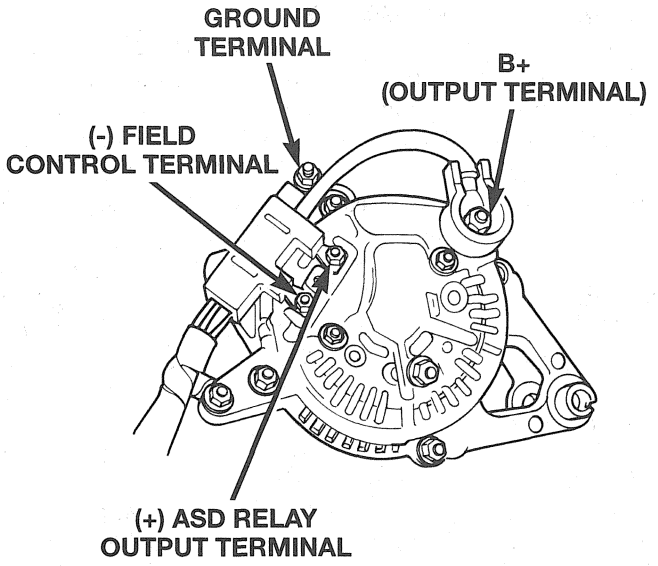


Fig. 2 Generator Terminals

(2) Before starting test, make sure battery is in good condition and is fully-charged. See Group 8A, Battery for more information.

(3) Check condition of battery cables at battery. Clean if necessary.

(4) Perform the previous Output Wire Resistance Test (voltage drop test). This will ensure clean and tight generator/battery electrical connections.

(5) Be sure the generator drive belt is properly tensioned. Refer to Group 7, Cooling System for information.

(6) A volt/amp tester equipped with both a battery load control (carbon pile rheostat) and an inductive-type pickup clamp (ammeter probe) will be used for this test. Refer to operating instructions supplied with tester. When using a tester equipped with an inductive-type clamp, removal of wiring at the generator will not be necessary.

(7) Start the engine and allow it to reach operating temperature.

(8) Shut engine off.

(9) Turn off all electrical accessories and all vehicle lighting.

(10) Connect the volt/amp tester leads to the battery. Be sure the carbon pile rheostat control is in the OPEN or OFF position before connecting leads. See Load Test in Group 8A, Battery for more information. Also refer to the operating instructions supplied with test equipment.

(11) Connect the inductive clamp (ammeter probe). Refer to the operating instructions supplied with test equipment.

(12) If volt/amp tester is not equipped with an engine tachometer, connect a separate tachometer to the engine.

TEST 1

(1) Perform the previous test Preparation.

(2) Fully engage the parking brake.

(3) Start engine.

(4) Bring engine speed to 2500 rpm.

(5) With engine speed held at 2500 rpm, slowly adjust the rheostat control (load) on the tester to obtain the highest amperage reading. Do not allow voltage to drop below 12 volts. Record the reading. **This load test must be performed within 15 seconds to prevent damage to test equipment.** On certain brands of test equipment, this load will be applied automatically. Refer to the operating manual supplied with test equipment.

(6) The ammeter reading must meet the Minimum Test Amps specifications as displayed in the Generator Ratings chart. This can be found in the Specifications section at the end of this group. A label stating a part reference number is attached to the generator case. On some engines this label may be located on the bottom of the case. Compare this reference number to the Generator Ratings chart.

(7) Rotate the load control to the OFF position.

(8) Continue holding engine speed at 2500. If EVR circuitry is OK, amperage should drop below 15–20 amps. With all electrical accessories and vehicle lighting off, this could take several minutes of engine operation. If amperage did not drop, refer to the appropriate Powertrain Diagnostic Procedures manual for testing.

(9) Remove volt/amp tester.

If minimum amperage could not be met, proceed to Test 2. This test will determine if the generator is faulty, or if EVR circuitry is defective.

TEST 2

(1) Perform the previous test preparation.

(2) Fully engage the parking brake.

(3) Connect one end of a jumper wire to a good ground. Connect the other end of jumper wire to the (-) field control circuit terminal. This terminal is located on the back of the generator (Fig. 2). Connecting the jumper wire will remove the voltage regulator circuitry from the test. It will also generate a Diagnostic Trouble Code (DTC).

CAUTION: Do not connect the jumper wire to the (+) ASD Relay output terminal (Fig. 2). Damage to electrical system components may result. The (-) field control circuit terminal is located farther away from the B+ output terminal than the (+) ASD Relay terminal (Fig. 2).

(4) Start engine. **Immediately** after starting, reduce engine speed to idle. This will prevent any electrical accessory damage from high voltage.

(5) Adjust carbon pile rheostat (load) and engine speed in slow increments until a speed of 1250 rpm,

DIAGNOSIS AND TESTING (Continued)

and a voltmeter reading of 15 volts is obtained. Immediately record ammeter reading. Do not apply load to system longer than 15 seconds as damage to test equipment may result.

CAUTION: When adjusting rheostat load, do not allow voltage to rise above 16 volts. Damage to the battery and electrical system components may result.

(6) The ammeter reading must meet the Minimum Test Amps specifications as displayed in the Generator Ratings chart. This can be found in the Specifications section at the end of this group. A label stating a part reference number is attached to the generator case. On some engines this label may be located on the bottom of the case. Compare this reference number to the Generator Rating chart.

(7) Remove volt/amp tester.

(8) Remove jumper wire.

(9) Use the DRB scan tool to erase the DTC. Refer to the DRB screen for procedures.

RESULTS

- If amp reading meets specifications in Test 2, generator is OK.
- If amp reading is less than specified in Test 2, and wire resistance (voltage drop) tests were OK, the generator should be replaced. Refer to Removal and Installation in this group for procedures.
- If Test 2 results were OK, but Test 1 results were not, the problem is in EVR circuitry. Refer to appropriate Powertrain Diagnostic Procedures manual for diagnosis.

BATTERY TEMPERATURE SENSOR

To perform a complete test of this sensor and its circuitry, refer to the appropriate Powertrain Diagnostic Procedures manual. To test the sensor only, refer to the following:

(1) The sensor is located under the battery and is attached to the battery tray (Fig. 1). A two-wire pigtail harness is attached directly to the sensor. The opposite end of this harness connects the sensor to the engine wiring harness.

(2) Disconnect the two-wire pigtail harness from the engine harness.

(3) Attach ohmmeter leads to the wire terminals of the pigtail harness.

(4) At room temperature of 25° C (75–80° F), an ohmmeter reading of 9 to 11K ohms should be observed.

(5) If reading is above or below the specification, replace the sensor.

(6) Refer to the Removal and Installation section for procedures.

ON-BOARD DIAGNOSTIC SYSTEM TEST

GENERAL INFORMATION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the OBD system. Some circuits are checked continuously and some are checked only under certain conditions.

If the OBD system senses that a monitored circuit is bad, it will put a DTC into electronic memory. The DTC will stay in electronic memory as long as the circuit continues to be bad. The PCM is programmed to clear the memory after 50 engine starts if the problem does not occur again.

DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Codes (DTC) are two-digit numbers flashed on the malfunction indicator (Check Engine) lamp that identify which circuit is bad. Refer to Group 14, Fuel Systems for more information. A DTC description can also be read using the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for information.

A DTC does not identify which component in a circuit is bad. Thus, a DTC should be treated as a symptom, not as the cause for the problem. In some cases, because of the design of the diagnostic test procedure, a DTC can be the reason for another DTC to be set. Therefore, it is important that the test procedures be followed in sequence, to understand what caused a DTC to be set.

See the Generator Diagnostic Trouble Code chart (Fig. 3) for DTC's which apply to the charging system. Refer to the Powertrain Diagnostic Procedures manual to diagnose an on-board diagnostic system trouble code.

RETRIEVING DIAGNOSTIC TROUBLE CODES

To start this function, cycle the ignition switch ON-OFF-ON-OFF-ON within 5 seconds. This will cause any DTC stored in the PCM memory to be displayed. The malfunction indicator (Check Engine) lamp will display a DTC by flashing on and off. There is a short pause between flashes and a longer pause between digits. All DTC's displayed are two-digit numbers, with a four-second pause between codes.

An example of a DTC is as follows:

(1) Lamp on for 2 seconds, then turns off.

(2) Lamp flashes 4 times pauses and then flashes 1 time.

(3) Lamp pauses for 4 seconds, flashes 4 times, pauses, then flashes 7 times.

(4) The two DTC's are 41 and 47. Any number of DTC's can be displayed, as long as they are in memory. The lamp will flash until all stored DTC's are

DIAGNOSIS AND TESTING (Continued)

Diagnostic Trouble Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
12*	Battery Disconnect	Direct battery input to PCM was disconnected within the last 50 key-on cycles.
41**	Generator Field Not Switching Properly	An open or shorted condition detected in the generator field control circuit.
46**	Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
47**	Charging System Voltage Too Low	Battery voltage sense input below target charging during engine operation. Also, no significant change detected in battery voltage during active test of generator output.
55*	N/A	Completion of fault code display on Check Engine lamp.

* Check Engine lamp will not illuminate at all times if this Diagnostic Trouble Code was recorded. Cycle ignition key as described in manual and observe code flashed by Check Engine lamp.

** Check Engine lamp will illuminate during engine operation if this Diagnostic Trouble Code was recorded.

J958A-7

Fig. 3 Generator Diagnostic Trouble Code

displayed, then it will flash a DTC 55 to indicate the test is complete.

ERASING DIAGNOSTIC TROUBLE CODES

The DRB Scan Tool must be used to erase a DTC.

REMOVAL AND INSTALLATION

GENERATOR

WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY.

(1) Disconnect negative battery cable.
(2) Remove generator drive belt. Refer to Group 7, Cooling System for procedure.
(3) Raise and support vehicle.
(4) Remove the rubber splash shield below the generator (if equipped).
(5) Remove the generator pivot and mounting bolts (Fig. 4). Position generator for access to wire connectors.
(6) Remove nuts from harness holddown, battery terminal, ground terminal and 2 field terminals (Fig. 5). Remove wire connectors.
(7) Remove the generator.
(8) Reverse removal procedures to install. Tighten generator hardware as follows:

- Generator mounting bolt—All engines - 55 N·m (41 ft. lbs.)
- Generator pivot bolt —All engines - 55 N·m (41 ft. lbs.)
- Battery terminal nut - 8.5 N·m (75 in. lbs.)

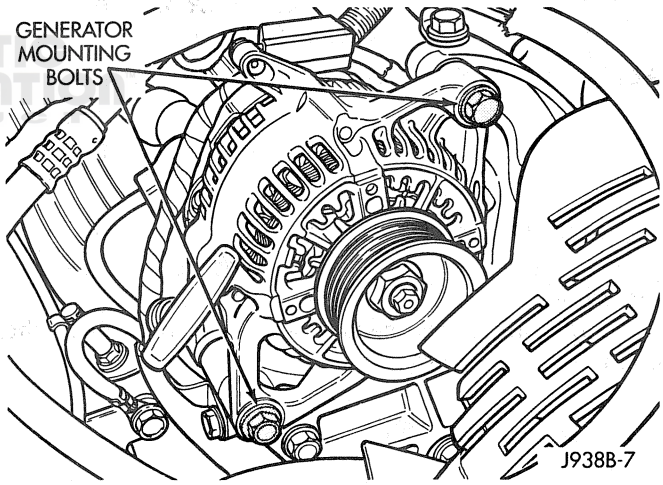


Fig. 4 Remove/Install Generator—Typical

- Ground terminal nut - 8.5 N·m (75 in. lbs.)
- Harness holddown nut - 8.5 N·m (75 in. lbs.)
- Field terminal nuts - 2.8 N·m (25 in. lbs.)

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in Group 7, Cooling System.

REMOVAL AND INSTALLATION (Continued)

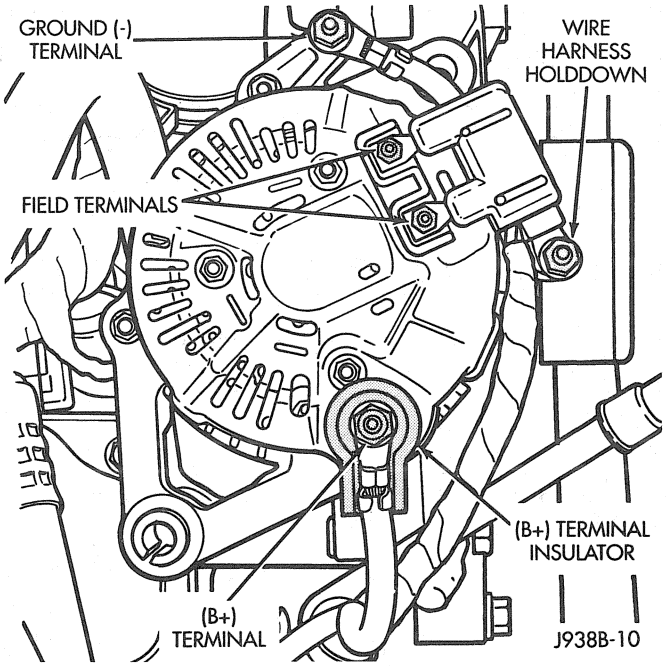


Fig. 5 Remove/Install Generator Connectors—Typical

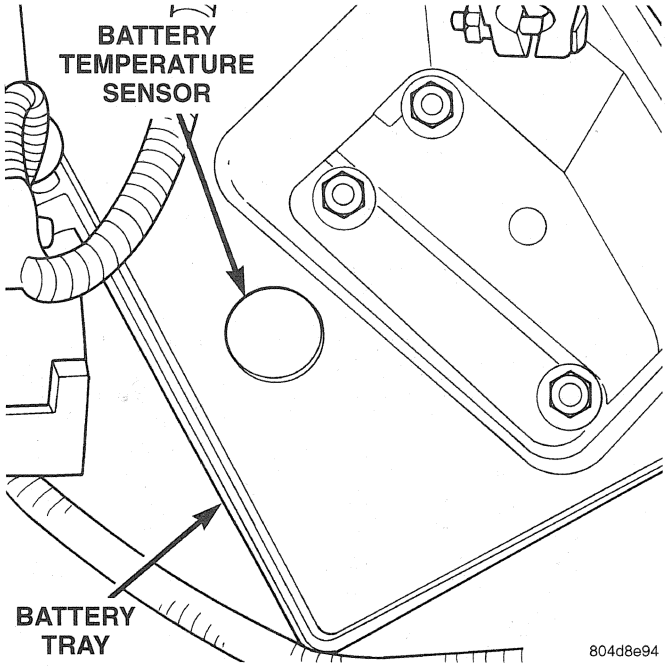


Fig. 6 Battery Temperature Sensor

BATTERY TEMPERATURE SENSOR

The battery temperature sensor is located under vehicle battery and is attached to a mounting hole on battery tray.

REMOVAL

(1) Remove the battery. Refer to Group 8A, Battery for procedures.

(2) Disconnect the sensor pigtail harness from the engine wire harness.

(3) Pry the sensor straight up from the battery tray mounting hole.

INSTALLATION

(1) Feed the pigtail harness through the hole in top of battery tray and press sensor into top of battery tray.

(2) Connect the pigtail harness.

(3) Install the battery. Refer to Group 8A, Battery for procedures.

SPECIFICATIONS

GENERATOR RATINGS

TYPE	PART NUMBER	RATED SAE AMPS	ENGINES	MINIMUM TEST AMPS
DENSO	56005684	81	2.5L/4.0L	75
DENSO	56005685	117	2.5L/4.0L	90

TORQUE SPECIFICATIONS

Description	Torque
Generator Mounting Bolt—	
2.5L/4.0L Engine	55 N·m (41 ft. lbs.)
Generator Pivot Bolt—	
2.5L/4.0L Engine	55 N·m (41 ft. lbs.)
Battery Terminal Nut	8.5 N·m (75 in. lbs.)
Ground Terminal Nut	8.5 N·m (75 in. lbs.)
Harness Hold-down Nut	8.5 N·m (75 in. lbs.)
Field Terminal Nuts	2.8 N·m (25 in. lbs.)

IGNITION SYSTEM

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
AUTOMATIC SHUTDOWN (ASD) RELAY	3
CAMSHAFT POSITION SENSOR	3
CRANKSHAFT POSITION SENSOR	3
DISTRIBUTOR	2
ENGINE COOLANT TEMPERATURE SENSOR	4
IGNITION COIL	3
IGNITION SWITCH AND KEY LOCK CYLINDER	4
IGNITION SYSTEM	1
INTAKE MANIFOLD AIR TEMPERATURE SENSOR	4
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR	4
POWERTRAIN CONTROL MODULE	2
SPARK PLUG CABLES	3
SPARK PLUGS	2
THROTTLE POSITION SENSOR	4
DIAGNOSIS AND TESTING	
AUTOMATIC SHUTDOWN (ASD) RELAY TEST	4
CAMSHAFT POSITION SENSOR	8
CHECK COIL TEST	5
CRANKSHAFT POSITION SENSOR TEST	7
DISTRIBUTOR CAP	6
DISTRIBUTOR ROTOR	7
ENGINE COOLANT TEMPERATURE SENSOR	9
FAILURE TO START TEST	5
IGNITION TIMING	7
INTAKE MANIFOLD AIR TEMPERATURE SENSOR	9
MAP SENSOR	7
SPARK PLUG CABLES	9
SPARK PLUG CONDITIONS	10
TESTING FOR SPARK AT COIL	4
REMOVAL AND INSTALLATION	
AUTOMATIC SHUTDOWN (ASD) RELAY	13
CAMSHAFT POSITION SENSOR	14
CRANKSHAFT POSITION SENSOR	14
DISTRIBUTOR	15
ENGINE COOLANT TEMPERATURE SENSOR	15
IGNITION COIL	13
IGNITION SWITCH AND KEY CYLINDER	19
INTAKE MANIFOLD AIR TEMPERATURE SENSOR	15
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR	15
POWERTRAIN CONTROL MODULE (PCM)	19
SHIFTER/IGNITION INTERLOCK	21
SPARK PLUG CABLES	12
SPARK PLUGS	12
THROTTLE POSITION SENSOR	15
SPECIFICATIONS	
ENGINE FIRING ORDER—2.5L 4-CYLINDER ENGINE	22
ENGINE FIRING ORDER—4.0L 6-CYLINDER ENGINE	22
IGNITION COIL	22
IGNITION TIMING	21
SPARK PLUG CABLE RESISTANCE	22
SPARK PLUGS	22
TORQUE SPECIFICATIONS	22
VECI LABEL SPECIFICATIONS	21

GENERAL INFORMATION

INTRODUCTION

This group describes the ignition systems for both the 2.5L 4–cylinder and the 4.0L 6–cylinder engines.

On Board Diagnostics is described in Group 25, Emission Control Systems.

Group 0, Lubrication and Maintenance, contains general maintenance information (in time or mileage intervals) for ignition related items. The Owner's Manual also contains maintenance information.

DESCRIPTION AND OPERATION

IGNITION SYSTEM

The ignition systems used on the 2.5L 4–cylinder and the 4.0L 6–cylinder engine are basically identical. Similarities and differences between the systems will be discussed.

DESCRIPTION AND OPERATION (Continued)

The ignition system is controlled by the powertrain control module (PCM) on all engines.

The ignition system consists of:

- Spark Plugs
- Ignition Coil
- Secondary Ignition Cables
- Distributor (contains rotor and camshaft position sensor)
- Powertrain Control Module (PCM)
- Crankshaft Position, Camshaft Position, Throttle Position and MAP Sensors

POWERTRAIN CONTROL MODULE

The Powertrain Control Module (PCM) is located in the engine compartment (Fig. 1).

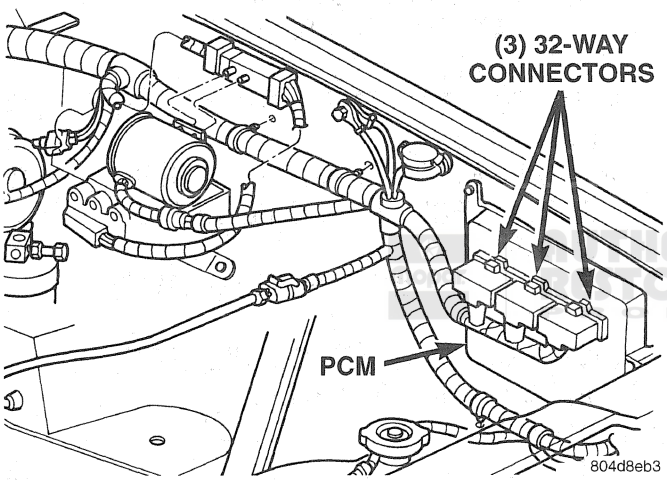


Fig. 1 Powertrain Control Module (PCM) Location

The ignition system is controlled by the PCM.

NOTE: Base ignition timing by rotation of distributor is not adjustable.

The PCM opens and closes the ignition coil ground circuit to operate the ignition coil. This is done to adjust ignition timing, both initial (base) and advance, and for changing engine operating conditions.

The amount of electronic spark advance provided by the PCM is determined by five input factors: engine coolant temperature, engine rpm, intake manifold temperature, manifold absolute pressure and throttle position.

DISTRIBUTOR

All engines are equipped with a camshaft driven mechanical distributor containing a shaft driven distributor rotor. All distributors are equipped with an internal camshaft position (fuel sync) sensor (Fig. 2). This sensor provides fuel injection synchronization and cylinder identification.

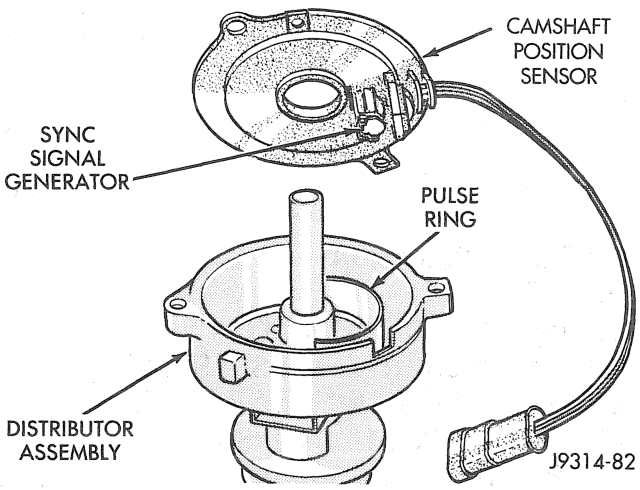


Fig. 2 Distributor and Camshaft Position Sensor-Typical

The distributors on both the 2.5L 4-cylinder and the 4.0L-6 cylinder engines do not have built in centrifugal or vacuum assisted advance. Base ignition timing and all timing advance is controlled by the powertrain control module (PCM). Because ignition timing is controlled by the PCM, **base ignition timing is not adjustable on any of these engines.**

The distributor is locked in place by a fork with a slot located on the distributor housing base. The distributor holddown clamp bolt passes through this slot when installed. Because the distributor position is locked when installed, its rotational position can not be changed. **Do not attempt to modify the distributor housing to get distributor rotation. Distributor position will have no effect on ignition timing. The position of the distributor will determine fuel synchronization only.**

All distributors contain an internal oil seal that prevents oil from entering the distributor housing. The seal is not serviceable.

SPARK PLUGS

All engines use resistor type spark plugs. Remove the spark plugs and examine them for burned electrodes and fouled, cracked or broken porcelain insulators. Keep plugs arranged in the order in which they were removed from the engine. A single plug displaying an abnormal condition indicates that a problem exists in the corresponding cylinder. Replace spark plugs at the intervals recommended in Group O, Lubrication and Maintenance

Spark plugs that have low milage may be cleaned and reused if not otherwise defective, carbon or oil fouled. Refer to the Spark Plug Condition section of this group.

DESCRIPTION AND OPERATION (Continued)

SPARK PLUG CABLES

Spark plug cables are sometimes referred to as secondary ignition wires. These cables transfer electrical current from the ignition coil(s) and/or distributor, to individual spark plugs at each cylinder. The resistive spark plug cables are of nonmetallic construction. The cables provide suppression of radio frequency emissions from the ignition system.

IGNITION COIL

Battery voltage is supplied to the ignition coil positive terminal from the ASD relay.

The Powertrain Control Module (PCM) opens and closes the ignition coil ground circuit for ignition coil operation.

Base ignition timing is not adjustable on any engine. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

AUTOMATIC SHUTDOWN (ASD) RELAY

As one of its functions, the ASD relay will supply battery voltage to the ignition coil. The ground circuit for the ASD relay is controlled by the Powertrain Control Module (PCM). The PCM regulates ASD relay operation by switching the ground circuit on-and-off.

CRANKSHAFT POSITION SENSOR

The crankshaft position sensor is mounted to the transmission bellhousing at the left/rear side of the engine block (Fig. 3) (Fig. 4).

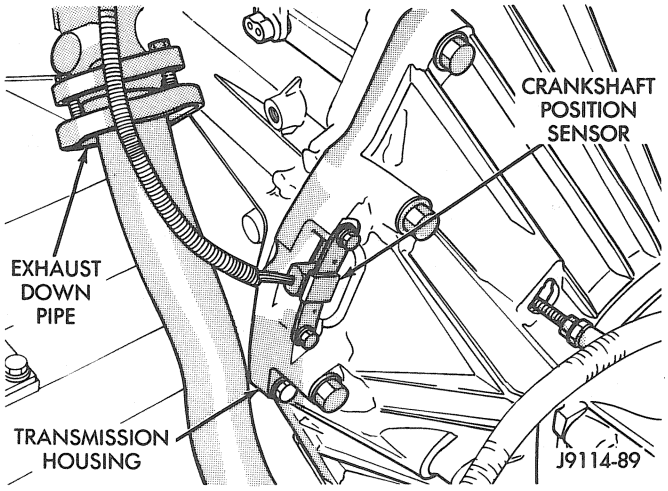


Fig. 3 Crankshaft Position Sensor—2.5L 4-Cyl. Engine—Typical

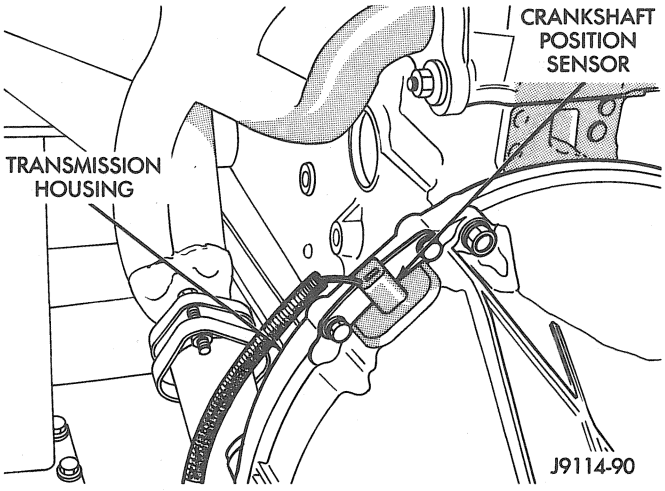


Fig. 4 Crankshaft Position Sensor—4.0L 6-Cyl. Engine

Engine speed and crankshaft position are provided through the crankshaft position sensor. The sensor generates pulses that are the input sent to the powertrain control module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

SENSOR OPERATION

The flywheel/drive plate has groups of four notches at its outer edge. On 4.0L 6-cylinder engines there are three sets of notches (Fig. 6). On 2.5L 4-cylinder engines there are two sets of notches (Fig. 5).

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM. For each engine revolution there are two groups of four pulses generated on 2.5L 4-cylinder engines. There are 3 groups of four pulses generated on 4.0L 6-cylinder engines.

The trailing edge of the fourth notch, which causes the pulse, is four degrees before top dead center (TDC) of the corresponding piston.

The engine will not operate if the PCM does not receive a crankshaft position sensor input.

CAMSHAFT POSITION SENSOR

The camshaft position sensor is located in the distributor on all engines.

The sensor contains a hall effect device called a sync signal generator to generate a fuel sync signal. This sync signal generator detects a rotating pulse ring (shutter) on the distributor shaft. The pulse ring rotates 180 degrees through the sync signal genera-

DESCRIPTION AND OPERATION (Continued)

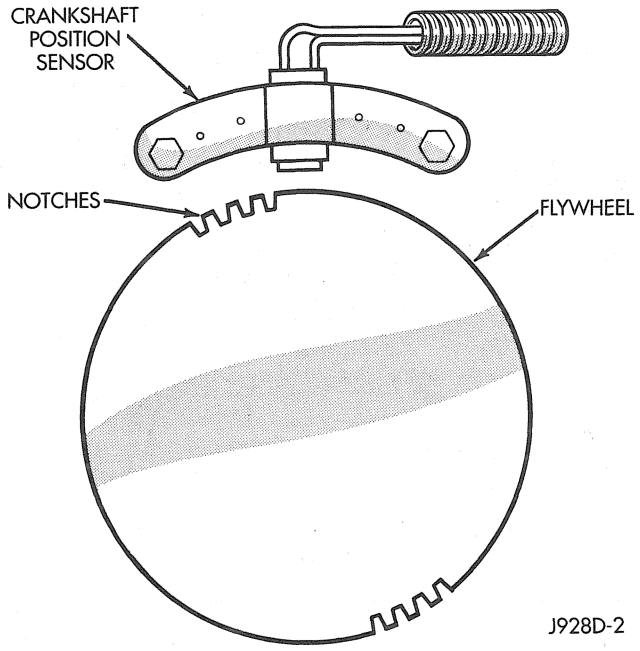


Fig. 5 Sensor Operation—2.5L 4-Cyl. Engine

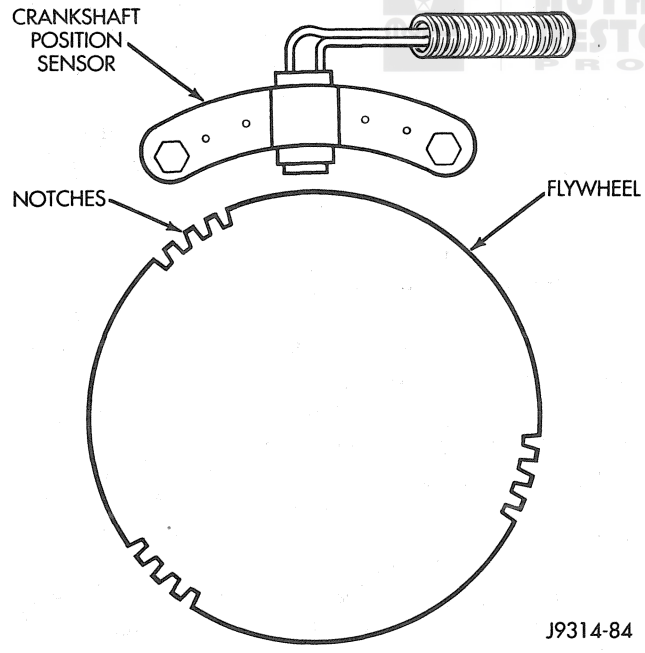


Fig. 6 Sensor Operation—4.0L 6-Cyl. Engine

tor. Its signal is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

When the leading edge of the pulse ring (shutter) enters the sync signal generator, the following occurs: The interruption of magnetic field causes the voltage to switch high resulting in a sync signal of approximately 5 volts.

When the trailing edge of the pulse ring (shutter) leaves the sync signal generator, the following occurs: The change of the magnetic field causes the sync signal voltage to switch low to 0 volts.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

ENGINE COOLANT TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

THROTTLE POSITION SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

IGNITION SWITCH AND KEY LOCK CYLINDER

The ignition switch is located on the steering column. The Key-In-Switch is located in the ignition switch module. For diagnosis of the Key-In-Switch, refer to Group, 8U.

A column shift interlock device is used to lock the transmission shifter in the Park position when the key is in the Off position. The interlock device is located within the steering column assembly and is not servicable. If repair is necessary, the steering column assembly must be replaced. Refer to Group 19, Steering for procedures.

DIAGNOSIS AND TESTING

AUTOMATIC SHUTDOWN (ASD) RELAY TEST

To perform a complete test of this relay and its circuitry, refer to the DRB scan tool. Also refer to the appropriate Powertrain Diagnostics Procedures manual. To test the relay only, refer to Relays—Operation/Testing in the Group 14, Fuel Systems section.

TESTING FOR SPARK AT COIL

CAUTION: When disconnecting a high voltage cable from a spark plug or from the distributor cap, twist the rubber boot slightly (1/2 turn) to break it loose (Fig. 7). Grasp the boot (not the cable) and pull it off with a steady, even force.

(1) Disconnect the ignition coil secondary cable from center tower of the distributor cap. Hold the cable terminal approximately 12 mm (1/2 in.) from a good engine ground (Fig. 8).

DIAGNOSIS AND TESTING (Continued)

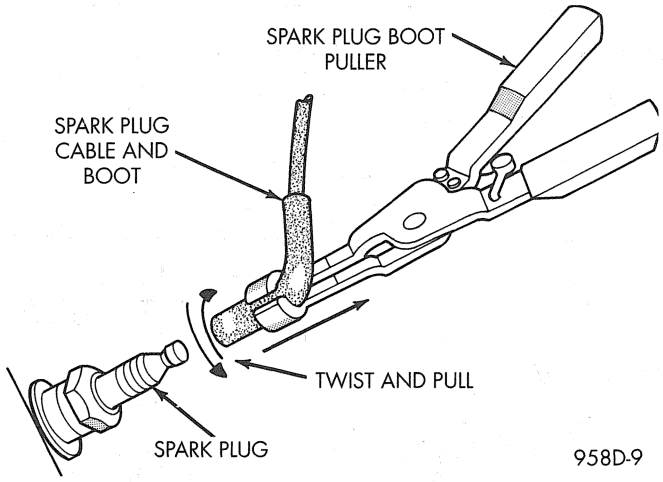


Fig. 7 Cable Removal

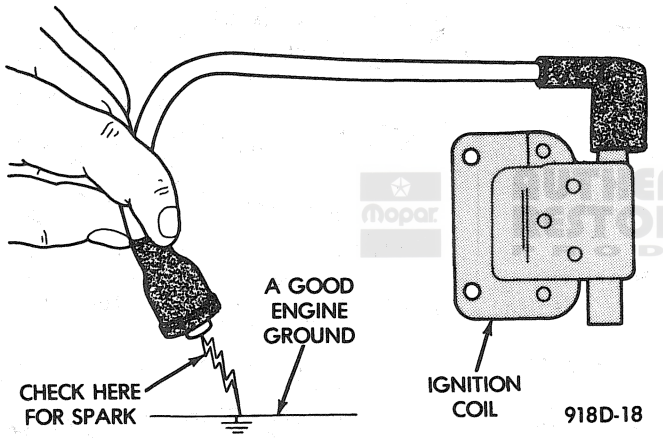


Fig. 8 Checking for Spark—Typical

WARNING: BE VERY CAREFUL WHEN THE ENGINE IS CRANKING. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE FITTING CLOTHING.

(2) Rotate (crank) the engine with the starter motor and observe the cable terminal for a steady arc. If steady arcing does not occur, inspect the secondary coil cable. Refer to Spark Plug Cables in this group. Also inspect the distributor cap and rotor for cracks or burn marks. Repair as necessary. If steady arcing occurs, connect ignition coil cable to the distributor cap.

(3) Remove a cable from one spark plug.

(4) Using insulated pliers, hold the cable terminal approximately 12 mm (1/2 in.) from the engine cylinder head or block while rotating the engine with the starter motor. Observe the spark plug cable terminal for an arc. If steady arcing occurs, it can be expected that the ignition secondary system is operating correctly. **(If the ignition coil cable is removed for this test, instead of a spark plug cable, the spark intensity will be much higher).** If steady arcing occurs at the spark plug cables, but the engine will not start, connect the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures service manual.

CHECK COIL TEST

To perform a complete test of the ignition coil and its circuitry, refer to the DRB scan tool. Also refer to the appropriate Powertrain Diagnostics Procedures manual. To test the coil only, refer to the following:

The ignition coil (Fig. 9) is designed to operate without an external ballast resistor.

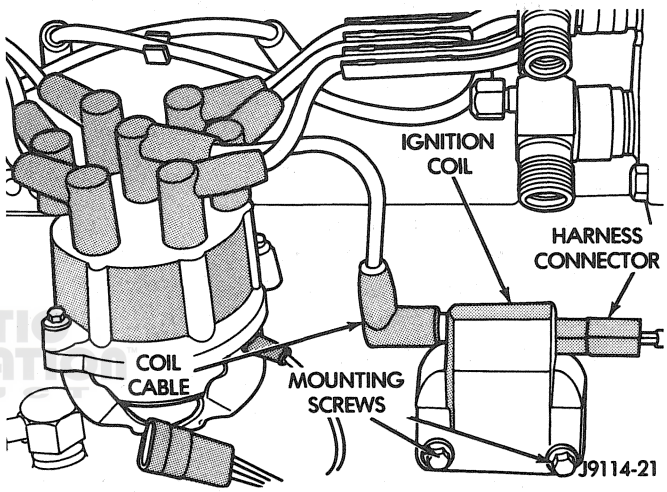


Fig. 9 Ignition Coil—Typical (4.0L Shown)

Inspect the ignition coil for arcing. Test the coil according to coil tester manufacturer's instructions. Test the coil primary and secondary resistance. Replace any coil that does not meet specifications. Refer to the Ignition Coil Resistance chart.

If the ignition coil is being replaced, the secondary spark plug cable must also be checked. Replace cable if it has been burned or damaged.

Arcing at the tower will carbonize the cable boot, which if it is connected to a new ignition coil, will cause the coil to fail.

If the secondary coil cable shows any signs of damage, it should be replaced with a new cable and new terminal. Carbon tracking on the old cable can cause arcing and the failure of a new ignition coil.

FAILURE TO START TEST

To prevent unnecessary diagnostic time and wrong test results, the Testing For Spark At Coil test should be performed prior to this test.

WARNING: SET PARKING BRAKE OR BLOCK THE DRIVE WHEELS BEFORE PROCEEDING WITH THIS TEST.

DIAGNOSIS AND TESTING (Continued)

COIL (MANUFACTURER)	PRIMARY RESISTANCE 21–27°C (70–80°F)	SECONDARY RESISTANCE 21–27°C (70–80°F)
Diamond	0.97 - 1.18 Ohms	11,300 - 15,300 Ohms
Toyodenso	0.95 - 1.20 Ohms	11,300 - 13,300 Ohms

J918D-2

IGNITION COIL RESISTANCE

(1) Unplug the ignition coil harness connector at the coil (Fig. 9).

(2) Connect a set of small jumper wires (18 gauge or smaller) between the disconnected harness terminals and the ignition coil terminals. To determine polarity at connector and coil, refer to the Wiring Diagrams section.

(3) Attach one lead of a voltmeter to the positive (12 volt) jumper wire. Attach the negative side of voltmeter to a good ground. Determine that sufficient battery voltage (12.4 volts) is present for the starting and ignition systems.

(4) Determine that sufficient battery voltage (12.4 volts) is present for the starting and ignition systems.

(5) Crank the engine for 5 seconds while monitoring the voltage at the coil positive terminal:

- If the voltage remains near zero during the entire period of cranking, refer to On-Board Diagnostics in Group 14, Fuel Systems. Check the Powertrain Control Module (PCM) and auto shutdown relay.
- If voltage is at or near battery voltage and drops to zero after 1-2 seconds of cranking, check the powertrain control module circuit. Refer to On-Board Diagnostics in Group 14, Fuel Systems.
- If voltage remains at or near battery voltage during the entire 5 seconds, turn the key off. Remove the three 32-way connectors (Fig. 10) from the PCM. Check 32-way connectors for any spread terminals or corrosion.

(6) Remove test lead from the coil positive terminal. Connect an 18 gauge jumper wire between the battery positive terminal and the coil positive terminal.

(7) Make the special jumper shown in (Fig. 11). Using the jumper, **momentarily** ground the ignition coil driver circuit at the PCM connector (cavity A-7). For cavity/terminal location of this circuit, refer to Group 8W, Wiring. A spark should be generated at the coil cable when the ground is removed.

(8) If spark is generated, replace the PCM.

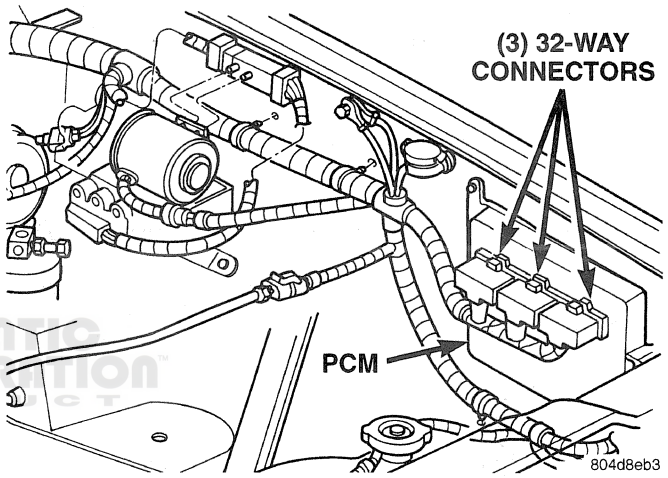


Fig. 10 PCM and Three 32–Way Connectors

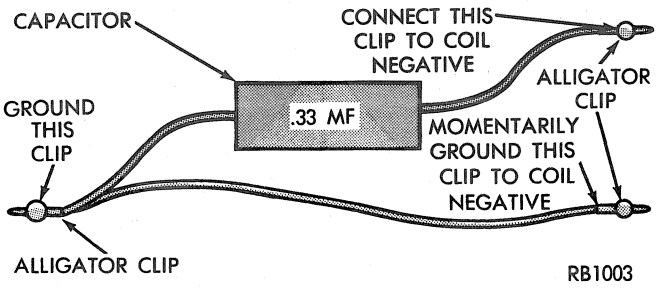


Fig. 11 Special Jumper Ground-to-Coil Negative Terminal

(9) If spark is not seen, use the special jumper to ground the coil negative terminal directly.

(10) If spark is produced, repair wiring harness for an open condition.

(11) If spark is not produced, replace the ignition coil.

DISTRIBUTOR CAP

Remove the distributor cap and wipe it clean with a dry lint free cloth. Visually inspect the cap for cracks, carbon paths, broken towers or damaged rotor button (Fig. 12) or (Fig. 13). Also check for white deposits on the inside (caused by condensation

DIAGNOSIS AND TESTING (Continued)

entering the cap through cracks). Replace any cap that displays charred or eroded terminals. The machined surface of a terminal end (faces toward rotor) will indicate some evidence of erosion from normal operation. Examine the terminal ends for evidence of mechanical interference with the rotor tip.

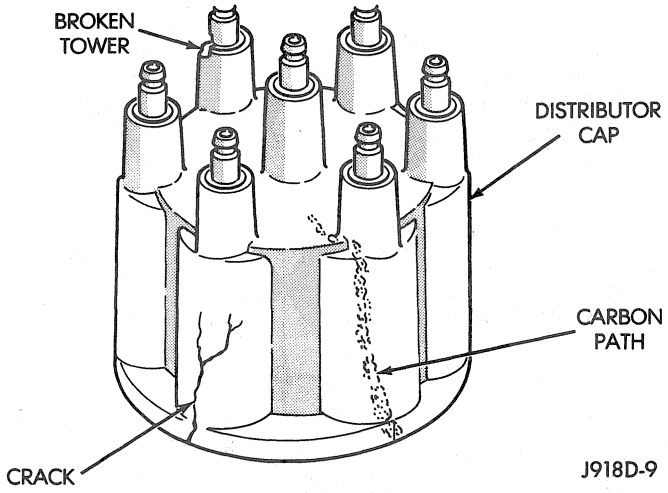


Fig. 12 Cap Inspection—External—Typical

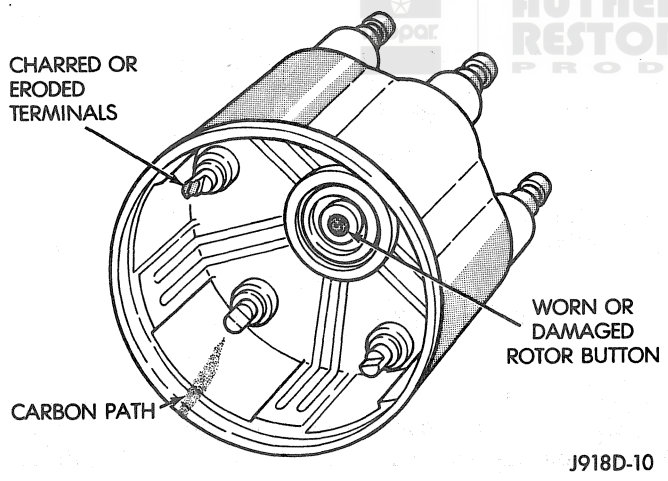


Fig. 13 Cap Inspection—Internal—Typical

DISTRIBUTOR ROTOR

Visually inspect the rotor (Fig. 14) for cracks, evidence of corrosion or the effects of arcing on the metal tip. Also check for evidence of mechanical interference with the cap. Some charring is normal on the end of the metal tip. The silicone-dielectric-varnish-compound applied to the rotor tip for radio interference noise suppression, will appear charred. This is normal. **Do not remove the charred compound.** Test the spring for insufficient tension. Replace a rotor that displays any of these adverse conditions.

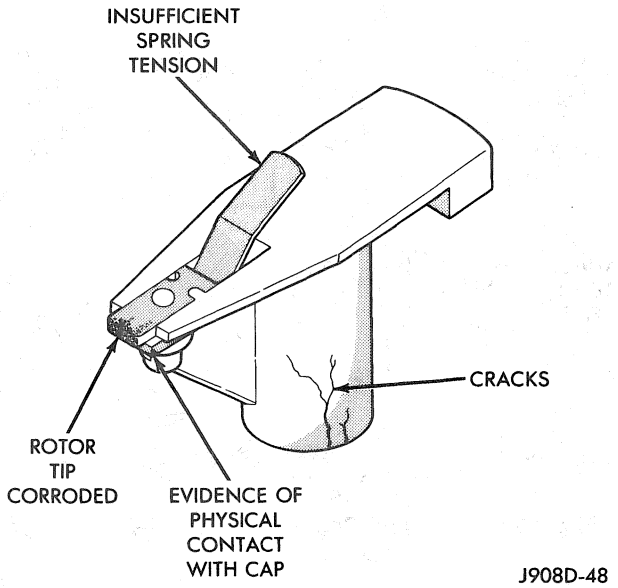


Fig. 14 Rotor Inspection—Typical

IGNITION TIMING

NOTE: Base (initial) ignition timing is NOT adjustable on any 2.5L 4-cylinder or 4.0L 6-cylinder engine. Do not attempt to adjust ignition timing by rotating the distributor.

NOTE: Do not attempt to modify the distributor housing to get distributor rotation. Distributor position will have no effect on ignition timing.

All ignition timing functions are controlled by the powertrain control module (PCM). For additional information, refer to the appropriate Powertrain Diagnostics Procedures service manual for operation of the DRB Scan Tool.

MAP SENSOR

For an operational description, diagnosis or removal/ installation procedures, refer to Group 14, Fuel Systems.

CRANKSHAFT POSITION SENSOR TEST

To perform a complete test of this sensor and its circuitry, refer to the DRB scan tool. Also refer to the appropriate Powertrain Diagnostics Procedures manual. To test the sensor only, refer to the following:

The sensor is located on the transmission bellhousing at the left/rear side of the engine block (Fig. 15) or (Fig. 16).

(1) Near the rear of the intake manifold, disconnect sensor pigtail harness connector from main wiring harness.

(2) Place an ohmmeter across terminals B and C (Fig. 17). Ohmmeter should be set to 1K-to-10K scale

DIAGNOSIS AND TESTING (Continued)

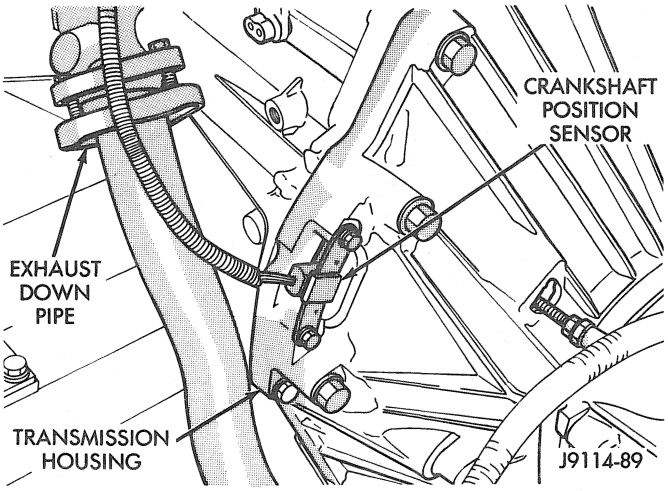


Fig. 15 Crankshaft Position Sensor—2.5L 4-Cyl. Engine—Typical

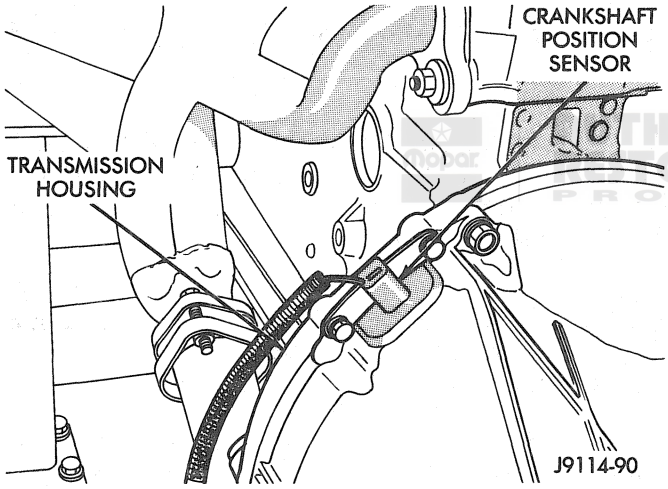


Fig. 16 Crankshaft Position Sensor—4.0L 6-Cyl. Engine

for this test. The meter reading should be open (no resistance). Replace sensor if a low resistance is indicated.

CAMSHAFT POSITION SENSOR

The camshaft position sensor is located in the distributor (Fig. 18) on all engines.

To perform a complete test of this sensor and its circuitry, refer to the appropriate Powertrain Diagnostics Procedures service manual. To test the sensor only, refer to the following:

For this test, an analog (non-digital) voltmeter is needed. Do not remove the distributor connector from the distributor. Using small paper clips, insert them into the backside of the distributor wire harness connector to make contact with the terminals. Be sure that the connector is not damaged

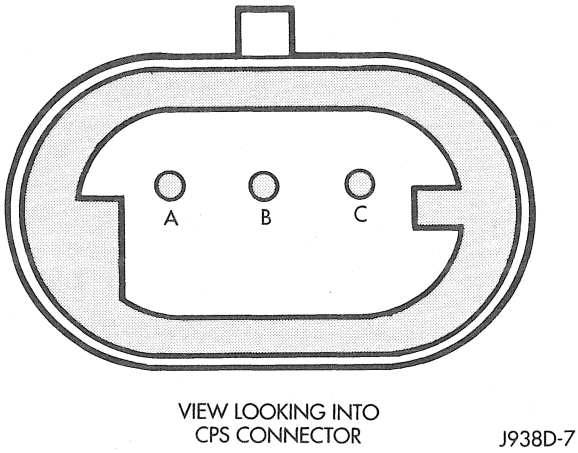


Fig. 17 Crankshaft Position Sensor Connector

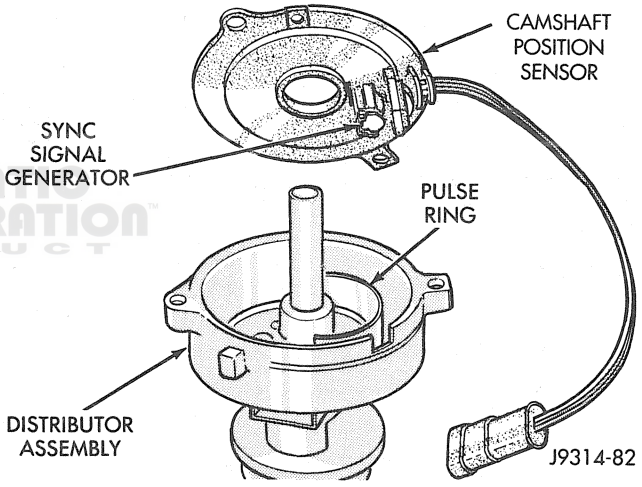


Fig. 18 Camshaft Position Sensor—Typical

when inserting the paper clips. Attach voltmeter leads to these paper clips.

(1) Connect the positive (+) voltmeter lead into the sensor output wire. This is at done the distributor wire harness connector. For wire identification, refer to Group 8W, Wiring Diagrams.

(2) Connect the negative (-) voltmeter lead into the ground wire. For wire identification, refer to Group 8W, Wiring Diagrams.

(3) Set the voltmeter to the 15 Volt DC scale.

(4) Remove distributor cap from distributor (two screws). Rotate (crank) the engine until the distributor rotor is approximately in the 11 o'clock position. The movable pulse ring should now be within the sensor pickup.

(5) Turn ignition key to ON position. Voltmeter should read approximately 5.0 volts.

(6) If voltage is not present, check the voltmeter leads for a good connection.

DIAGNOSIS AND TESTING (Continued)

(7) If voltage is still not present, check for voltage at the supply wire. For wire identification, refer to Group 8W, Wiring Diagrams.

(8) If 5 volts is not present at supply wire, check for voltage at PCM 32-way connector (cavity A-17). Refer to Group 8W, Wiring for location of connector/terminal. Leave the PCM connector connected for this test.

(9) If voltage is still not present, perform vehicle test using the DRB scan tool.

(10) If voltage is present at cavity A-17, but not at the supply wire:

(a) Check continuity between the supply wire. This is checked between the distributor connector and cavity A-17 at the PCM. If continuity is not present, repair the harness as necessary.

(b) Check for continuity between the camshaft position sensor output wire and cavity A-18 at the PCM. If continuity is not present, repair the harness as necessary.

(c) Check for continuity between the ground circuit wire at the distributor connector and ground. If continuity is not present, repair the harness as necessary.

(11) While observing the voltmeter, crank the engine with ignition switch. The voltmeter needle should fluctuate between 0 and 5 volts while the engine is cranking. This verifies that the camshaft position sensor in the distributor is operating properly and a sync pulse signal is being generated.

If sync pulse signal is not present, replacement of the camshaft position sensor is necessary

ENGINE COOLANT TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

SPARK PLUG CABLES

Check the spark plug cable connections for good contact at the coil(s), distributor cap towers, and spark plugs. Terminals should be fully seated. The insulators should be in good condition and should fit tightly on the coil, distributor and spark plugs. Spark plug cables with insulators that are cracked or torn must be replaced.

Clean high voltage ignition cables with a cloth moistened with a non-flammable solvent. Wipe the cables dry. Check for brittle or cracked insulation.

TESTING

When testing secondary cables for damage with an oscilloscope, follow the instructions of the equipment manufacturer.

If an oscilloscope is not available, spark plug cables may be tested as follows:

CAUTION: Do not leave any one spark plug cable disconnected for longer than necessary during testing. This may cause possible heat damage to the catalytic converter. Total test time must not exceed ten minutes.

With the engine running, remove spark plug cable from spark plug (one at a time) and hold next to a good engine ground. If the cable and spark plug are in good condition, the engine rpm should drop and the engine will run poorly. If engine rpm does not drop, the cable and/or spark plug may not be operating properly and should be replaced. Also check engine cylinder compression.

With the engine not running, connect one end of a test probe to a good ground. Start the engine and run the other end of the test probe along the entire length of all spark plug cables. If cables are cracked or punctured, there will be a noticeable spark jump from the damaged area to the test probe. The cable running from the ignition coil to the distributor cap can be checked in the same manner. Cracked, damaged or faulty cables should be replaced with resistance type cable. This can be identified by the words ELECTRONIC SUPPRESSION printed on the cable jacket.

Use an ohmmeter to test for open circuits, excessive resistance or loose terminals. Remove the distributor cap from the distributor. **Do not remove cables from cap.** Remove cable from spark plug. Connect ohmmeter to spark plug terminal end of cable and to corresponding electrode in distributor cap. Resistance should be 250 to 1000 Ohms per inch of cable. If not, remove cable from distributor cap tower and connect ohmmeter to the terminal ends of cable. If resistance is not within specifications as found in the Spark Plug Cable Resistance chart, replace the cable. Test all spark plug cables in this manner.

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

J908D-43

SPARK PLUG CABLE RESISTANCE

DIAGNOSIS AND TESTING (Continued)

To test ignition coil-to-distributor cap cable, do not remove the cable from the cap. Connect ohmmeter to rotor button (center contact) of distributor cap and terminal at ignition coil end of cable. If resistance is not within specifications as found in the Spark Plug Cable Resistance chart, remove the cable from the distributor cap. Connect the ohmmeter to the terminal ends of the cable. If resistance is not within specifications as found in the Spark Plug Cable Resistance chart, replace the cable. Inspect the ignition coil tower for cracks, burns or corrosion.

SPARK PLUG CONDITIONS

NORMAL OPERATING

The few deposits present on the spark plug will probably be light tan or slightly gray in color. This is evident with most grades of commercial gasoline (Fig. 19). There will not be evidence of electrode burning. Gap growth will not average more than approximately 0.025 mm (.001 in) per 1600 km (1000 miles) of operation. Spark plugs that have normal wear can usually be cleaned, have the electrodes filed, have the gap set and then be installed.

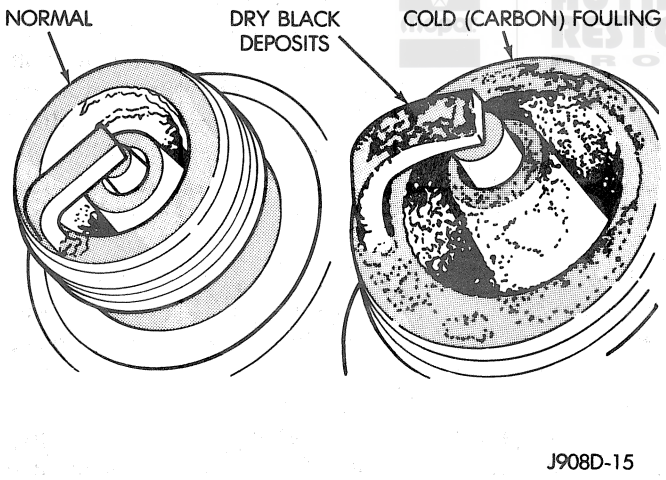


Fig. 19 Normal Operation and Cold (Carbon) Fouling

Some fuel refiners in several areas of the United States have introduced a manganese additive (MMT) for unleaded fuel. During combustion, fuel with MMT causes the entire tip of the spark plug to be coated with a rust colored deposit. This rust color can be misdiagnosed as being caused by coolant in the combustion chamber. Spark plug performance is not affected by MMT deposits.

COLD FOULING/CARBON FOULING

Cold fouling is sometimes referred to as carbon fouling. The deposits that cause cold fouling are basically carbon (Fig. 19). A dry, black deposit on one or two plugs in a set may be caused by sticking valves or defective spark plug cables. Cold (carbon) fouling of the entire set of spark plugs may be caused by a clogged air cleaner element or repeated short operating times (short trips).

WET FOULING OR GAS FOULING

A spark plug coated with excessive wet fuel or oil is wet fouled. In older engines, worn piston rings, leaking valve guide seals or excessive cylinder wear can cause wet fouling. In new or recently overhauled engines, wet fouling may occur before break-in (normal oil control) is achieved. This condition can usually be resolved by cleaning and reinstalling the fouled plugs.

OIL OR ASH ENCRUSTED

If one or more spark plugs are oil or oil ash encrusted (Fig. 20), evaluate engine condition for the cause of oil entry into that particular combustion chamber.

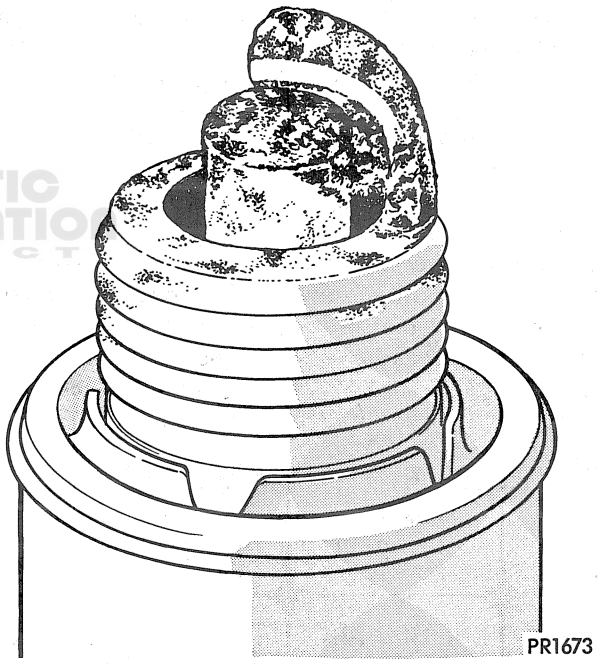


Fig. 20 Oil or Ash Encrusted

ELECTRODE GAP BRIDGING

Electrode gap bridging may be traced to loose deposits in the combustion chamber. These deposits accumulate on the spark plugs during continuous stop-and-go driving. When the engine is suddenly subjected to a high torque load, deposits partially liquefy and bridge the gap between electrodes (Fig. 21). This short circuits the electrodes. Spark plugs with electrode gap bridging can be cleaned using standard procedures.

SCAVENGER DEPOSITS

Fuel scavenger deposits may be either white or yellow (Fig. 22). They may appear to be harmful, but this is a normal condition caused by chemical addi-

DIAGNOSIS AND TESTING (Continued)

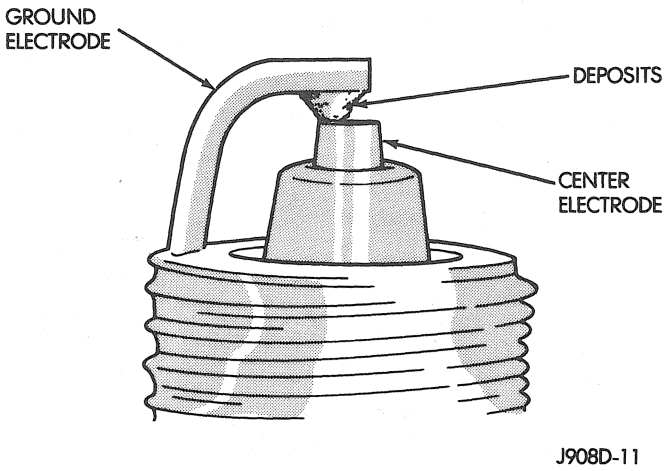


Fig. 21 Electrode Gap Bridging

tives in certain fuels. These additives are designed to change the chemical nature of deposits and decrease spark plug misfire tendencies. Notice that accumulation on the ground electrode and shell area may be heavy, but the deposits are easily removed. Spark plugs with scavenger deposits can be considered normal in condition and can be cleaned using standard procedures.

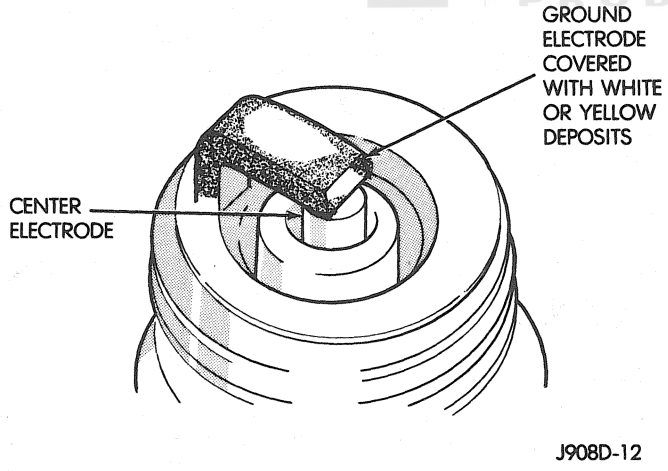


Fig. 22 Scavenger Deposits

CHIPPED ELECTRODE INSULATOR

A chipped electrode insulator usually results from bending the center electrode while adjusting the spark plug electrode gap. Under certain conditions, severe detonation can also separate the insulator from the center electrode (Fig. 23). Spark plugs with this condition must be replaced.

PREIGNITION DAMAGE

Preignition damage is usually caused by excessive combustion chamber temperature. The center electrode dissolves first and the ground electrode dissolves somewhat latter (Fig. 24). Insulators appear

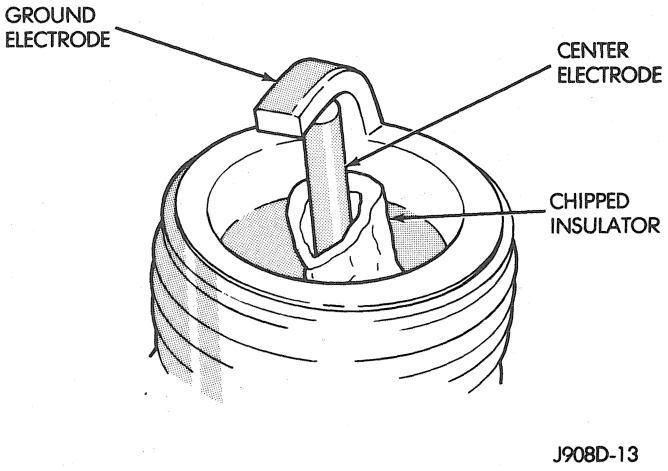


Fig. 23 Chipped Electrode Insulator

relatively deposit free. Determine if the spark plug has the correct heat range rating for the engine. Determine if ignition timing is over advanced or if other operating conditions are causing engine overheating. (The heat range rating refers to the operating temperature of a particular type spark plug. Spark plugs are designed to operate within specific temperature ranges. This depends upon the thickness and length of the center electrodes porcelain insulator.)

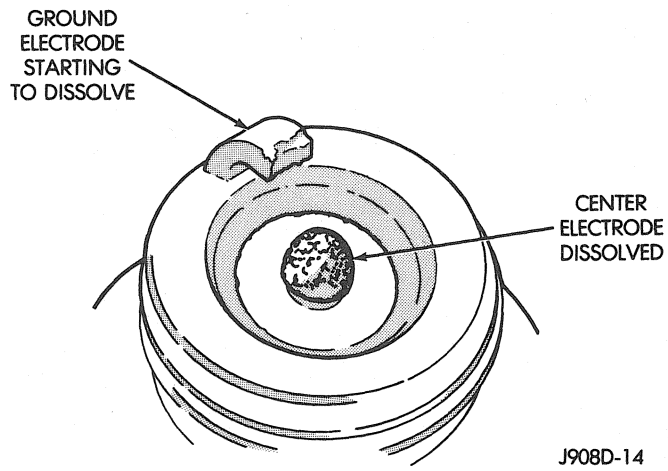


Fig. 24 Preignition Damage

SPARK PLUG OVERHEATING

Overheating is indicated by a white or gray center electrode insulator that also appears blistered (Fig. 25). The increase in electrode gap will be considerably in excess of 0.001 inch per 1000 miles of operation. This suggests that a plug with a cooler heat range rating should be used. Over advanced ignition timing, detonation and cooling system malfunctions can also cause spark plug overheating.

REMOVAL AND INSTALLATION (Continued)

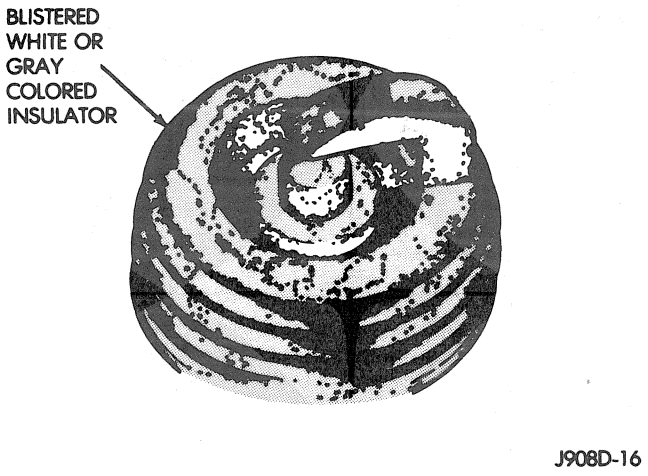


Fig. 25 Spark Plug Overheating

REMOVAL AND INSTALLATION

SPARK PLUG CABLES

CAUTION: When disconnecting a high voltage cable from a spark plug or from the distributor cap, twist the rubber boot slightly (1/2 turn) to break it loose (Fig. 26). Grasp the boot (not the cable) and pull it off with a steady, even force.

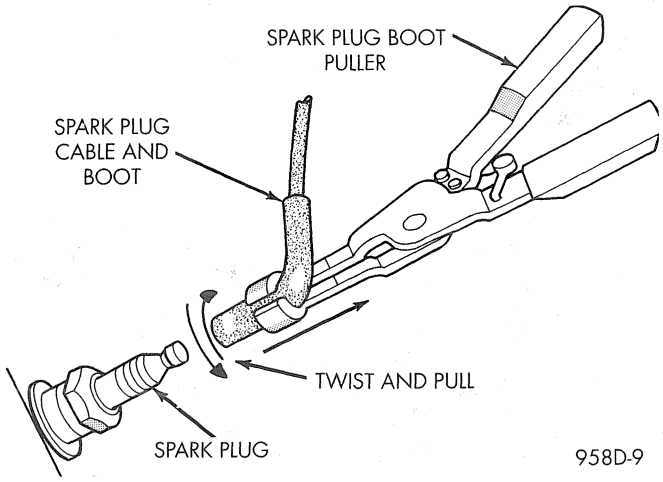


Fig. 26 Cable Removal

Install cables into the proper engine cylinder firing order (Fig. 27) or (Fig. 28).

When replacing the spark plug and coil cables, route the cables correctly and secure in the proper retainers. Failure to route the cables properly can cause the radio to reproduce ignition noise. It could also cause cross ignition of the plugs or short circuit the cables to ground.

When installing new cables, make sure a positive connection is made. A snap should be felt when a good connection is made between the plug cable and the distributor cap tower.

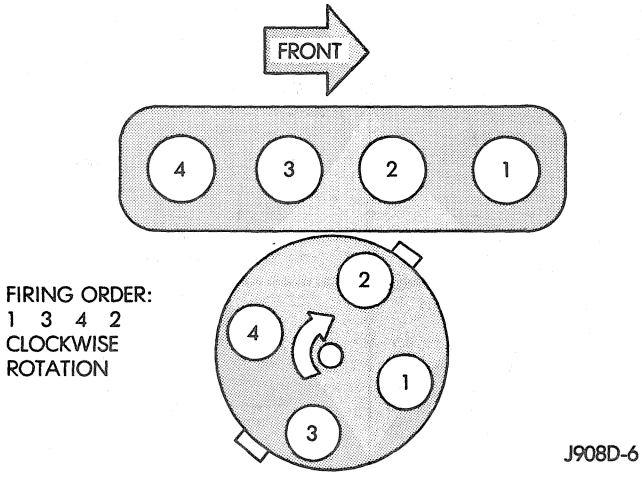


Fig. 27 Engine Firing Order—2.5L 4-Cylinder Engine

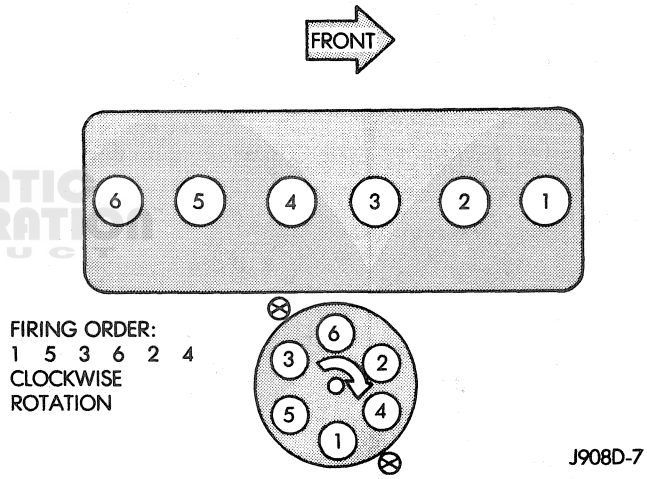


Fig. 28 Engine Firing Order—4.0L 6-Cylinder Engine

SPARK PLUGS

PLUG REMOVAL

(1) Always remove spark plug or ignition coil cables by grasping at the cable boot (Fig. 26). Turn the cable boot 1/2 turn and pull straight back in a steady motion. Never pull directly on the cable. Internal damage to cable will result.

(2) Prior to removing the spark plug, spray compressed air around the spark plug hole and the area around the spark plug. This will help prevent foreign material from entering the combustion chamber.

(3) Remove the spark plug using a quality socket with a rubber or foam insert.

(4) Inspect the spark plug condition. Refer to Spark Plugs in the Diagnostics/Service Procedures section of this group.

PLUG CLEANING

The plugs may be cleaned using commercially available spark plug cleaning equipment. After clean-

REMOVAL AND INSTALLATION (Continued)

ing, file the center electrode flat with a small point file or jewelers file before adjusting gap.

CAUTION: Never use a motorized wire wheel brush to clean the spark plugs. Metallic deposits will remain on the spark plug insulator and will cause plug misfire.

PLUG GAP ADJUSTMENT

Check the spark plug gap with a gap gauge tool. If the gap is not correct, adjust it by bending the ground electrode (Fig. 29). **Never attempt to adjust the gap by bending the center electrode.**

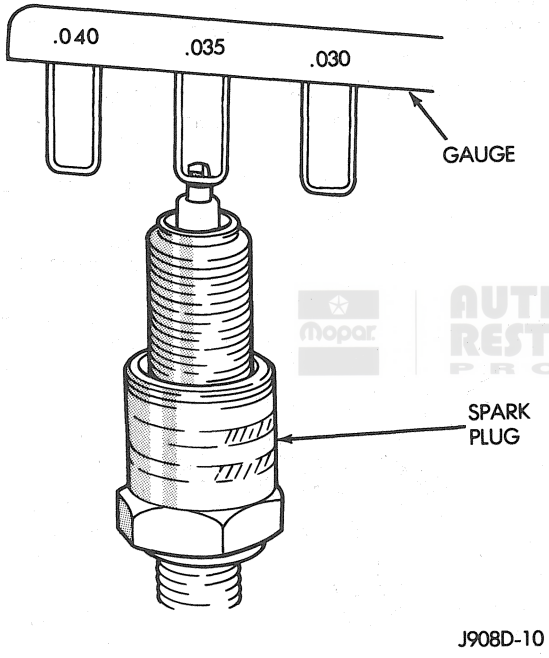


Fig. 29 Setting Spark Plug Gap—Typical

SPARK PLUG GAP

- 2.5L 4-Cylinder Engine Spark Plug Gap: .89 mm (.035 in).
- 4.0L 6-Cylinder Engine Spark Plug Gap: .89 mm (.035 in).

PLUG INSTALLATION

Always tighten spark plugs to the specified torque. Over tightening can cause distortion. This may result in a change in the spark plug gap, or a cracked porcelain insulator.

When replacing the spark plug and ignition coil cables, route the cables correctly and secure them in the appropriate retainers. Failure to route the cables properly can cause the radio to reproduce ignition noise. It could cause cross ignition of the spark plugs, or short circuit the cables to ground.

(1) Start the spark plug into the cylinder head by hand to avoid cross threading.

(2) Tighten the spark plugs to 35-41 N·m (26-30 ft. lbs.) torque.

(3) Install spark plug cables over spark plugs.

IGNITION COIL

The ignition coil is an epoxy filled type. If the coil is replaced, it must be replaced with the same type.

REMOVAL

On the 2.5L 4-cylinder engine, the ignition coil is mounted to a bracket on the side of the engine (to the rear of the distributor).

On the 4.0L 6-cylinder engine, the ignition coil is mounted to a bracket on the side of the engine (to the front of the distributor) (Fig. 30).

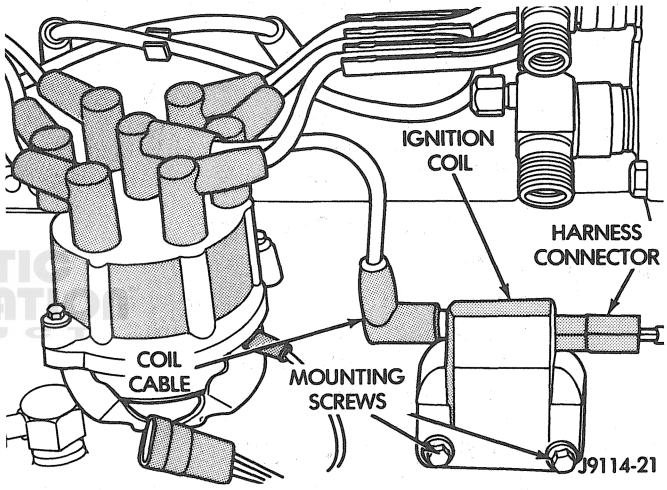


Fig. 30 Ignition Coil—Typical (4.0L Shown)

(1) Disconnect the ignition coil secondary cable from ignition coil (Fig. 30).

(2) Disconnect engine harness connector from ignition coil.

(3) Remove ignition coil mounting bolts (nuts are used on back side of bracket). Remove coil.

INSTALLATION

(1) Install ignition coil to bracket on cylinder block with mounting bolts and nuts.

(2) Connect engine harness connector to coil.

(3) Connect ignition coil cable to ignition coil.

AUTOMATIC SHUTDOWN (ASD) RELAY

The ASD relay is located in the power distribution center (PDC) (Fig. 31). Relay location is printed on a label on PDC cover.

REMOVAL

(1) Remove the PDC cover.

(2) Remove the relay by lifting straight up.

REMOVAL AND INSTALLATION (Continued)

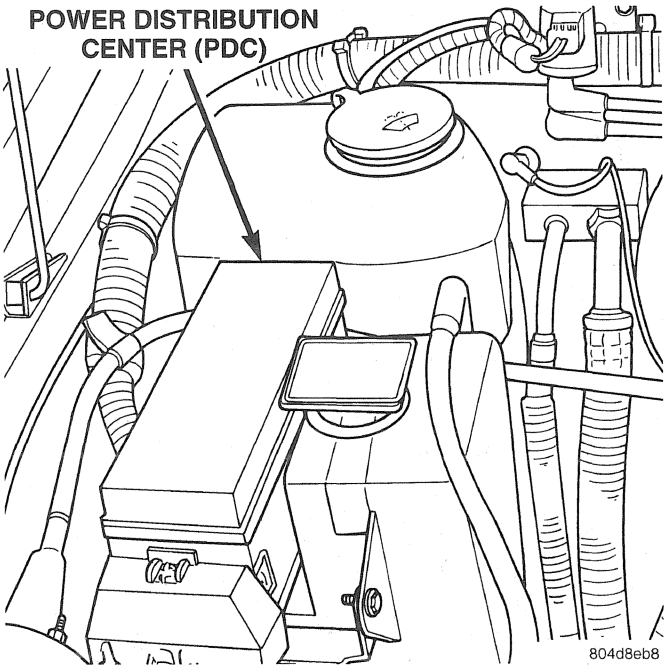


Fig. 31 PDC Location

INSTALLATION

(1) Check the condition of relay wire terminals at PDC before installing relay. Repair as necessary.
(2) Push the relay into the connector.
(3) Install the relay cover.

CRANKSHAFT POSITION SENSOR

The crankshaft position sensor is mounted in the transmission bellhousing at the left/rear side of the engine block (Fig. 32) or (Fig. 33).

On most 2.5L 4-cylinder and 4.0L 6-cylinder engines, the sensor is attached with two bolts. The 2.5L 4-cylinder engine, when equipped with an automatic transmission, will have the sensor mounted with two nuts.

REMOVAL

(1) Near the rear of the intake manifold, disconnect the pigtail harness (on the sensor) from the main electrical harness.
(2) Remove the nut holding sensor wire clip to fuel rail mounting stud.
(3) Depending upon application, remove either the sensor mounting bolt(s) or nuts.
(4) Remove the sensor.
(5) Remove clip from sensor wire harness.

INSTALLATION

(1) Install the sensor flush against the opening in the transmission housing.
(2) Install and tighten the two sensor mounting bolts (or nuts) to 19 N·m (14 ft. lbs.) torque.

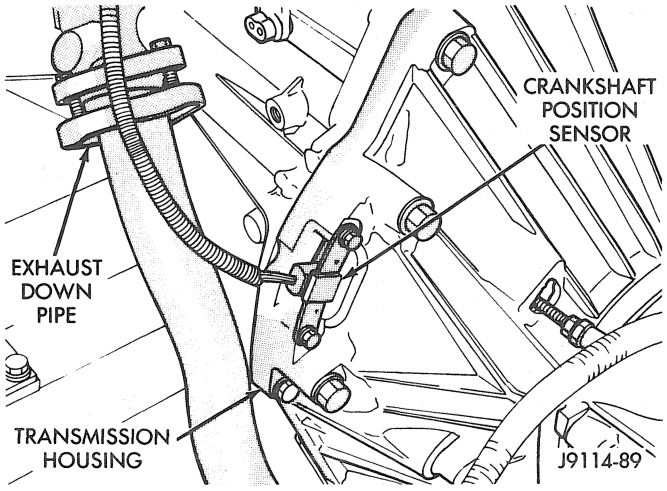


Fig. 32 Crankshaft Position Sensor—2.5L 4-Cylinder Engine—Typical

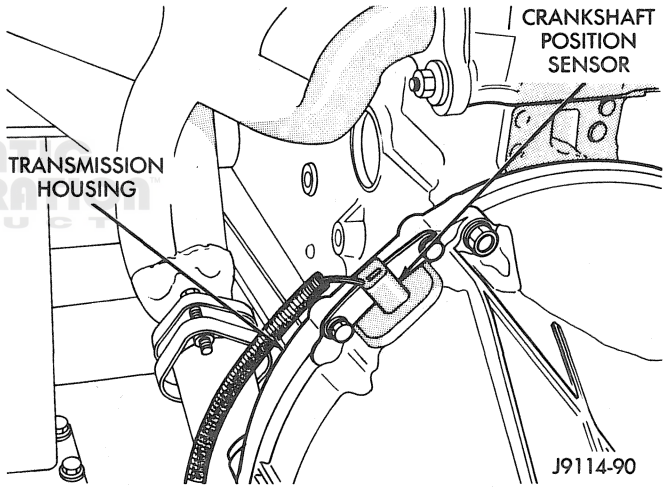


Fig. 33 Crankshaft Position Sensor—4.0L 6-Cylinder Engine

CAUTION: On some models, two bolts are used to secure the sensor to the transmission. These bolts are specially machined to correctly space the unit to the flywheel. Do not attempt to install any other bolts.

(3) Connect the electrical connector to the sensor.
(4) Install clip on sensor wire harness.
(5) Install clip over fuel rail mounting stud. Install clip mounting nut.

CAMSHAFT POSITION SENSOR

The camshaft position sensor is located in the distributor (Fig. 34).

REMOVAL

Distributor removal is not necessary to remove camshaft position sensor.
(1) Disconnect negative battery cable at battery.

REMOVAL AND INSTALLATION (Continued)

(2) Remove distributor cap from distributor (two screws).

(3) Disconnect camshaft position sensor wiring harness from main engine wiring harness.

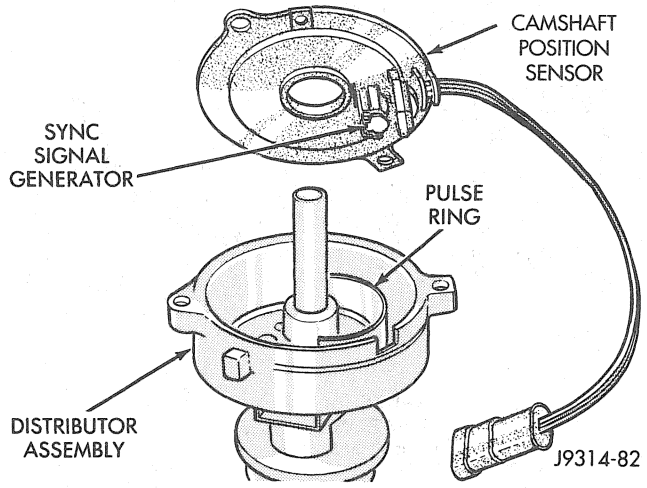


Fig. 34 Camshaft Position Sensor

(4) Remove distributor rotor from distributor shaft.

(5) Lift the camshaft position sensor assembly from the distributor housing (Fig. 34).

INSTALLATION

(1) Install camshaft position sensor to distributor. Align sensor into notch on distributor housing.

(2) Connect wiring harness.

(3) Install rotor.

(4) Install distributor cap. Tighten mounting screws.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

For removal and installation, refer to Manifold Absolute Pressure Sensor in group 14, Fuel Systems.

ENGINE COOLANT TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

THROTTLE POSITION SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

DISTRIBUTOR

All distributors contain an internal oil seal that prevents oil from entering the distributor housing. The seal is not serviceable.

Factory replacement distributors are equipped with a plastic alignment pin already installed. The pin is located in an access hole on the bottom of the distributor housing (Fig. 35). It is used to temporarily lock the rotor to the cylinder number 1 position during installation. The pin must be removed after installing the distributor.

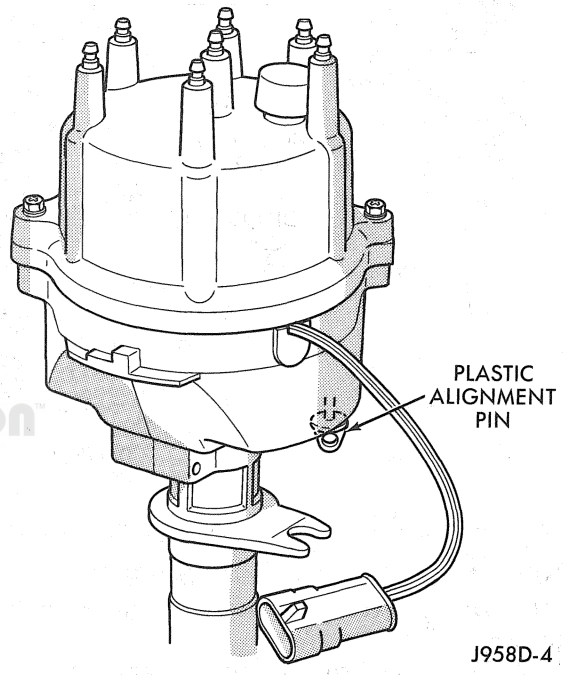


Fig. 35 Plastic Alignment Pin

The camshaft position sensor is located in the distributor on all engines (Fig. 36). For removal/installation procedures, refer to Camshaft Position Sensor. Distributor removal is not necessary for sensor removal.

Refer to (Fig. 36) for an exploded view of the distributor.

A fork with a slot is supplied on the bottom of the distributor housing where the housing base seats against the engine block (Fig. 36). The centerline of the slot aligns with the distributor holddown bolt hole in the engine block. Because of the fork, the distributor cannot be rotated. Distributor rotation is not necessary as all ignition timing requirements are handled by the powertrain control module (PCM).

The position of the distributor determines fuel synchronization only. It does not determine ignition timing.

NOTE: Do not attempt to modify this fork to attain ignition timing.

REMOVAL AND INSTALLATION (Continued)

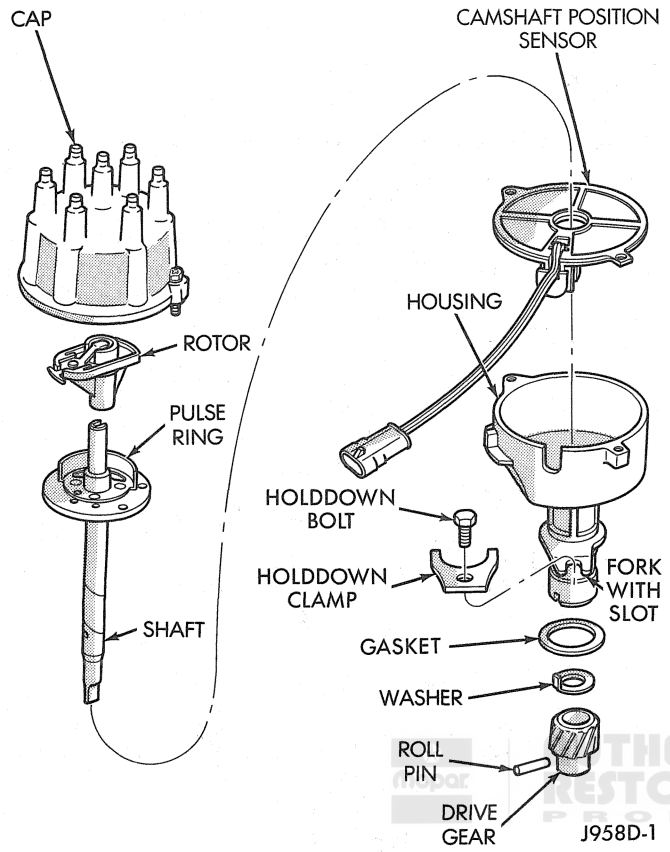


Fig. 36 Distributor—2.5L Or 4.0L Engines—Typical

REMOVAL—2.5L OR 4.0L ENGINE

(1) Disconnect the negative battery cable at the battery.

(2) Disconnect coil secondary cable at coil.

(3) Remove distributor cap from distributor (2 screws). Do not remove cables from cap. Do not remove rotor.

(4) Disconnect the distributor wiring harness from the main engine harness.

(5) Remove the cylinder number 1 spark plug.

(6) Hold a finger over the open spark plug hole. Rotate the engine at the vibration dampener bolt until compression (pressure) is felt.

(7) Slowly continue to rotate the engine. Do this until the timing index mark on the vibration damper pulley aligns with the top dead center (TDC) mark (0 degree) on timing degree scale (Fig. 37). Always rotate the engine in direction of normal rotation. Do not rotate the engine backward to align the timing marks.

(8) On models equipped with A/C, remove the electrical cooling fan and shroud assembly from the radiator. Refer to Group 7, Cooling System for procedures.

(9) This will provide room to turn the engine crankshaft with a socket and ratchet using the vibration damper bolt.

(10) Remove the distributor holddown bolt and clamp.

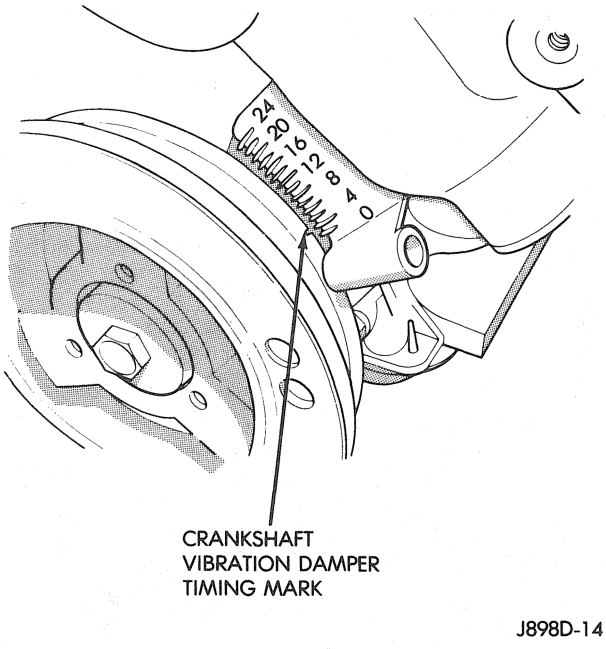


Fig. 37 Align Timing Marks

(11) Remove the distributor from engine by slowly lifting straight up.

(12) Note that the rotor will rotate slightly in a counterclockwise direction while lifting up the distributor. The oil pump gear will also rotate slightly in a counterclockwise direction while lifting up the distributor. This is due to the helical cut gears on the distributor and camshaft.

(13) Note the removed position of the rotor during distributor removal. During installation, this will be referred to as the Pre-position.

(14) **2.5L 4-Cylinder Engine:** Observe the slot in the oil pump gear through the hole on the side of the engine. It should be slightly before (counterclockwise of) the 10 o'clock position (Fig. 38).

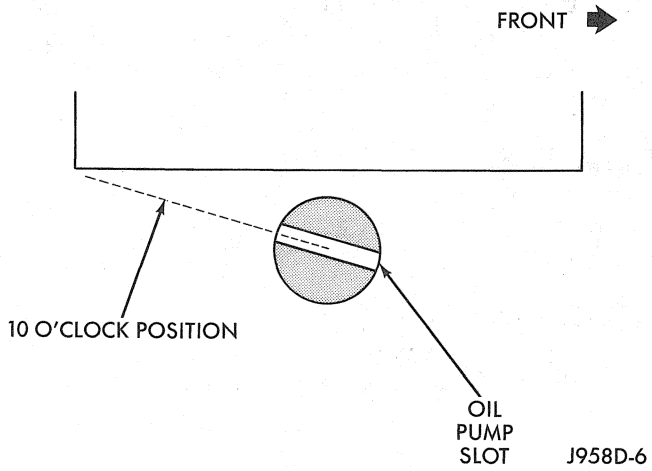


Fig. 38 Slot At 10 O'clock Position—2.5L Engine

REMOVAL AND INSTALLATION (Continued)

(15) **4.0L 6-Cylinder Engine:** Observe the slot in the oil pump gear through the hole on the side of the engine. It should be slightly before (counterclockwise of) the 11 o'clock position (Fig. 39).

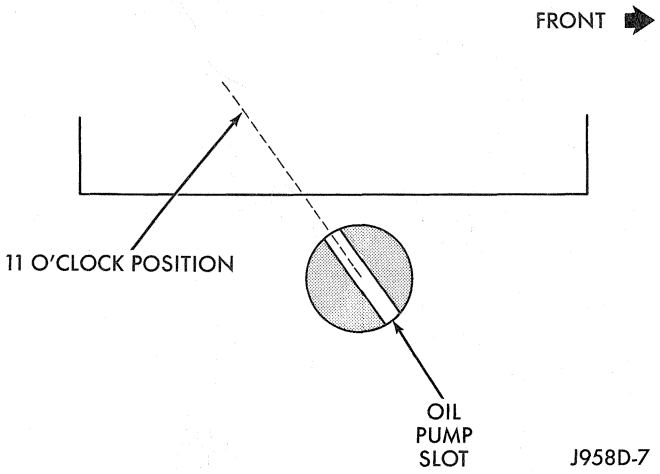


Fig. 39 Slot At 11 O'clock Position—4.0L Engine

(16) Remove and discard the old distributor-to-engine block gasket.

INSTALLATION

(1) If the engine crankshaft has been rotated after distributor removal, cylinder number 1 must be returned to its proper firing stroke. Refer to previous REMOVAL Step 5 and Step 6. These steps must be done before installing distributor.

(2) Check the position of the slot on the oil pump gear. On the 2.5L engine, it should be just slightly before (counterclockwise of) the 10 o'clock position (Fig. 38). On the 4.0L engine, it should be just slightly before (counterclockwise of) the 11 o'clock position (Fig. 39). If not, place a flat blade screwdriver into the oil pump gear and rotate it into the proper position.

(3) Factory replacement distributors are equipped with a plastic alignment pin already installed (Fig. 35). This pin is used to temporarily hold the rotor to the cylinder number 1 firing position during distributor installation. If this pin is in place, proceed to Step 8. If not, proceed to next step.

(4) If the original distributor is to be reinstalled, such as during engine overhaul, the plastic pin will not be available. A 3/16 inch drift pin punch tool may be substituted for the plastic pin.

(5) Remove the camshaft position sensor from the distributor housing. Lift straight up.

(6) Four different alignment holes are provided on the plastic ring (Fig. 40). **Note that 2.5L and 4.0L engines have different alignment holes (Fig. 40).**

(7) Rotate the distributor shaft and install the pin punch tool through the proper alignment hole in the plastic ring (Fig. 40) and into the mating access hole in the distributor housing. This will prevent the distributor shaft and rotor from rotating.

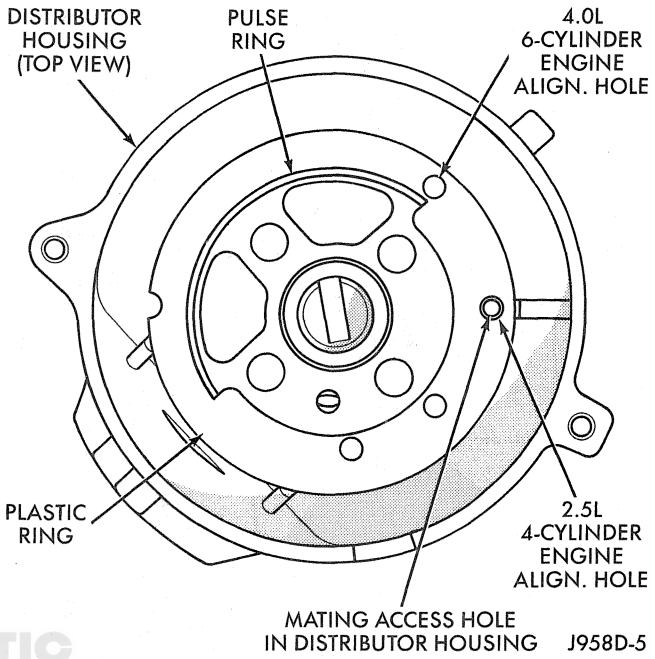


Fig. 40 Pin Alignment Holes

(8) Clean the distributor mounting hole area of the engine block.

(9) Install a new distributor-to-engine block gasket (Fig. 36).

(10) Install the rotor to the distributor shaft.

(11) **2.5L 4-Cylinder Engine:** Pre-position the distributor into the engine while holding the centerline of the base slot in the 1 o'clock position (Fig. 41). Continue to engage the distributor into the engine. The rotor and distributor will rotate clockwise during installation. This is due to the helical cut gears on the distributor and camshaft. When the distributor is fully seated to the engine block, the centerline of the base slot should be aligned to the clamp bolt mounting hole on the engine (Fig. 42). The rotor should also be pointed slightly past (clockwise of) the 3 o'clock position.

4.0L 6-Cylinder Engine: Pre-position the distributor into the engine while holding the centerline of the base slot in the 1 o'clock position (Fig. 41). Continue to engage the distributor into the engine. The rotor and distributor will rotate clockwise during installation. This is due to the helical cut gears on the distributor and camshaft. When the distributor is fully seated to the engine block, the centerline of the base slot should be aligned to the clamp bolt mounting hole on the engine (Fig. 43). The rotor should also be pointed at the 5 o'clock position.

It may be necessary to rotate the rotor and distributor shaft (very slightly) to engage the distributor

REMOVAL AND INSTALLATION (Continued)

shaft with the slot in the oil pump gear. The same may have to be done to engage the distributor gear with the camshaft gear.

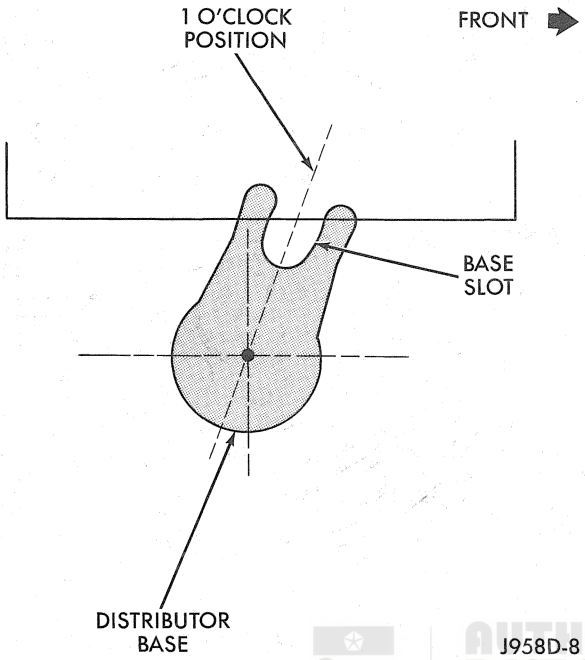


Fig. 41 Distributor Pre-position—All Engines

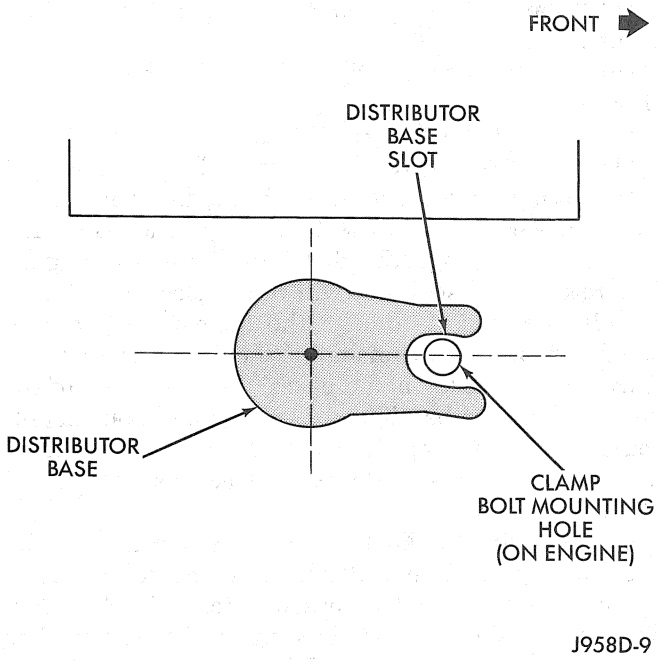


Fig. 42 Distributor Engaged Position—2.5L 4-Cylinder Engine

The distributor is correctly installed when:

- the rotor is pointed at the 3 o'clock position (2.5L engine), or at the 5 o'clock position (4.0L engine).

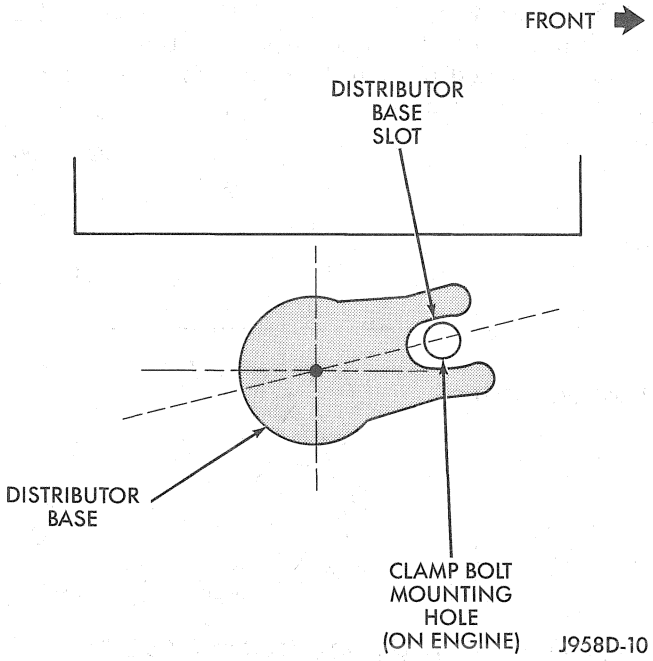


Fig. 43 Distributor Engaged Position—4.0L 6-Cylinder Engine

- the plastic alignment pin (or pin punch tool) is still installed to distributor.
- the number 1 cylinder piston is set at top dead center (TDC) (compression stroke).
- the centerline of the slot at the base of the distributor is aligned to the centerline of the distributor holddown bolt hole on the engine. In this position, the holddown bolt should easily pass through the slot and into the engine.

No adjustments are necessary. Proceed to next step.

(12) Install the distributor holddown clamp and bolt. Tighten the bolt to 23 N·m (17 ft. lbs.) torque.

(13) Remove the pin punch tool from the distributor. Or, if the plastic alignment pin was used, remove it straight down from the bottom of the distributor. Discard plastic pin.

(14) If removed, install the camshaft position sensor to the distributor. Align the wiring harness grommet to the notch in the distributor housing.

(15) Install the rotor.

CAUTION: If the distributor cap is incorrectly positioned on distributor housing, the cap or rotor may be damaged when engine is started.

(16) Install the distributor cap. Tighten distributor cap holddown screws to 3 N·m (26 in. lbs.) torque.

(17) If removed, install the spark plug cables to the distributor cap. For proper firing order, refer to the Specifications section at the end of this group. See Engine Firing Order.

REMOVAL AND INSTALLATION (Continued)

(18) Connect the distributor wiring harness to the main engine harness.

(19) Connect battery cable to battery.

POWERTRAIN CONTROL MODULE (PCM)

Refer to Group 14, Fuel System for procedures.

IGNITION SWITCH AND KEY CYLINDER

The ignition switch is located on the steering column. The Key-In-Switch is located in the ignition switch module. For diagnosis of the Key-In-Switch, refer to Section 8U.

REMOVAL

(1) Disconnect negative cable from battery.

(2) If vehicle has a tilt column, remove tilt lever by turning it counterclockwise.

(3) Remove upper and lower covers from steering column (Fig. 44).

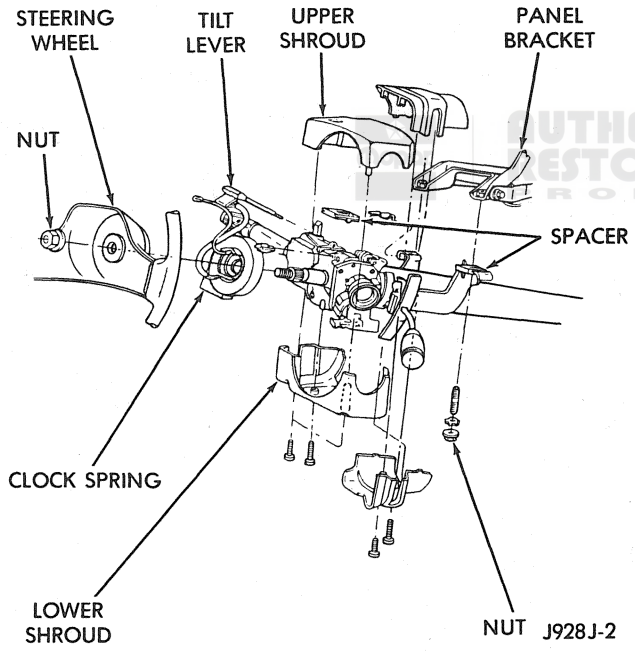


Fig. 44 Shroud Removal/Installation—Typical

(4) Remove ignition switch mounting screws. Use tamper proof torx bit Snap-on TTXR20A2 or equivalent to remove the screws (Fig. 45) or (Fig. 46).

(5) Gently pull switch away from column. Release connector locks on 7-terminal wiring connector, then remove connector from ignition switch.

(6) Release connector lock on 4-terminal connector, then remove connector from ignition switch (Fig. 47).

(7) To remove key cylinder from ignition switch:

(a) Insert key in ignition switch. Turn key to LOCK position. Using a TTXR20A2 or equivalent torx bit, remove key cylinder retaining screw and bracket (Fig. 48) or (Fig. 49).

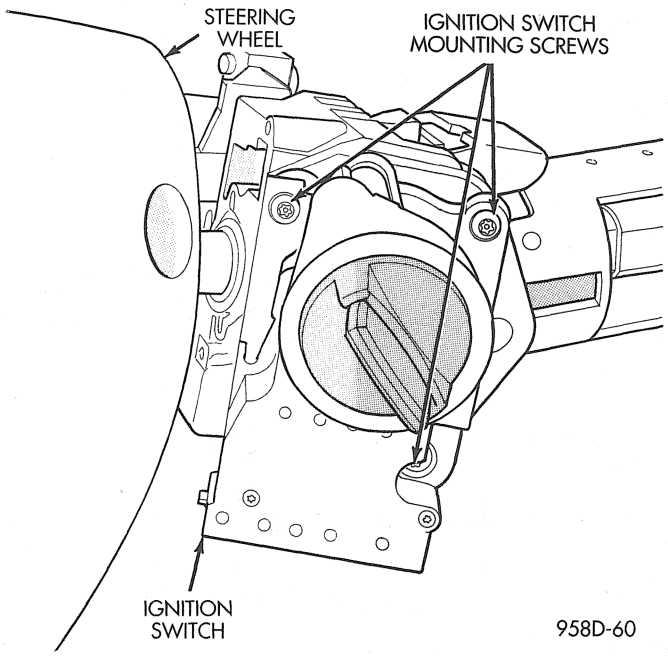


Fig. 45 Ignition Switch Screw Removal

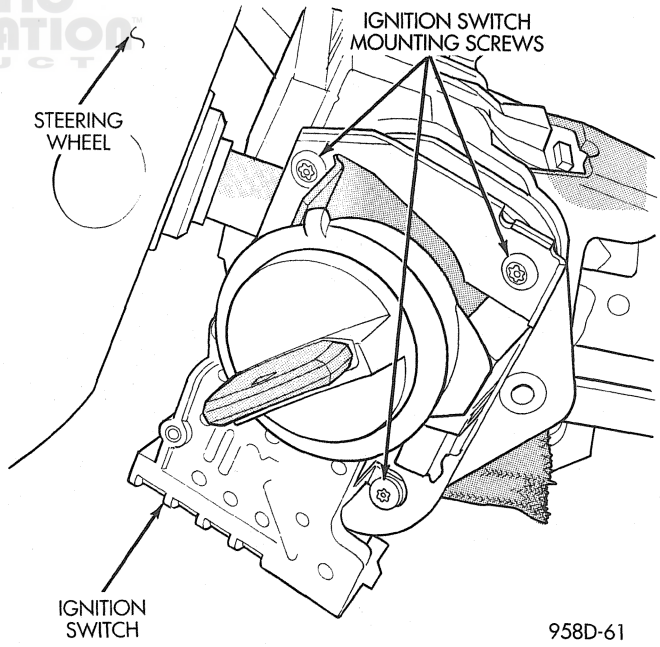


Fig. 46 Ignition Switch Screw Removal

(b) Rotate key clockwise to the OFF position. Key cylinder will unseat from ignition switch (Fig. 50). When key cylinder is unseated, it will be approximately 1/8 inch away from ignition switch halo light ring. **Do not attempt to remove key cylinder at this time.**

(c) With key cylinder in unseated position, rotate key counterclockwise to the lock position and remove key.

REMOVAL AND INSTALLATION (Continued)

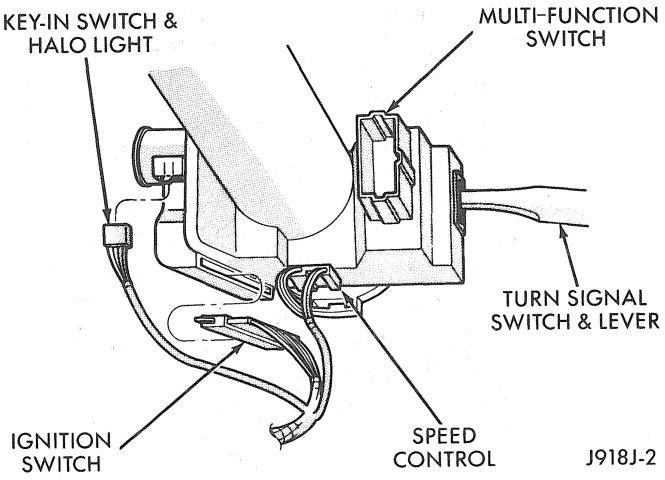


Fig. 47 Key-In-Switch and Halo Lamp Connector

(d) With key cylinder in unseated position, rotate key counterclockwise to the lock position and remove key.

(e) Remove key cylinder from ignition switch (Fig. 51).

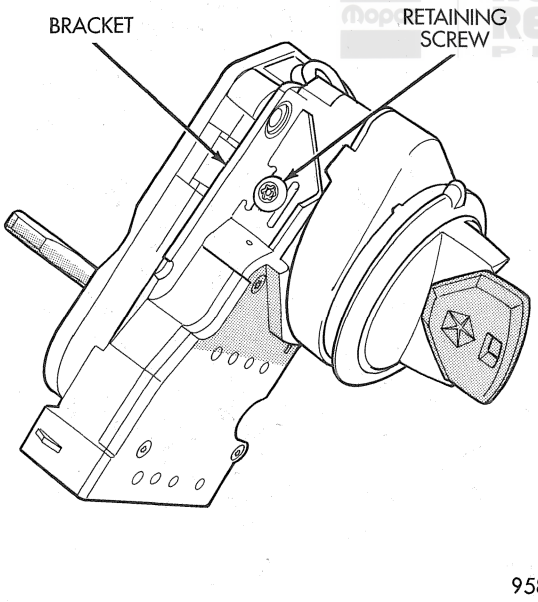


Fig. 48 Key Cylinder Retaining Screw

INSTALLATION

(1) Connect electrical connectors to ignition switch. Make sure that switch locking tabs are fully seated in wiring connectors.

(2) Before attaching ignition switch to a tilt steering column, the transmission shifter must be in Park position. The park lock dowel pin and column lock flag must also be properly indexed before installing switch (Fig. 52).

(a) Place transmission shifter in PARK position.

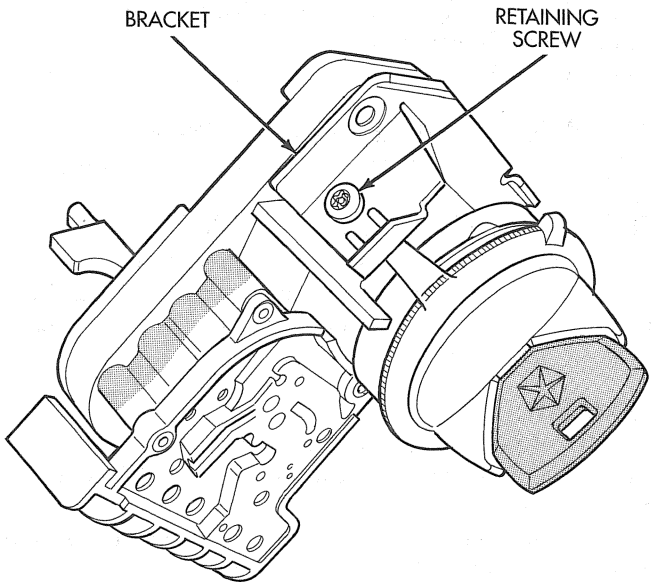


Fig. 49 Key Cylinder Retaining Screw

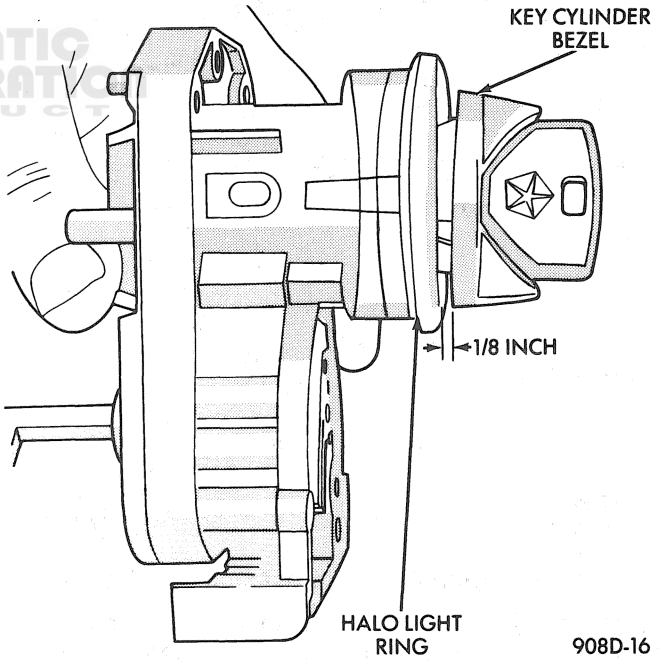


Fig. 50 Unseated Key Cylinder

(b) Place ignition switch in lock position. The switch is in the lock position when column lock flag is parallel to ignition switch terminals (Fig. 52).

(c) Position ignition switch park lock dowel pin so it will engage steering column park lock slider linkage (Fig. 53).

(d) Apply a light coating of grease to column lock flag and park lock dowel pin.

(3) Place ignition switch against lock housing opening on steering column. Ensure that ignition

REMOVAL AND INSTALLATION (Continued)

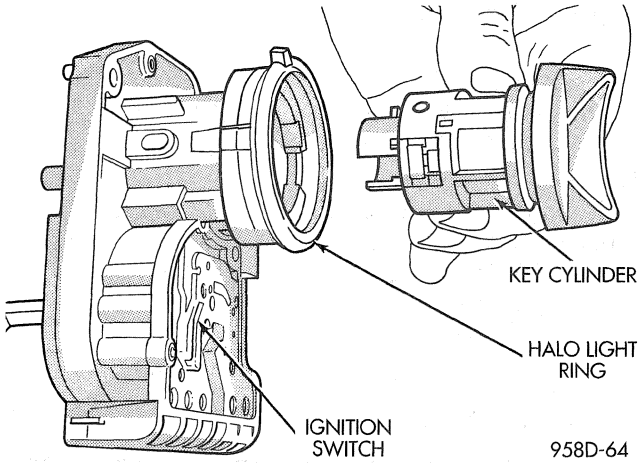


Fig. 51 Key Cylinder Removal

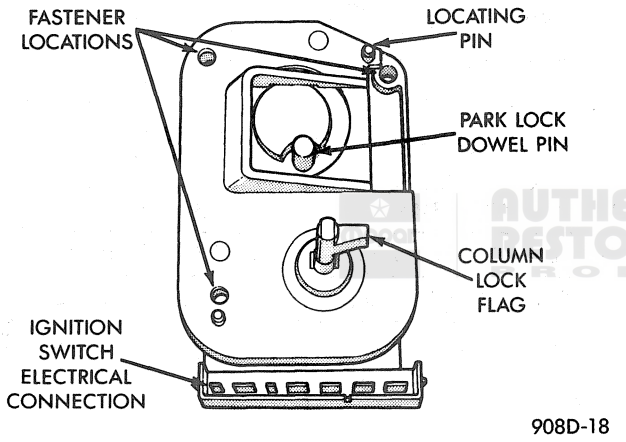


Fig. 52 Ignition Switch View From Column

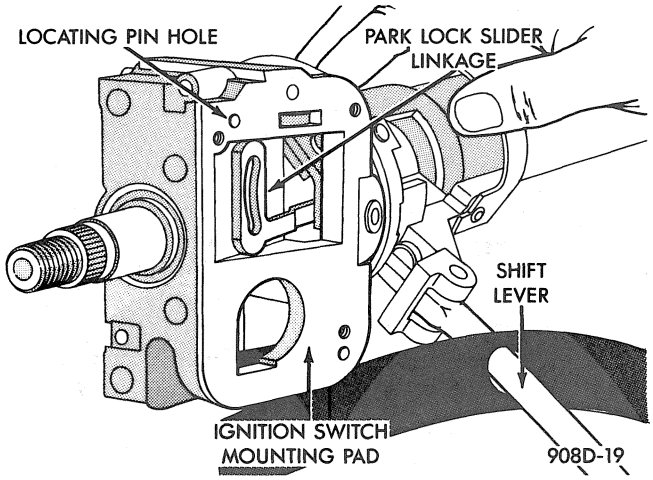


Fig. 53 Ignition Switch Mounting Pad

switch park lock dowel pin enters slot in park lock slider linkage in steering column.

(4) Install retaining bracket and ignition switch mounting screws. Tighten screws to 3±.5 N·m (26±4 in. lbs.) torque.

(5) Install ignition lock cylinder:

(6) With lock cylinder and ignition switch in Lock position, insert lock cylinder into ignition switch until it bottoms.

(7) Insert ignition key into lock cylinder. While gently pushing lock cylinder in toward ignition switch, rotate ignition key to end of travel.

(8) Install retaining screw into bracket and lock cylinder. Tighten screw to 3±.5 N·m (26±4 in. lbs.) torque.

(9) Install steering column covers. Tighten screws to 2 N·m (17 in. lbs.) torque.

(10) If vehicle is equipped with a tilt steering column, install tilt lever.

(11) Connect negative cable to battery.

(12) Check for proper operation of halo light, shift lock (if applicable), and column lock. Also check for proper operation of ignition switch accessory, lock, off, run, and start positions.

SHIFTER/IGNITION INTERLOCK

On models equipped with an automatic transmission, a cable connects the ignition switch with the floor shift lever. The shifter will be locked in the PARK position when the ignition key is in the LOCK or ACCESSORY positions. The cable can be adjusted or replaced. Refer to Group 21, Transmissions for procedures. The ignition interlock device within the steering column is not serviceable. If service is necessary, the steering column must be replaced. Refer to Group 19, Steering for procedures.

SPECIFICATIONS

VECI LABEL SPECIFICATIONS

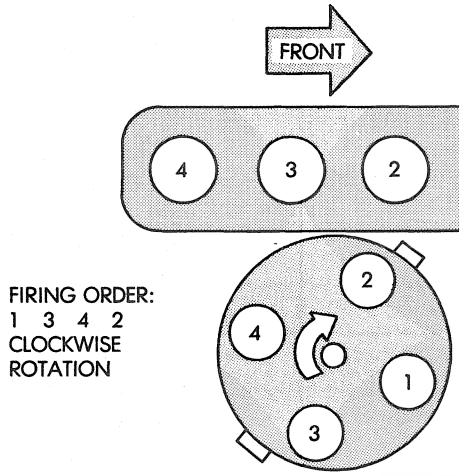
If anything differs between the specifications found on the Vehicle Emission Control Information (VECI) label and the following specifications, use specifications on VECI label. The VECI label is located in the engine compartment.

IGNITION TIMING

Ignition timing is not adjustable on any engine. Refer to Ignition Timing in the Diagnostics/Service Procedures section of this group for more information.

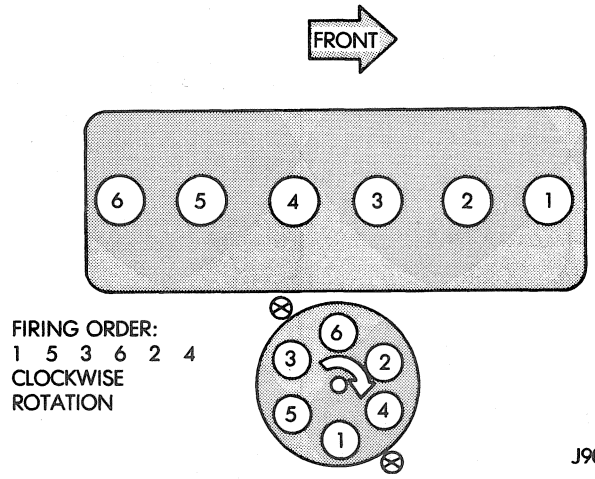
SPECIFICATIONS (Continued)

ENGINE FIRING ORDER—2.5L 4-CYLINDER ENGINE



J908D-6

ENGINE FIRING ORDER—4.0L 6-CYLINDER ENGINE



J908D-7

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Crankshaft Position Sensor	19 N·m (15 ft. lbs.)
Distributor Hold Down Bolt	23 N·m (17 ft. lbs.)
Ignition Coil Mounting (if tapped bolts are used)	5 N·m (50 in. lbs.)
Ignition Coil Mounting (if nuts/bolts are used)	11 N·m (100 in. lbs.)
Powertrain Control Module (PCM) Mounting Screws	1 N·m (9 in. lbs.)
Spark Plugs (all engines)	41 N·m (30 ft. lbs.)

SPARK PLUGS

ENGINE	PLUG TYPE	ELECTRODE GAP
2.5L/4.0L	RC12LYC	0.89 mm (0.035 in.)

J928D-12

SPARK PLUG CABLE RESISTANCE

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

J908D-43

IGNITION COIL

COIL	TOYODENSO	DIAMOND
Primary Resistance	.95 - 1.20 Ohms	.96 - 1.18 Ohms
Secondary Resistance at 70° - 80°F	11,300 - 13,300 Ohms	11,300 - 15,300 Ohms

J918D-25

INSTRUMENT PANEL SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
FUSEBLOCK MODULE	3
GAUGES	2
INDICATOR LAMPS	3
INSTRUMENT CLUSTERS	2
INSTRUMENT PANEL	2
INTRODUCTION	1
RELAY CENTER	3
DESCRIPTION AND OPERATION	
ANTI-LOCK BRAKE SYSTEM LAMP	4
BRAKE WARNING LAMP	4
CLUSTER ILLUMINATION LAMPS	4
COOLANT TEMPERATURE GAUGE	3
COOLANT TEMPERATURE WARNING LAMP	4
FOUR-WHEEL DRIVE INDICATOR LAMPS	5
FUEL GAUGE	3
GENERATOR WARNING LAMP	5
HEADLAMP HIGH BEAM INDICATOR LAMP	5
LOW FUEL WARNING LAMP	5
LOW OIL PRESSURE WARNING LAMP	5
LOW WASHER FLUID WARNING LAMP	5
MALFUNCTION INDICATOR LAMP	5
OIL PRESSURE GAUGE	3
SEAT BELT REMINDER LAMP	5
SPEEDOMETER/ODOMETER	4
TACHOMETER	4
TRIP ODOMETER	4
TURN SIGNAL INDICATOR LAMPS	6
UPSHIFT INDICATOR LAMP	6
VOLTMETER	4
DIAGNOSIS AND TESTING	
ANTI-LOCK BRAKE SYSTEM LAMP	9
BRAKE WARNING LAMP	9
CLUSTER ILLUMINATION LAMPS	10
COOLANT TEMPERATURE GAUGE	7
COOLANT TEMPERATURE WARNING LAMP	10
FOUR-WHEEL DRIVE INDICATOR LAMPS	11
FUEL GAUGE	7
GENERATOR WARNING LAMP	11
HEADLAMP HIGH BEAM INDICATOR LAMP	11
LOW FUEL WARNING LAMP	12
LOW OIL PRESSURE WARNING LAMP	12
LOW WASHER FLUID WARNING LAMP	12
MALFUNCTION INDICATOR LAMP	13
OIL PRESSURE GAUGE	7
PRINTED CIRCUITS	6
SEAT BELT REMINDER LAMP	13
SPEEDOMETER/ODOMETER	8
TACHOMETER	8
TRIP ODOMETER	8
TURN SIGNAL INDICATOR LAMPS	13
UPSHIFT INDICATOR LAMP	14
VOLTMETER	8
REMOVAL AND INSTALLATION	
GAUGES	15
HEADLAMP SWITCH	17
INSTRUMENT CLUSTER	14
INSTRUMENT PANEL	18
PRINTED CIRCUITS	15
SPECIFICATIONS	
GAUGE CALIBRATION	20

GENERAL INFORMATION

INTRODUCTION

This group is responsible for covering the vehicle instrument panel. However, because the instrument panel serves as the vehicle's command center, it is a very complex unit. The instrument panel is designed to house the controls and monitors for standard and optional powertrains, climate control systems, audio systems, lighting systems, safety systems and many other comfort or convenience items. It is also designed so that all of the controls and monitors can be safely reached and/or viewed by the vehicle operator, while still allowing relative ease of access to these items for service.

Complete service information coverage for all of the systems and components housed in the instrument panel in this section of the service manual would not be practical. It would result in a great deal of duplication and make this group too large for the informa-

GENERAL INFORMATION (Continued)

tion to be easily accessed and used. Therefore, the information found in this group has been limited as follows:

- General Information - Covers non-electrical components and features of the instrument panel that are not related to other systems.
- Description and Operation - Covers gauges and their sending units, warning lamps and their switches, and instrument panel illumination lamps.
- Diagnosis and Testing - Covers gauges and their sending units, warning lamps and their switches, and instrument panel illumination lamps.
- Removal and Installation - Covers components installed on or in the instrument panel that require removal for diagnosis or service of instrument panel components covered in this group.

For more information on components or systems not covered above, refer to the appropriate group in this manual. If you are uncertain as to the appropriate group, refer to the Component and System Index at the back of this manual. Refer to Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

INSTRUMENT PANEL

Modular instrument panel construction allows all of the gauges and controls to be serviced from the front of the panel. In addition, most of the instrument panel wiring or heating and air conditioning components can be accessed without complete instrument panel removal. If necessary, the instrument panel can be rolled-down and removed from the vehicle as an assembly.

Removal of the instrument cluster bezel allows access to the cluster assembly, most switches, the climate controls, and the radio. Removal of the cluster assembly allows access to the individual gauges, illumination and indicator lamp bulbs, printed circuits, and most of the instrument panel wiring.

Removal of the lower instrument panel allows access to heating and air conditioning components, and other wiring and electrical components. Those models equipped with a driver's side airbag restraint have a knee blocker and reinforcement behind the driver's side lower instrument panel.

The instrument panel layout is mirror image for left-hand and right-hand drive vehicles. In most cases, the diagnosis and service procedures found in this group are applicable to either vehicle. Although, most illustrations represent only the left-hand drive version. Exceptions are clearly identified as Right-Hand Drive (RHD).

INSTRUMENT CLUSTERS

Two basic instrument cluster options are offered. One is referred to as a low-line cluster, and the other is referred to as a high-line cluster. Each cluster is divided into two areas: the gauge area, and the telltale area. Each area is served by a separate printed circuit and wiring connector. Some variations of each cluster exist due to optional equipment and regulatory requirements.

The low-line cluster includes the following gauges:

- Fuel gauge
- Speedometer/odometer.

The low-line cluster includes provisions for the following indicator lamps:

- Anti-lock brake system lamp
- Brake warning lamp
- Coolant temperature warning lamp
- Four-wheel drive indicator lamps
- Generator warning lamp
- Headlamp high beam indicator lamp
- Low oil pressure warning lamp
- Low washer fluid warning lamp
- Malfunction indicator (Check Engine) lamp
- Seat belt reminder lamp
- Turn signal indicator lamps
- Upshift indicator lamp.

The high-line cluster includes the following gauges:

- Coolant temperature gauge
- Fuel gauge
- Oil pressure gauge
- Speedometer/odometer
- Tachometer
- Trip odometer
- Voltmeter.

The high-line cluster includes provisions for the following indicator lamps:

- Anti-lock brake system lamp
- Brake warning lamp
- Four-wheel drive indicator lamps
- Generator warning lamp
- Headlamp high beam indicator lamp
- Low fuel warning lamp
- Low washer fluid warning lamp
- Malfunction indicator (Check Engine) lamp
- Seat belt reminder lamp
- Turn signal indicator lamps
- Upshift indicator lamp.

GAUGES

With the ignition switch in the On or Start positions, voltage is supplied to all gauges through the instrument cluster printed circuits. With the ignition switch in the Off position, voltage is not supplied to the gauges. A gauge pointer may remain within the gauge scale with the ignition switch in the Off position. However, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions.

GENERAL INFORMATION (Continued)

All gauges, except the odometer, are air core magnetic units. Two fixed electromagnetic coils are located within the gauge. These coils are wrapped at right angles to each other around a movable permanent magnet. The movable magnet is suspended within the coils on one end of a shaft. The gauge needle is attached to the other end of the shaft.

One of the coils has a fixed current flowing through it to maintain a constant magnetic field strength. Current flow through the second coil changes, which causes changes in its magnetic field strength. The current flowing through the second coil can be changed by:

- A variable resistor-type sending unit (fuel level, coolant temperature, or oil pressure gauges)
- Changes in electrical system voltage (voltmeter)
- Electronic control circuitry (speedometer/odometer, tachometer).

The gauge needle moves as the movable permanent magnet aligns itself to the changing magnetic fields created around it by the electromagnets.

INDICATOR LAMPS

Indicator lamps are located in two areas within the cluster. Each of these areas is served by a separate printed circuit and wiring connector. Those lamps in the gauge area of the cluster share the gauge area printed circuit and the cluster harness connector. Those lamps in the tell-tale area of the cluster use the tell-tale printed circuit and the tell-tale harness connector.

Up to ten indicator lamps can be found in the tell-tale area of the cluster. These lamps are arranged in five stacked rows with two lamps in each row, and are located to the driver's side of the main cluster.

FUSEBLOCK MODULE

The fuseblock module for left-hand drive models is mounted to the left dash panel, outboard of the steering column. It has cavities for up to 20 blade-type fuses and circuit breakers, as well as the buzzer module. It can be accessed from under the instrument panel without the removal of any components.

The fuseblock module for right-hand drive models is mounted to a bracket on the lower instrument panel reinforcement, inboard of the steering column and adjacent to the relay center. It has cavities for up to 28 blade-type fuses and circuit breakers. A separate connector is provided near the fuseblock module for the buzzer module. It can also be accessed from under the instrument panel without the removal of any components.

RELAY CENTER

The relay center is mounted to the driver's side lower instrument panel reinforcement, inboard of the steering column. It contains relays for the horns, radio illumination, power door locks, rear window defogger, and the turn signal and hazard warning combination flasher. The relay center can be accessed from under the instrument panel without the removal of any components.

DESCRIPTION AND OPERATION

COOLANT TEMPERATURE GAUGE

The coolant temperature gauge gives an indication of engine coolant temperature. The coolant temperature sending unit is a thermistor that changes its electrical resistance with changes in engine coolant temperature. The sending unit is installed in a threaded hole that penetrates a coolant passage of the engine. High sending unit resistance causes low coolant temperature readings. Low resistance causes high coolant temperature readings. The sending unit resistance values are shown in a chart in Specifications at the back of this group.

FUEL GAUGE

The fuel gauge gives an indication of the level of fuel in the fuel tank. The fuel gauge sending unit is mounted to the electric fuel pump module located inside the fuel tank. Refer to Group 14 - Fuel System for sending unit service procedures.

The sending unit has a float attached to a swing-arm. The float moves up or down within the fuel tank as fuel level changes. As the float moves, an electrical contact on the pivot end of the swing-arm wipes across a resistor coil, which changes the resistance of the sending unit. High sending unit resistance causes low fuel level readings. Low resistance causes high fuel level readings. The sending unit resistance values are shown in a chart in Specifications at the back of this group.

OIL PRESSURE GAUGE

The oil pressure gauge gives an indication of the engine oil pressure. The combination oil pressure switch/sending unit contains a flexible diaphragm and a variable resistor coil. The diaphragm moves in response to changes in the engine oil pressure. The sending unit is installed in a threaded hole that penetrates an oil passage of the engine. As the diaphragm moves, resistance in the coil increases or decreases. High resistance on the gauge side of the sending unit causes high oil pressure readings. Low resistance causes low oil pressure readings. Sending unit resistance values are shown in a chart in Specifications at the back of this group.

DESCRIPTION AND OPERATION (Continued)

SPEEDOMETER/ODOMETER

The speedometer/odometer gives an indication of the vehicle speed and distance traveled. The speedometer/odometer unit receives a vehicle speed pulse signal from the Vehicle Speed Sensor (VSS). An electronic integrated circuit contained within the speedometer/odometer unit reads and analyzes the pulse signal. It then adjusts the ground path resistance of one electromagnet in the gauge to control speedometer needle movement. It also sends signals to an electric stepper motor to control movement of the odometer number rolls. The frequency values for the pulse signal are shown in a chart in Specifications at the back of this group.

The VSS is mounted to an adapter near the transmission (two-wheel drive) or transfer case (four-wheel drive) output shaft. The sensor is driven through the adapter by a speedometer pinion gear. The adapter and pinion used may vary with transmission and transfer case models, axle ratio and tire size. Refer to Group 21 - Transmission for more information.

TACHOMETER

The tachometer gives an indication of the engine speed in revolutions-per-minute (rpm). With the engine running, the tachometer receives an engine speed pulse signal from the Powertrain Control Module (PCM). An electronic integrated circuit contained within the tachometer unit reads and analyzes this pulse signal. It then adjusts the ground path resistance of one electromagnet in the gauge to control needle movement. The frequency values for the pulse signal are shown in a chart in Specifications at the back of this group.

TRIP ODOMETER

Like the odometer, the trip odometer gives an indication of the distance the vehicle has travelled. However, by depressing the trip odometer reset knob on the face of the speedometer/odometer unit, the trip odometer can be reset to zero. The trip odometer is driven by the same signal and circuits as the speedometer and odometer. The trip odometer is serviced only as a part of the speedometer/odometer unit.

VOLTMETER

The voltmeter gives an indication of electrical system voltage. The voltmeter is connected in parallel with the battery. With the ignition switch in the On position, the voltmeter indicates battery voltage or generator output voltage, whichever is greater.

ANTI-LOCK BRAKE SYSTEM LAMP

The optional Anti-Lock Brake System (ABS) lamp is switched to ground by the Controller Anti-lock Brake (CAB). The CAB lights the lamp when the ignition switch is turned to the Start position as a bulb test. The lamp will stay on for 3 to 5 seconds after vehicle start-up to indicate a system self-test is in process. If the lamp remains on after start-up, or comes on and stays on while driving, it may indicate that the CAB has detected a system malfunction and/or that the ABS system has become inoperative. Refer to Group 5 - Brakes for more information.

BRAKE WARNING LAMP

The brake warning lamp gives the driver an indication that the parking brake is applied, or that the pressures in the two halves of the split brake hydraulic system are unequal. With the ignition switch turned to the On or Start positions, battery voltage is supplied to one side of the indicator bulb. A ground path for the bulb is provided by three switches. The bulb will light when:

- The ignition switch is in the Start position (bulb test).
- The brake warning switch is closed (indicating unequal split brake hydraulic system pressures, due to low brake fluid or brake fluid leakage).
- The parking brake switch is closed (indicating the parking brake is applied).

Refer to Group 5 - Brakes for more information.

CLUSTER ILLUMINATION LAMPS

All cluster illumination lamps receive battery feed from the instrument lamps fuse in the fuseblock module through the panel dimmer rheostat of the headlamp switch. When the park or head lamps are on, the cluster illumination lamps light. Illumination brightness can be adjusted by rotating the headlamp switch knob (clockwise to dim, counterclockwise to brighten).

COOLANT TEMPERATURE WARNING LAMP

The coolant temperature warning lamp lights whenever engine coolant temperature is too high. Battery voltage is supplied to one side of the indicator bulb when the ignition switch is turned to the On position. The coolant temperature sending unit is connected to the other side of the bulb. The coolant temperature sending unit is a thermistor that changes its electrical resistance with changes in engine coolant temperature. The sending unit is installed in a threaded hole that penetrates a coolant passage of the engine. When the engine coolant temperature is too high, the sending unit resistance is low. This provides a ground path for the indicator bulb, which causes it to light.

DESCRIPTION AND OPERATION (Continued)

FOUR-WHEEL DRIVE INDICATOR LAMPS

PART TIME

On vehicles with the Command-Trac Four-Wheel Drive system, the Part Time lamp lights when the transfer case is engaged in the 4H or 4L positions. On vehicles with the Selec-Trac Four-Wheel Drive system, the Part Time lamp lights when the transfer case is engaged in the 4 X 4 Part Time or 4 Lo positions. When the ignition switch is in the On position, battery voltage is supplied to one side of the indicator lamp bulb. A switch in the transfer case is connected to the other side of the indicator lamp bulb. When the switch is closed, a path to ground is provided and the indicator lamp bulb lights.

FULL TIME

The Full Time lamp is only operational on vehicles equipped with the Selec-Trac Four-Wheel Drive system. The Full Time lamp lights when the transfer case is engaged in the 4 X 4 Full Time position. When the ignition switch is in the On position, battery voltage is supplied to one side of the indicator lamp bulb. A switch in the transfer case is connected to the other side of the indicator lamp bulb. When the switch is closed, a path to ground is provided and the indicator lamp bulb lights.

GENERATOR WARNING LAMP

The generator warning lamp gives the driver an indication of a charging system problem. One side of the bulb is connected to ignition-switched battery feed. The other side of the bulb is switched to ground by the Powertrain Control Module (PCM). The lamp should light when the ignition switch is turned to the On position, but should go out whenever the engine is running. If the lamp comes on and stays on while the engine is running, it indicates that the PCM has detected a system malfunction and/or the charging system has become inoperative. Refer to Group 8C - Charging System for diagnosis of charging system problems. Refer to Group 14 - Fuel System for more information on the PCM generator warning lamp control output.

HEADLAMP HIGH BEAM INDICATOR LAMP

The headlamp high beam indicator lamp lights when the high beam circuit is activated. The circuit is controlled by the headlamp dimmer (multi-function) switch. One side of the indicator bulb is grounded at all times. The other side of the bulb receives a battery feed through the contacts of the dimmer switch when the multi-function switch stalk is actuated to turn on the headlamp high beams. Refer to Group 8L - Lamps for more information.

LOW FUEL WARNING LAMP

A Light-Emitting Diode (LED) on the face of the fuel gauge unit will light when the fuel level falls below approximately 4 gallons. A low fuel warning module attached to the rear of the fuel gauge controls when the LED will light. When the module senses 66.5 ohms or more resistance from the fuel level sending unit for 10 continuous seconds, the LED will light. When the module senses 63.5 ohms or less resistance from the fuel level sending unit for 20 continuous seconds, the LED is turned off.

LOW OIL PRESSURE WARNING LAMP

The low oil pressure warning lamp lights with the ignition switch in the On position and the engine not running. The lamp should be off when the engine is running. Battery voltage is supplied to one side of the indicator bulb when the ignition switch is turned to the On position. The warning lamp side of the combination oil pressure switch/sending unit resistor coil is connected to the other side of the bulb. When normal engine oil pressure is applied to the sending unit, resistance on the warning lamp side of the resistor coil is high and the lamp goes off. When engine oil pressure is too low, resistance on the warning lamp side of the resistor coil is low, which causes the bulb to light.

LOW WASHER FLUID WARNING LAMP

The low washer fluid warning lamp indicates when the fluid level in the washer reservoir is too low. The washer fluid level sensor uses a float in the reservoir to monitor the fluid level. The up and/or down action of the float opens or closes the switch within the sensor that provides ignition-switched battery voltage to the lamp bulb. Refer to Group 8K - Wiper and Washer Systems for more information.

MALFUNCTION INDICATOR LAMP

The Check Engine or Malfunction Indicator Lamp (MIL) lights each time the ignition switch is turned to the On position, and stays on for three seconds as a bulb test. If the Powertrain Control Module (PCM) receives an incorrect signal or no signal from certain fuel or emission system related circuits or components, the lamp is turned on. This indicates that the PCM has recorded a Diagnostic Trouble Code (DTC) in electronic memory for a circuit or component malfunction. Refer to Group 14 - Fuel System for more information.

SEAT BELT REMINDER LAMP

The seat belt reminder lamp lights for four to eight seconds after the ignition switch is turned to the On position. A timer circuit within the chime/buzzer module controls ignition-switched battery feed to the

DESCRIPTION AND OPERATION (Continued)

lamp. Refer to Group 8U - Chime/Buzzer Warning Systems for more information.

TURN SIGNAL INDICATOR LAMPS

The left and right turn signal indicator lamps are controlled by the turn signal and hazard warning (multi-function) switches. One side of the bulb for each lamp is grounded at all times. The other side of the bulb receives a battery feed through the contacts of the multi-function switch when the turn signal lever (multi-function switch stalk) or hazard warning button is actuated. Refer to Group 8J - Turn Signal and Hazard Warning Systems for more information.

UPSHIFT INDICATOR LAMP

Vehicles equipped with a manual transmission may have an optional upshift indicator lamp. One side of the indicator lamp bulb receives ignition-switched battery feed. The ground feed for the other side of the lamp bulb is switched by the Powertrain Control Module (PCM). The lamp lights to indicate when the driver should shift to the next highest gear for best fuel economy. The PCM will turn the lamp off after 3 to 5 seconds if the upshift is not performed. The lamp will remain off until the vehicle stops accelerating and is brought back to the range of lamp operation, or until the transmission is shifted into another gear.

The indicator lamp is normally on when the ignition switch is in the On position, and is turned off when the engine is started. The lamp will be turned on and off during vehicle operation, according to the engine speed and load conditions that are being monitored by the PCM. Refer to Group 14 - Fuel System for more information on the PCM upshift indicator lamp control output.

DIAGNOSIS AND TESTING

PRINTED CIRCUITS

GAUGE CLUSTER

If an individual gauge or lamp is inoperative, see the diagnostic procedure under the heading for that gauge or lamp. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams. If more than one gauge or lamp is inoperative, perform the following:

(1) Check the fuse(s) in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse(s).

(2) Check for battery voltage at the fuse(s) with the ignition switch in the On position. If OK, go to Step 3. If not OK, repair the open circuit from the ignition switch and/or refer to Group 8D - Ignition Systems for testing of the ignition switch.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Disconnect the gauge cluster connector.

(4) Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavity of the cluster connector. If OK, go to Step 5. If not OK, repair the open circuit from the fuse as required.

(5) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Probe the ground circuit cavities of the cluster connector. Check for continuity to a good ground. There should be continuity. If OK, replace the faulty gauge cluster printed circuit. If not OK, repair the open circuit to ground as required.

TELL-TALE CLUSTER

If an individual indicator lamp is inoperative, see the diagnostic procedure under the heading for that lamp. If more than one indicator lamp or a combination of lamps and gauges in the gauge area of the instrument cluster is inoperative, see Gauge Cluster Printed Circuit diagnosis in this section.

For circuit diagrams and descriptions, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams. If more than one indicator lamp in the tell-tale area of the cluster is inoperative, perform the following:

(1) Check the fuse in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Check for battery voltage at the fuse with the ignition switch in the On position. If OK, go to Step 3. If not OK, repair the open circuit from the ignition switch and/or refer to Group 8D - Ignition Systems for testing of the ignition switch.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Unplug the cluster tell-tale connector.

(4) Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavities of the cluster tell-tale connector. If OK, go to Step 5. If not OK, repair the open circuit from the fuse as required.

(5) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Probe the ground circuit cavity of the cluster tell-tale connector. Check for continuity to a good ground. There should be continuity. If OK, replace the faulty cluster tell-tale printed circuit. If not OK, repair the open circuit to ground as required.

DIAGNOSIS AND TESTING (Continued)

COOLANT TEMPERATURE GAUGE

The diagnosis found here addresses an inoperative gauge condition. If the problem being diagnosed is related to gauge accuracy, be certain to confirm that the problem is with the gauge and not with cooling system performance. The actual engine coolant temperature should be checked with a test gauge or thermometer and compared to the gauge readings before you proceed with gauge diagnosis. Refer to Group 7 - Cooling System for more information. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. Disconnect the coolant temperature sending unit connector (Fig. 1). The gauge needle should move to the low end of the gauge scale. If OK, go to Step 2. If not OK, go to Step 3.

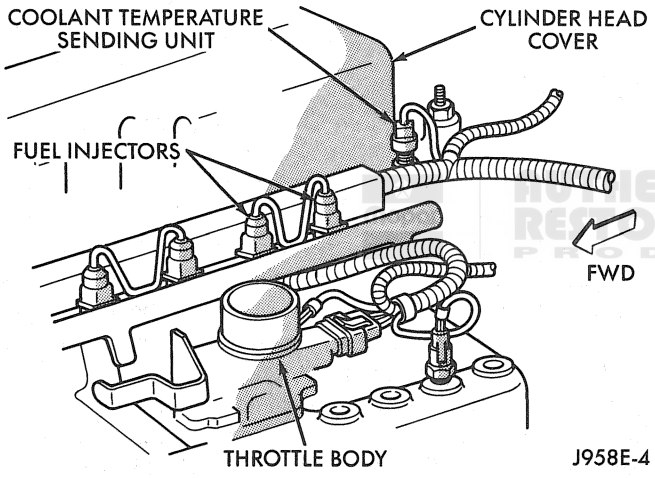


Fig. 1 Coolant Temperature Switch/Sending Unit - Typical

(2) Install a jumper wire from the sending unit connector to a good ground. The gauge needle should move to the high end of the gauge scale. If OK, replace the faulty sending unit. If not OK, remove the jumper wire and go to Step 3.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Disconnect the gauge cluster connector.

(4) Probe the engine coolant temperature (ECT) gauge sensor signal circuit cavity of the cluster connector. Check for continuity to a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the short circuit as required.

(5) Still probing the engine coolant temperature (ECT) gauge sensor signal circuit cavity of the cluster connector, check for continuity to the sending unit connector. There should be continuity. If OK, replace the faulty gauge. If not OK, repair the open circuit as required.

FUEL GAUGE

The diagnosis found here addresses an inoperative gauge condition. If the problem being diagnosed is related to gauge accuracy, be certain to confirm that the problem is with the gauge or sending unit and not with the fuel tank. Inspect the fuel tank for signs of damage or distortion that could affect the sending unit performance before you proceed with gauge diagnosis. Refer to Group 14 - Fuel System for more information. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. Disconnect the fuel pump module connector. The connector is located on top of the fuel tank. The gauge needle should move to the low end of the gauge scale. If OK, go to Step 2. If not OK, go to Step 4.

(2) Connect a jumper wire between the sending unit ground circuit cavity and the fuel level signal circuit cavity of the fuel pump module wiring connector. The gauge needle should move to the high end of the gauge scale. If OK, refer to Group 14 - Fuel System for the procedures to replace the faulty sending unit. If not OK, remove the jumper wire and go to Step 3.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Check for continuity between the sending unit ground circuit cavity of the fuel pump module wiring connector and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the circuit to ground as required.

(4) Remove the instrument cluster bezel and the cluster assembly. Disconnect the cluster connector.

(5) Probe the fuel level signal circuit cavity of the cluster connector. Check for continuity to a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the short circuit as required.

(6) Check for continuity between the fuel level signal circuit cavities of the cluster connector and the fuel pump module wiring connector. There should be continuity. If OK, replace the faulty gauge. If not OK, repair the open circuit as required.

OIL PRESSURE GAUGE

The diagnosis found here addresses an inoperative gauge condition. If the problem being diagnosed is related to gauge accuracy, be certain to confirm that the problem is with the gauge and not with the engine oiling system. The actual engine oil pressure should be checked with a test gauge and compared to the instrument cluster gauge readings before you proceed with gauge diagnosis. Refer to Group 9 - Engines for more information. For circuit descrip-

DIAGNOSIS AND TESTING (Continued)

tions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. Disconnect the oil pressure sending unit connector (Fig. 2). The gauge needle should move to the high end of the gauge scale. If OK, go to Step 2. If not OK, go to Step 3.

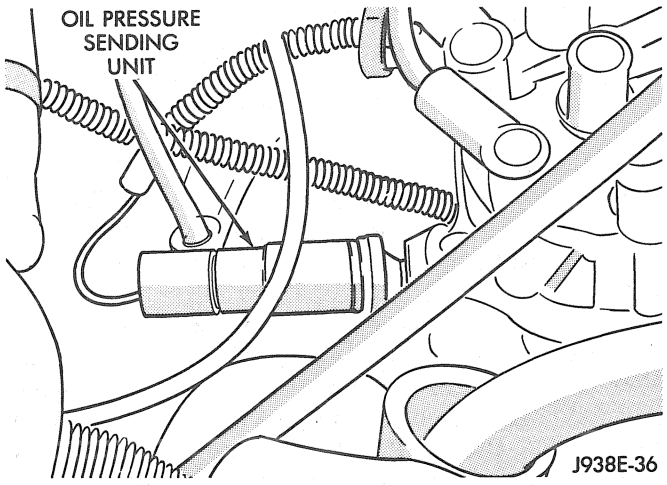


Fig. 2 Oil Pressure Switch/Sending Unit - Typical

(2) Install a jumper wire from the engine oil pressure switch sense circuit cavity of the sending unit connector to a good ground. The gauge needle should move to the low end of the gauge scale. If OK, replace the faulty sending unit. If not OK, remove the jumper wire and go to Step 3.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Disconnect the instrument cluster connector.

(4) Probe the engine oil pressure switch sense circuit cavity of the cluster connector and check for continuity to a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the short circuit as required.

(5) Check for continuity between the engine oil pressure switch sense circuit cavities of the cluster connector and the sending unit connector. There should be continuity. If OK, replace the faulty gauge. If not OK, repair the open circuit as required.

SPEEDOMETER/ODOMETER

The diagnosis found here addresses an inoperative gauge condition. If the problem being diagnosed is related to gauge accuracy, be certain to confirm that the problem is with the gauge and not with an incorrect speedometer pinion, axle ratio, or tire size. Refer to Group 21 - Transmission for more information. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Perform the vehicle speed sensor test as described in the appropriate Powertrain Diagnostic Procedures manual. If OK, go to Step 2. If not OK, replace the faulty vehicle speed sensor.

(2) Disconnect the battery negative cable. Unplug the vehicle speed sensor, the PCM connector B (white), and the daytime running lamp module (if equipped). Remove the instrument cluster bezel and the cluster assembly. Disconnect the instrument cluster connector.

(3) Probe the vehicle speed sensor signal circuit cavity of the cluster connector. Check for continuity to a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check for continuity between the vehicle speed sensor signal circuit cavities of the cluster connector and the vehicle speed sensor connector. There should be continuity. If OK, replace the faulty speedometer/odometer unit. If not OK, repair the open circuit as required.

TACHOMETER

For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) With the engine running, check for a tachometer signal at the tachometer signal circuit cavity of the PCM connector C (gray). See the Tachometer Calibration chart in Specifications at the back of this group for the frequency ranges. If OK, go to Step 2. If not OK, replace the faulty PCM.

(2) Disconnect the battery negative cable. Unplug the PCM connector C. Remove the instrument cluster bezel and the cluster assembly. Disconnect the instrument cluster connector.

(3) Probe the tachometer signal circuit cavity of the cluster connector. Check for continuity to a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check for continuity between the tachometer signal circuit cavities of the cluster connector and the PCM connector C. There should be continuity. If OK, replace the faulty tachometer. If not OK, repair the open circuit as required.

TRIP ODOMETER

If the trip odometer is inoperative, but the speedometer/odometer functions are unaffected, replace the faulty speedometer/odometer unit. If the speedometer/odometer functions are affected, see the diagnosis for Speedometer/Odometer in this group.

VOLTMETER

The diagnosis found here addresses an inoperative gauge condition. If the gauge accuracy is suspect, be certain to confirm proper charging system operation

DIAGNOSIS AND TESTING (Continued)

before considering gauge replacement. Refer to Group 8C - Charging System for more information. If no charging system problem is found, the following procedure will help diagnose an inaccurate gauge. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. The voltmeter should read battery voltage. If all gauges except the voltmeter are OK, go to Step 2. If the other gauges are inoperative, see the diagnosis for Printed Circuits in this group.

(2) Using an accurate test voltmeter, measure battery voltage at the battery. Compare this reading to the instrument cluster voltmeter reading. Now, see the Voltmeter Calibration chart in Specifications at the back of this group. If the voltmeter does not perform to the specifications, replace the faulty voltmeter.

ANTI-LOCK BRAKE SYSTEM LAMP

The diagnosis found here addresses an inoperative Anti-Lock Brake System (ABS) lamp condition. If the ABS lamp stays on with the ignition switch in the On position, or comes on and stays on while driving, refer to Group 5 - Brakes for diagnosis. If no ABS problem is found, the following procedure will help locate a short or open in the ABS lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster, and 8W-35 - Anti-Lock Brakes in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable. Remove the instrument cluster bezel and cluster assembly, but do not unplug the cluster connectors. Remove the ABS main relay from the PDC and disconnect the CAB connector A.

(2) Install a jumper wire between the ABS warning lamp driver circuit cavity of the cluster tell-tale connector and a good ground. Connect the battery negative cable and turn the ignition switch to the On position. The lamp should light. If OK, remove the jumper wire and go to Step 3. If not OK, replace the faulty bulb.

(3) Turn the ignition switch to the Off, position. Disconnect the battery negative cable and unplug the cluster tell-tale connector. Check for continuity between the ABS warning lamp driver circuit cavity of the cluster tell-tale connector and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check for continuity between the ABS warning lamp driver circuit cavities of the cluster tell-tale connector and the CAB connector A. There should be continuity. If OK, refer to Group 5 - Brakes for diagnosis of the ABS system. If not OK, repair the open circuit as required.

BRAKE WARNING LAMP

The diagnosis found here addresses an inoperative brake warning lamp condition. If the brake warning lamp stays on with the ignition switch in the On position and the parking brake released, refer to Group 5 - Brakes for diagnosis. If no service brake or parking brake problem is found, the following procedure will help locate a short circuit or faulty switch. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Unplug the park brake switch connector. Turn the ignition switch to the Start position. The lamp should light. Release the ignition switch to the On position. The lamp should go off. If OK, go to Step 10. If not OK, go to Step 2.

(2) Unplug the brake warning lamp switch connector. Install a jumper wire between the two cavities of the connector. Turn the ignition switch to the Start position. The lamp should light. Remove the jumper wire and the lamp should go off. If OK, replace the faulty brake warning switch. If not OK, remove the jumper wire and go to Step 3.

(3) Turn the ignition switch to the On position. Install a jumper wire between the brake warning lamp driver circuit (lamp side) cavity of the brake warning lamp switch connector and a good ground. The lamp should light. If OK, go to Step 5. If not OK, go to Step 4.

(4) Turn the ignition switch to the Off position. Remove the jumper wire and disconnect the battery negative cable. Remove the instrument cluster bezel and cluster assembly, but do not unplug the cluster connectors. Install a jumper wire between the brake warning lamp driver circuit cavity of the cluster tell-tale connector and a good ground. Connect the battery negative cable and turn the ignition switch to the On position. The lamp should light. If OK, repair the open circuit to the brake warning lamp switch. If not OK, replace the faulty bulb.

(5) Turn the ignition switch to the Off position and remove the jumper wire. Disconnect the battery negative cable. Check for continuity between the brake warning lamp driver circuit (ignition switch side) cavity of the brake warning lamp switch connector and a good ground with the ignition switch in the Start position. There should be continuity. If not OK, go to Step 6.

(6) Turn the ignition switch to the Off position and disconnect the battery negative cable. Unplug the ignition switch connector. Check for continuity between the brake warning lamp driver circuit cavity of the ignition switch connector and a good ground. There should be no continuity. If OK, go to Step 7. If not OK, repair the short circuit to the brake warning lamp switch as required.

DIAGNOSIS AND TESTING (Continued)

(7) Check for continuity between the brake warning lamp driver circuit cavities of the ignition switch connector and the brake warning lamp switch connector (ignition switch side). There should be continuity. If OK, go to Step 8. If not OK, repair the open circuit as required.

(8) Check for continuity between the metal steering column jacket and a good ground. There should be continuity. If OK, go to Step 9. If not OK, refer to Group 19 - Steering to check the steering column ground clip installation.

(9) Turn the ignition switch to the Start position and hold. Check for continuity between the brake warning lamp driver circuit terminal of the ignition switch and a good ground. There should be continuity. If not OK, replace the faulty ignition switch.

(10) Unplug the brake warning lamp switch connector. Check for continuity between the park brake switch connector and a good ground. There should be no continuity. If OK, go to Step 11. If not OK, repair the short circuit as required.

(11) Check for continuity between the park brake switch connector and the brake warning lamp driver circuit (lamp side) cavity of the brake warning lamp switch connector. There should be continuity. If OK, replace the faulty park brake switch. If not OK, repair the open circuit as required.

CLUSTER ILLUMINATION LAMPS

For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Check the fuse in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Turn the park lamps on with the headlamp switch. Rotate the headlamp switch knob counterclockwise to just before the interior lamps detent. Check for battery voltage at the fuse in the fuseblock module. Now, rotate the headlamp switch clockwise, while observing the test voltmeter. As the switch is rotated, the voltage should drop, until there are zero volts at the full clockwise stop. If OK, go to Step 3. If not OK, repair the open circuit to the headlamp switch or refer to Group 8L - Lamps to diagnose the headlamp switch.

(3) Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Unplug the cluster connector. Connect the battery negative cable. Turn the park lamps on with the headlamp switch. Rotate the headlamp switch knob counterclockwise to just before the interior lamps detent. Check for battery voltage at the panel lamps driver circuit cavity of the cluster connector. If OK, go to Step 4. If not OK, repair the open circuit to the fuseblock module as required.

(4) Turn the park lamps off. Disconnect the battery negative cable. Remove the fuse from the fuseblock module. Probe the panel lamps driver circuit cavity of the cluster connector. Check for continuity to a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the short circuit as required.

(5) Probe each of the two ground circuit cavities of the cluster connector and check for continuity to a good ground. There should be continuity. If OK, replace the faulty bulb(s). If not OK, repair the ground circuit as required.

COOLANT TEMPERATURE WARNING LAMP

The diagnosis found here addresses an inoperative lamp condition. If the problem being diagnosed is related to lamp accuracy, be certain to confirm that the problem is with the lamp and not with cooling system performance. The actual engine coolant temperature should be checked with a test gauge or thermometer before proceeding with lamp diagnosis. Refer to Group 7 - Cooling System for more information. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. Disconnect the coolant temperature switch connector (Fig. 3). Install a jumper wire between the switch connector and a good ground. The lamp should light. If OK, replace the faulty switch. If not OK, go to Step 2.

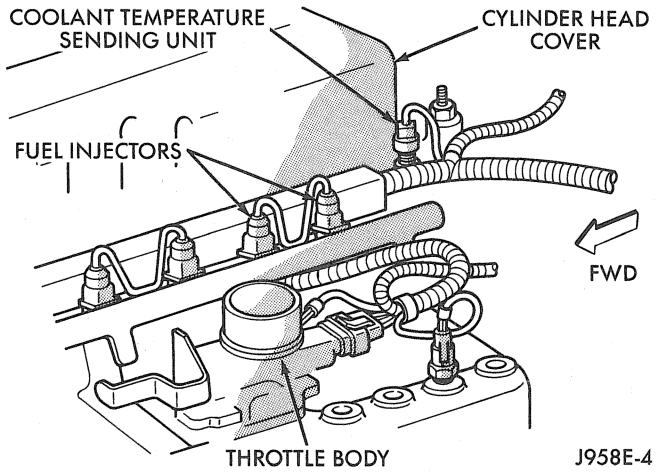


Fig. 3 Coolant Temperature Switch/Sending Unit - Typical

(2) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Unplug the coolant temperature switch connector. Remove the instrument cluster bezel and the cluster assembly. Disconnect the cluster connector. Check for continuity between the engine coolant temperature (ECT) sensor signal circuit cavity of the cluster connector

DIAGNOSIS AND TESTING (Continued)

and a good ground. There should be no continuity. If OK, go to Step 3. If not OK, repair the short circuit as required.

(3) Check for continuity between the engine coolant temperature (ECT) sensor signal circuit cavity of the cluster connector and the coolant temperature switch connector. There should be continuity. If OK, replace the faulty bulb. If not OK, repair the open circuit as required.

FOUR-WHEEL DRIVE INDICATOR LAMPS

The diagnosis found here addresses an inoperative four-wheel drive indicator lamp condition. If the problem being diagnosed is related to lamp accuracy, be certain to confirm that the problem is with the lamp or switch and not with a damaged or inoperative transmission or transfer case. Refer to Group 21 - Transmission for more information. If no transmission or transfer case problem is found, the following procedure will help locate a short or open in the indicator lamp circuit. For circuit diagrams and descriptions, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Apply the parking brake and start the engine with the transfer case gearshift selector lever in a 4WD Lock or 4WD position.

(2) Unplug the transfer case switch connector and check for continuity between the ground circuit cavity of the switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit to ground as required.

(3) Turn the ignition switch to the On position. Install a jumper wire between the 4WD lock circuit cavity and/or the 4WD full time circuit cavity (if equipped) of the transfer case switch connector and a good ground. The lamp should light. If OK, replace the faulty switch. If not OK, go to Step 4.

(4) Remove the instrument cluster bezel and the tell-tale cluster, but do not unplug the telltale connector. Turn the ignition switch to the On position. Install a jumper wire between a good ground and the 4WD lock circuit cavity and/or the 4WD full time circuit cavity of the tell-tale connector. The lamp should light. If OK, repair the open circuit to the transfer case switch as required. If not OK, replace the faulty bulb.

GENERATOR WARNING LAMP

The diagnosis found here addresses an inoperative lamp condition. If the generator warning lamp comes on or stays on with the engine running, refer to Group 8C - Charging System for diagnosis. If no charging system problem is found, the following procedure will help locate a short or open in the generator warning lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable and unplug the PCM connector C (gray). Install a jumper wire between the generator lamp driver circuit cavity of the PCM connector and a good ground. Connect the battery negative cable and turn the ignition switch to the On position. The lamp should light. Unplug the jumper wire and the lamp should go off. If OK, refer to the Powertrain Diagnostic Procedures to check the PCM. If not OK, go to Step 2.

(2) Turn the ignition switch to the Off position and disconnect the battery negative cable. The PCM connector C is still unplugged. Remove the instrument cluster bezel and the instrument cluster. Do not unplug the telltale cluster connector. Install a jumper wire between the generator lamp driver circuit cavity of the telltale cluster connector and a good ground. Connect the battery negative cable and turn the ignition switch to the On position. The lamp should light. If OK, go to Step 3. If not OK, replace the faulty bulb.

(3) Turn the ignition switch to the Off position and disconnect the battery negative cable. The PCM connector C is still unplugged. Unplug the telltale cluster connector. Probe the generator lamp driver circuit cavity of the message center connector and check for continuity to a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check for continuity between the generator lamp driver circuit cavities of the message center connector and the PCM connector C. There should be continuity. If not OK, repair the open circuit as required.

HEADLAMP HIGH BEAM INDICATOR LAMP

The diagnosis found here addresses an inoperative headlamp high beam indicator lamp condition. If the problem being diagnosed is related to inoperative headlamp high beams, refer to Group 8L - Lamps for diagnosis of the headlamp system. If no headlamp system problems are found, the following procedure will help locate an open in the high beam indicator lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Unplug the cluster printed circuit connector.

(2) Connect the battery negative cable. Turn the headlamps on and select the high beams with the multi-function switch stalk. Check for battery voltage at the high beam indicator driver circuit cavity of the printed circuit connector. If OK, replace the faulty

DIAGNOSIS AND TESTING (Continued)

bulb. If not OK, repair the open circuit to the headlamp dimmer (multi-function) switch as required.

LOW FUEL WARNING LAMP

The diagnosis found here addresses an inoperative low fuel warning lamp condition. If the problem being diagnosed is related to lamp accuracy, be certain to confirm the problem is the with the low fuel warning lamp and not with the fuel gauge circuit. See the diagnosis for the Fuel Gauge, in this group. If no fuel gauge problem is found, the following procedure will help to identify a faulty low fuel warning lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Check that the fuel gauge is operating as designed. See the diagnosis for Fuel Gauge in this group. If OK, go to Step 2.

(2) With at least 10 gallons of fuel in the fuel tank, unplug the fuel tank sending unit wiring connector. Turn the ignition switch to the On position and wait 10 seconds. The lamp (LED) should light. Reconnect the fuel tank sending unit and wait 20 seconds. The lamp (LED) should go off. If not OK, replace the faulty low fuel warning lamp module.

LOW OIL PRESSURE WARNING LAMP

The diagnosis found here addresses an inoperative lamp condition. If the problem being diagnosed is related to lamp accuracy, be certain to confirm that the problem is with the lamp and not with the engine oiling system. The actual engine oil pressure should be checked with a test gauge before you proceed with lamp diagnosis. Refer to Group 9 - Engines for more information. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. Disconnect the oil pressure sending unit connector (Fig. 4). Install a jumper wire between the oil pressure switch sense circuit cavity of the sending unit connector and a good ground. The lamp should light. Remove the jumper wire and the lamp should go off. If OK, replace the faulty sending unit. If not OK, go to Step 2.

(2) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Disconnect the cluster printed circuit connector.

(3) Probe the oil pressure switch sense circuit cavity of the cluster connector and check for continuity to a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check for continuity between the oil pressure switch sense circuit cavities of the cluster connector and the sending unit wire connector. There should be continuity. If OK, replace the faulty bulb. If not OK, repair the open circuit as required.

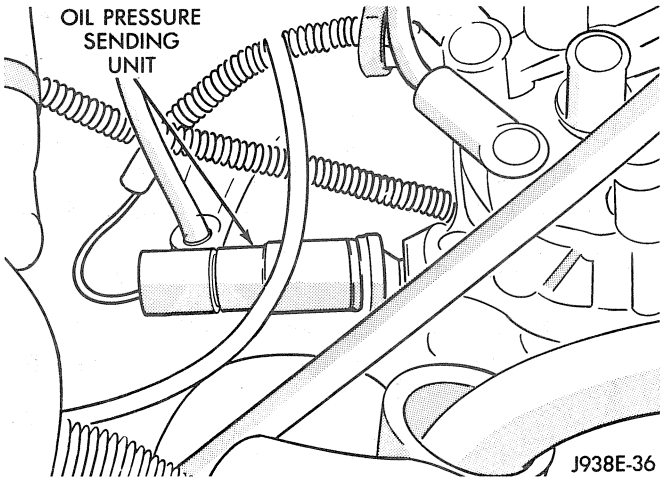


Fig. 4 Oil Pressure Switch/Sending Unit - Typical

LOW WASHER FLUID WARNING LAMP

The diagnosis found here addresses an inoperative low washer fluid warning lamp condition. If the problem being diagnosed is related to lamp accuracy, be certain to confirm that the problem is with the lamp or switch and not with a damaged or empty washer fluid reservoir. Inspect the reservoir for proper fluid level and signs of damage or distortion that could affect switch performance before you proceed with lamp diagnosis. Refer to Group 8K - Wiper and Washer Systems for more information. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Check the fuse in the Power Distribution Center (PDC). If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fuse in the PDC. If OK, go to Step 3. If not OK, repair the open circuit to the ignition switch as required.

(3) Unplug the washer fluid level switch connector. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavity of the washer fluid level switch connector. If OK, turn the ignition switch to the Off position and go to Step 4. If not OK, repair the open circuit to the PDC as required.

(4) Install a jumper wire between the fused ignition switch output circuit cavity and the washer fluid switch sense circuit cavity of the washer fluid level switch connector. Turn the ignition switch to the On position. The lamp should light. Disconnect the jumper wire and the lamp should go off. If OK, replace the faulty washer fluid level switch. If not OK, reinstall the jumper wire and go to Step 5.

DIAGNOSIS AND TESTING (Continued)

(5) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Unplug the cluster tell-tale connector. Turn the ignition switch to the On position. Check for battery voltage at the washer fluid switch sense circuit cavity of the tell-tale connector. If OK, replace the faulty bulb. If not OK, repair the open circuit to the washer fluid level switch as required.

MALFUNCTION INDICATOR LAMP

The diagnosis found here addresses an inoperative lamp condition. If the lamp comes on and stays on with the engine running, refer to Group 14 - Fuel System for diagnosis. If no fuel or emission system problem is found, the following procedure will help locate a short or open in the lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable. Unplug the PCM connector C (gray). Install a jumper wire between the malfunction indicator lamp driver circuit cavity of the PCM connector C and a good ground. Connect the battery negative cable. Turn the ignition switch to the On position. The lamp should light. Remove the jumper wire and the lamp should go off. If OK, refer to the Powertrain Diagnostic Procedures to diagnose the PCM. If not OK, go to Step 2.

(2) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Install a jumper wire between the malfunction indicator lamp driver circuit cavity of the cluster tell-tale connector and a good ground. Connect the battery negative cable. Turn the ignition switch to the On position. The lamp should light. If OK, go to Step 3. If not OK, replace the faulty bulb.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Unplug the cluster tell-tale connector. Check for continuity between the malfunction indicator lamp driver circuit cavity of the tell-tale connector and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check continuity between the malfunction indicator lamp driver circuit cavities of the tell-tale connector and the PCM connector C. There should be continuity. If not OK, repair the open circuit as required.

SEAT BELT REMINDER LAMP

The diagnosis found here addresses an inoperative lamp condition. If the lamp comes on and stays on, refer to Group 8U - Chime/Buzzer Warning Systems for diagnosis. If no warning system problem is found, the following procedure will help locate a short or open in the lamp circuit. For circuit descriptions and diagrams, refer to 8W-46 - Message Center in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Unplug the cluster tell-tale connector. Check for continuity between the ground circuit cavity of the tell-tale connector and a good ground. There should be continuity. If OK, plug the tell-tale connector back into the cluster and go to Step 2. If not OK, repair the open circuit as required.

(2) Connect the battery negative cable. Install a jumper wire between a 12-volt battery feed source and the seat belt lamp driver circuit cavity of the tell-tale connector. The lamp should light. If OK, go to Step 3. If not OK, replace the faulty bulb.

(3) Disconnect the battery negative cable. Unplug the chime/buzzer module from the fuseblock module. Unplug the cluster tell-tale connector. Check for continuity between the seat belt lamp driver circuit cavity of the tell-tale connector and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check continuity between the seat belt lamp driver circuit cavities of the tell-tale connector and the fuseblock module. There should be continuity. If not OK, repair the open circuit as required.

TURN SIGNAL INDICATOR LAMPS

The diagnosis found here addresses an inoperative lamp condition. For any other turn signal problem, refer to Group 8J - Turn Signal and Hazard Warning Systems for diagnosis. If no turn signal or hazard warning system problem is found, the following procedure will help locate a short or open in the indicator lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Probe the ground circuit cavity of the cluster connector. Check for continuity to a good ground. There should be continuity. If OK, go to Step 2. If not OK, repair the open circuit as required.

(2) Connect the battery negative cable. Install a jumper wire from the left turn signal circuit or the right turn signal circuit cavity of the cluster connector to a 12-volt battery feed. The lamp should light. If OK, go to Step 3. If not OK, replace the faulty bulb.

(3) Disconnect the battery negative cable. Check for continuity between the left turn signal circuit or the right turn signal circuit cavity of the cluster connector and the left turn signal circuit or the right turn signal circuit cavity of the bulkhead disconnect. There should be continuity. If OK, refer to Group 8J -

DIAGNOSIS AND TESTING (Continued)

Turn Signal and Hazard Warning Systems for further diagnosis. If not OK, repair the open circuit as required.

UPSHIFT INDICATOR LAMP

The diagnosis found here addresses an inoperative lamp condition. If the lamp comes on and stays on with the engine running, refer to Group 14 - Fuel System for the procedure for diagnosis of the Powertrain Control Module. If no fuel or emission system problem is found, the following procedure will help locate a short or open in the lamp circuit. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster in Group 8W - Wiring Diagrams.

(1) Disconnect the battery negative cable. Unplug the PCM connector B (white). Install a jumper wire between the up-shift lamp driver circuit cavity of the PCM connector B and a good ground. Connect the battery negative cable. Turn the ignition switch to the On position. The lamp should light. Remove the jumper wire and the lamp should go off. If OK, refer to the Powertrain Diagnostic Procedures to diagnose the PCM. If not OK, go to Step 2.

(2) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel and the cluster assembly. Install a jumper wire between the up-shift lamp driver circuit cavity of the cluster tell-tale connector and a good ground. Connect the battery negative cable. Turn the ignition switch to the On position. The lamp should light. If OK, go to Step 3. If not OK, replace the faulty bulb.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Unplug the cluster tell-tale connector. Check for continuity between the up-shift lamp driver circuit cavity of the tell-tale connector and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the short circuit as required.

(4) Check continuity between the up-shift lamp driver circuit cavities of the tell-tale connector and the PCM connector B. There should be continuity. If not OK, repair the open circuit as required.

REMOVAL AND INSTALLATION

INSTRUMENT CLUSTER

(1) Disconnect the battery negative cable.

(2) Remove the upper and lower steering column shrouds and the steering column to instrument panel bezel gap hider. If equipped with tilt steering, apply tape to the tilt mechanism on top of the steering column to protect the instrument panel bezel from damage during removal.

(3) Remove the four instrument cluster bezel attaching screws and remove the bezel. The bezel is snap fit at the locations shown in the illustration (Fig. 5).

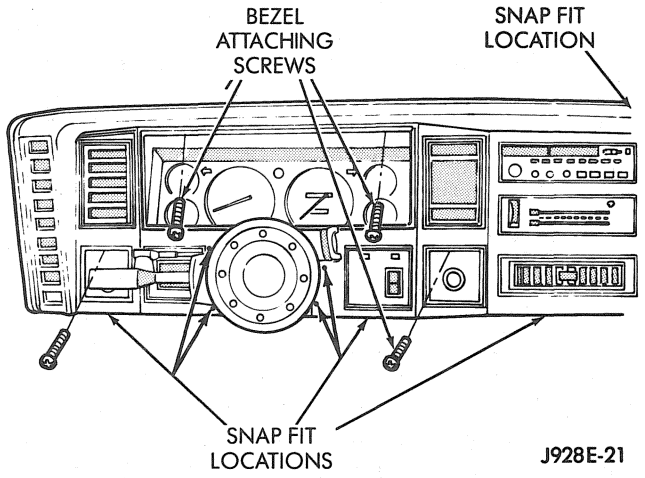


Fig. 5 Instrument Cluster Bezel Remove/Install

(4) Remove the cigar lighter housing attaching screws (Fig. 6).

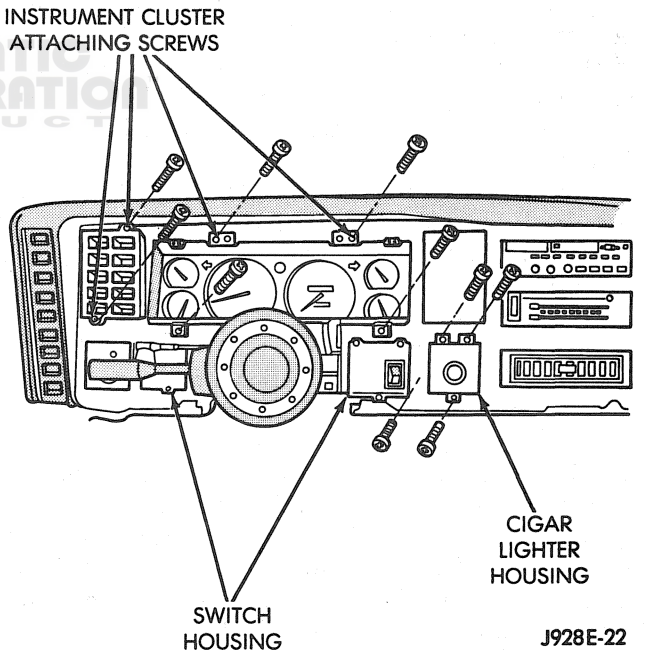


Fig. 6 Instrument Cluster Remove/Install

(5) If equipped, remove the attaching screws for the switch housing(s).

(6) Remove the instrument cluster attaching screws.

(7) Pull the cluster assembly far enough out to disconnect the two cluster harness connectors from the rear of the cluster. Remove the cluster assembly.

(8) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

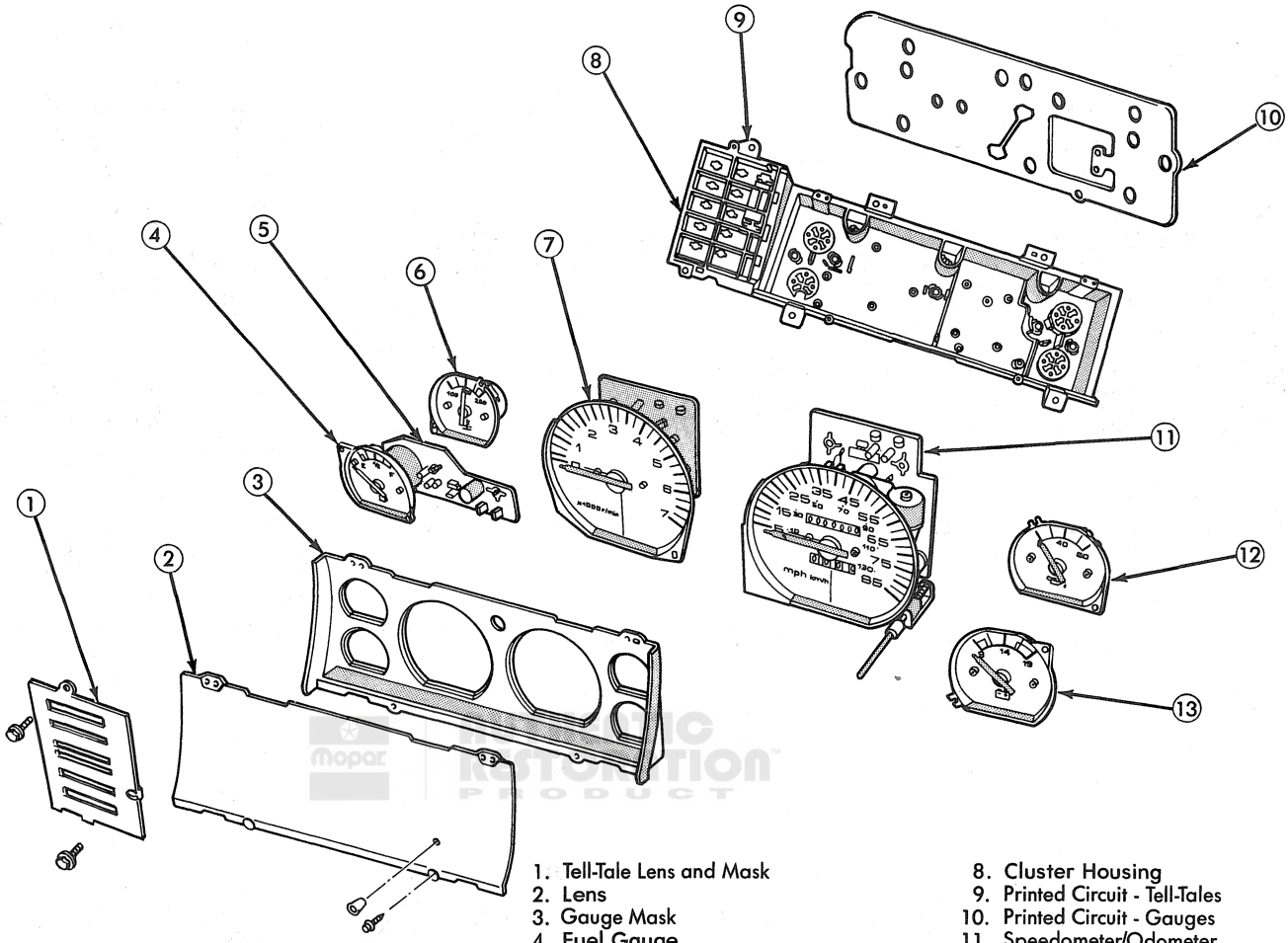


Fig. 7 Instrument Cluster

GAUGES

(1) Remove the instrument cluster assembly as described in this group.

(2) If equipped with a trip odometer, gently pull the knob off of the trip odometer push pin. Remove the cluster lens and mask (Fig. 7).

(3) Remove the gauge mounting screws from the rear of the cluster housing (Fig. 8). Remove the gauge from the front of the cluster housing.

(4) Reverse the removal procedures to install.

PRINTED CIRCUITS

GAUGE CLUSTER

(1) Remove the instrument cluster assembly as described in this group.

(2) Remove all of the gauge mounting screws from the rear of the gauge cluster housing as described in this group.

(3) Remove the screw holding the cluster connector retaining strap to the cluster housing (Fig. 9). Remove the strap and pivot the connector down (Fig. 10).

(4) Remove all of the bulb holders from the printed circuit.

(5) Remove the printed circuit, including the connector.

(6) Reverse the removal procedures to install.

TELL-TALE CLUSTER

(1) Remove the instrument cluster assembly as described in this group.

(2) Remove all of the lamp holders from the tell-tale printed circuit.

REMOVAL AND INSTALLATION (Continued)

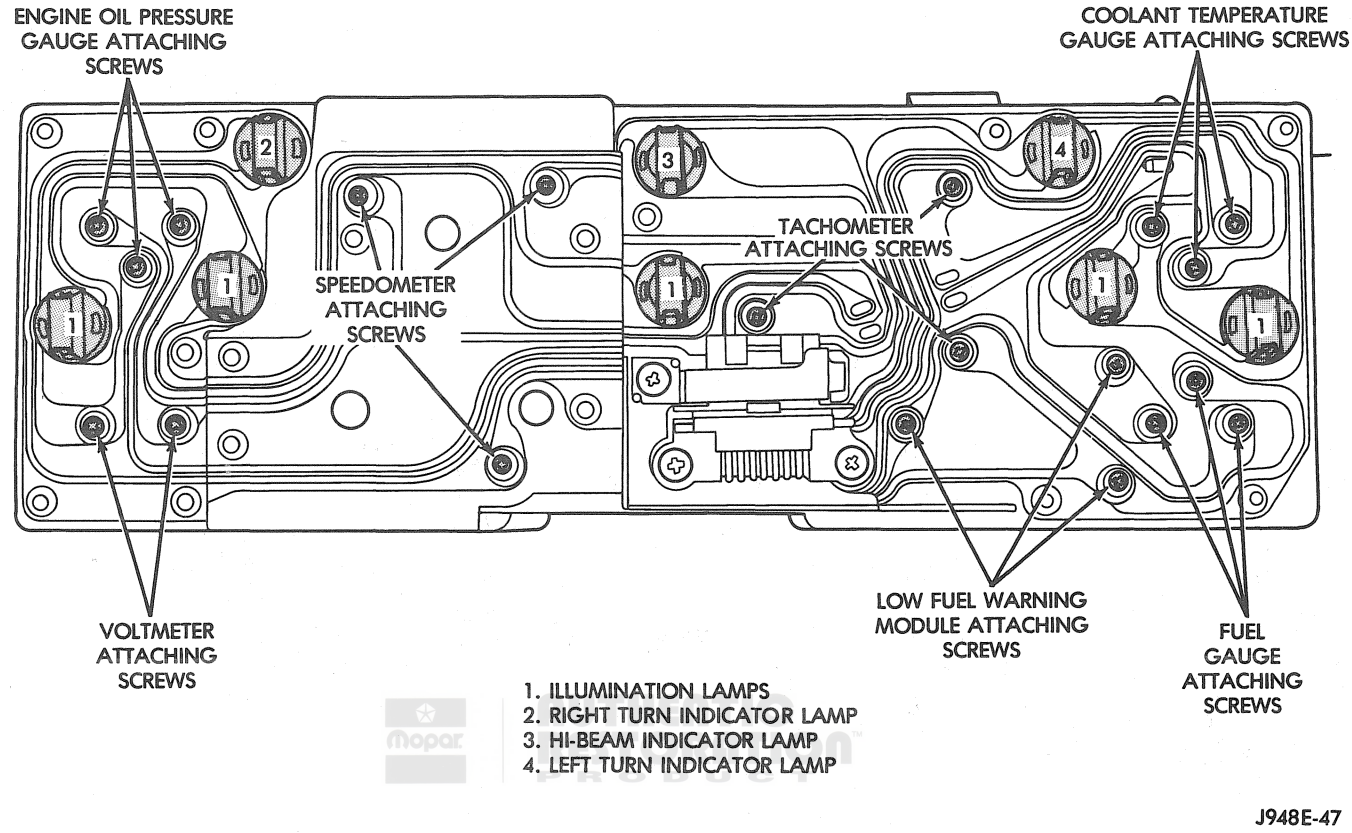


Fig. 8 Printed Circuit Remove/Install

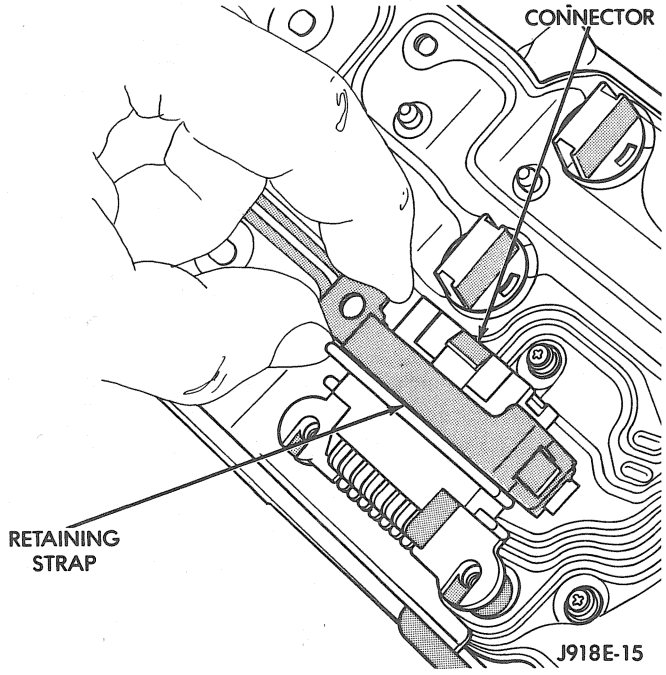


Fig. 9 Cluster Connector Retaining Strap

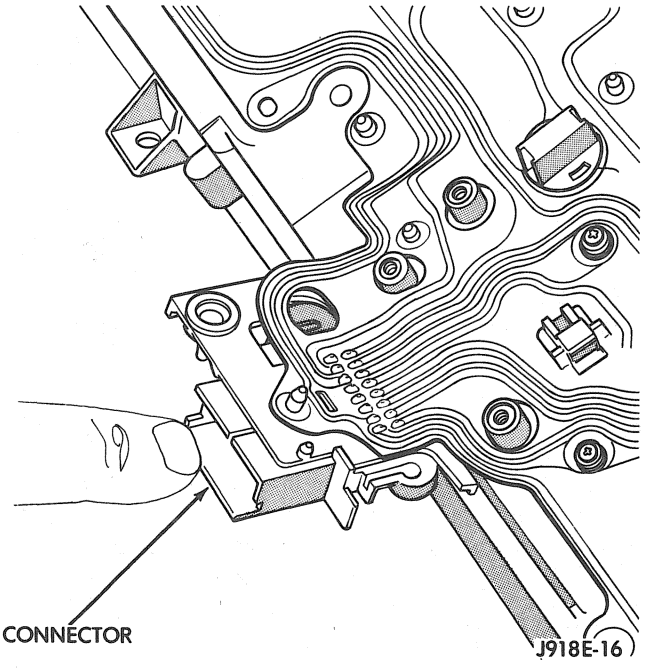


Fig. 10 Printed Circuit and Cluster Connector

(3) Remove the printed circuit.
(4) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

HEADLAMP SWITCH

(1) Disconnect the battery negative cable.

(2) Place the headlamp switch control knob in the On position.

(3) Reach under the instrument panel and depress the switch shaft release/retainer button (Fig. 11). Pull the switch control knob and shaft outward.

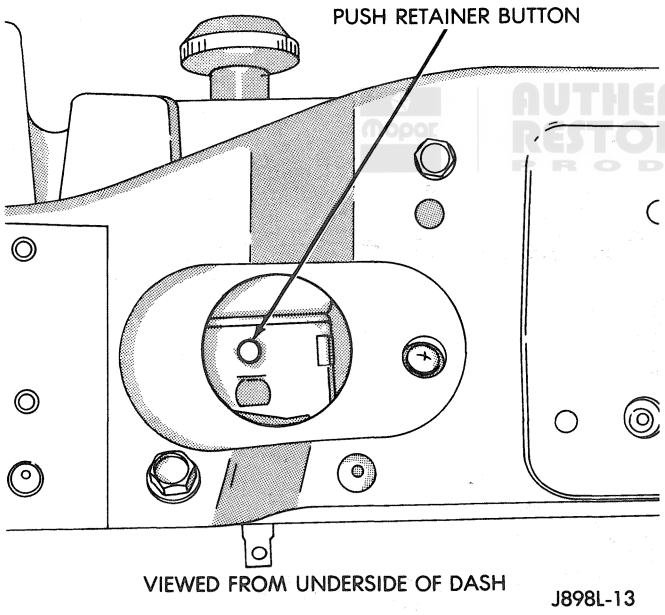


Fig. 11 Headlamp Switch Knob and Shaft Remove/ Install

(4) Remove the headlamp switch retaining nut from the front of the instrument panel (Fig. 12).

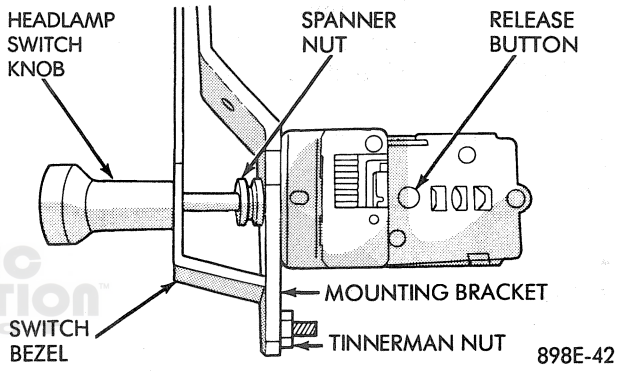


Fig. 12 Headlamp Switch Remove/Install

(5) Disconnect the wire harness connector from the switch.

(6) Remove the headlamp switch from the instrument panel.

(7) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

INSTRUMENT PANEL

(1) Disconnect the battery negative cable.
(2) Remove the following (Fig. 13):

- Parking brake release handle
- Lower heat-A/C duct below steering column
- Ash receiver
- Lower instrument panel
- Cluster bezel
- Cluster assembly
- Radio
- Climate control panel
- Instrument panel switches
- Headlamp switch
- Unplug antenna connector
- Blower motor resistors
- Ground lead
- Unplug glove box lamp
- Defroster cowl outlet panel
- Instrument panel attaching bolts
- Steering column attaching bolts
- Instrument panel assembly.

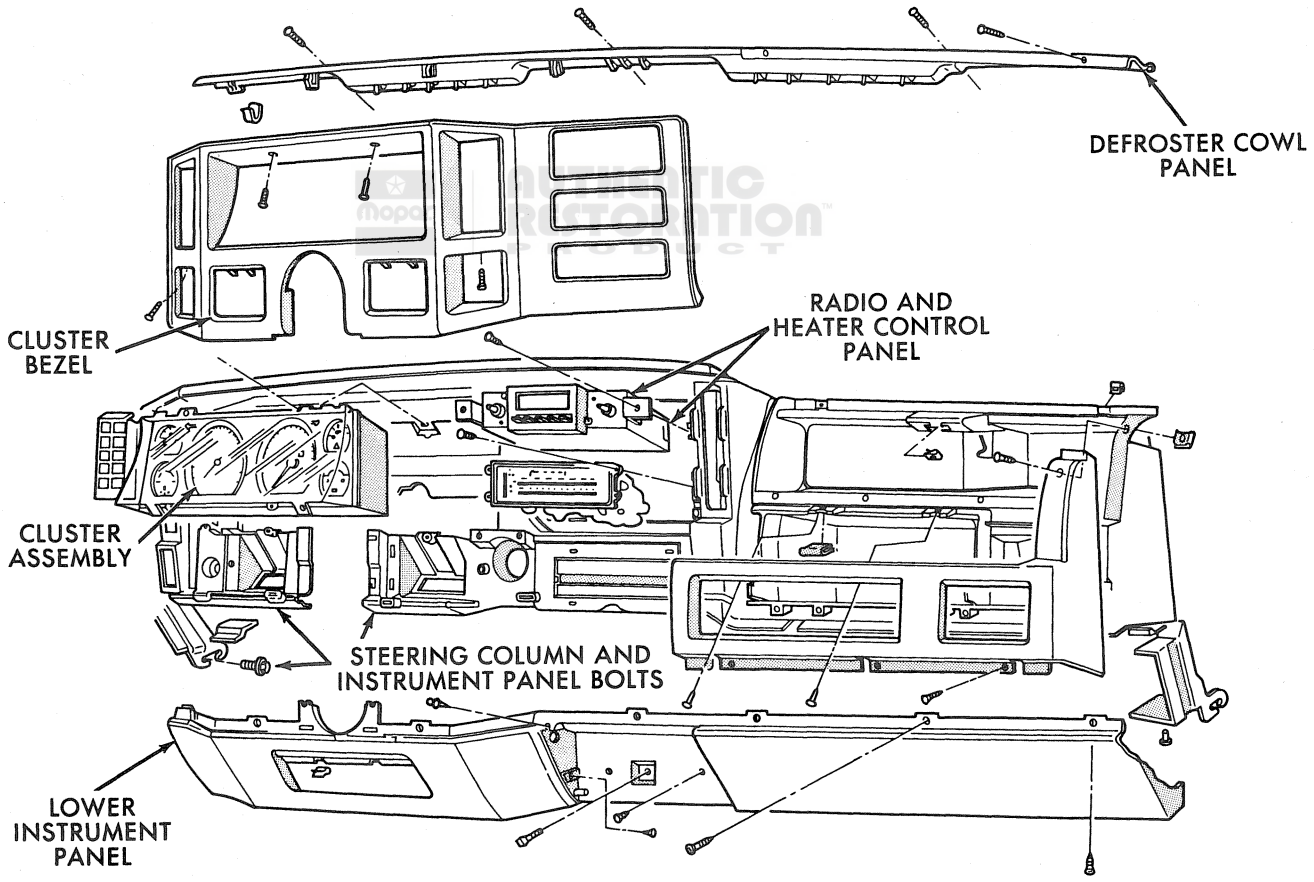


Fig. 13 Instrument Panel Exploded View

REMOVAL AND INSTALLATION (Continued)

NOTE: Remove the driver's side heat-A/C outlet to gain access to the driver's side defroster cowl outlet panel retaining clip (Fig. 14).

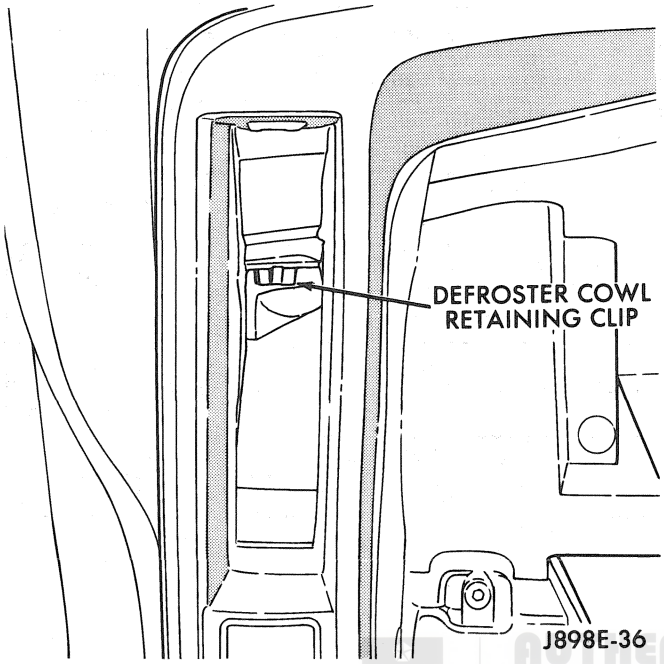


Fig. 14 Driver's Side Defroster Cowl Retaining Clip

(3) To install the instrument panel, position the instrument panel assembly on the cowl side mounting bolts (Fig. 15).

NOTE: The instrument panel wiring harness is attached to the back of the instrument panel assembly and must be installed correctly.

(4) Route the wiring harnesses and secure the instrument panel assembly mounting points.

(5) Connect the tube to the lap cooler.

(6) Reverse the removal procedures to complete the installation.

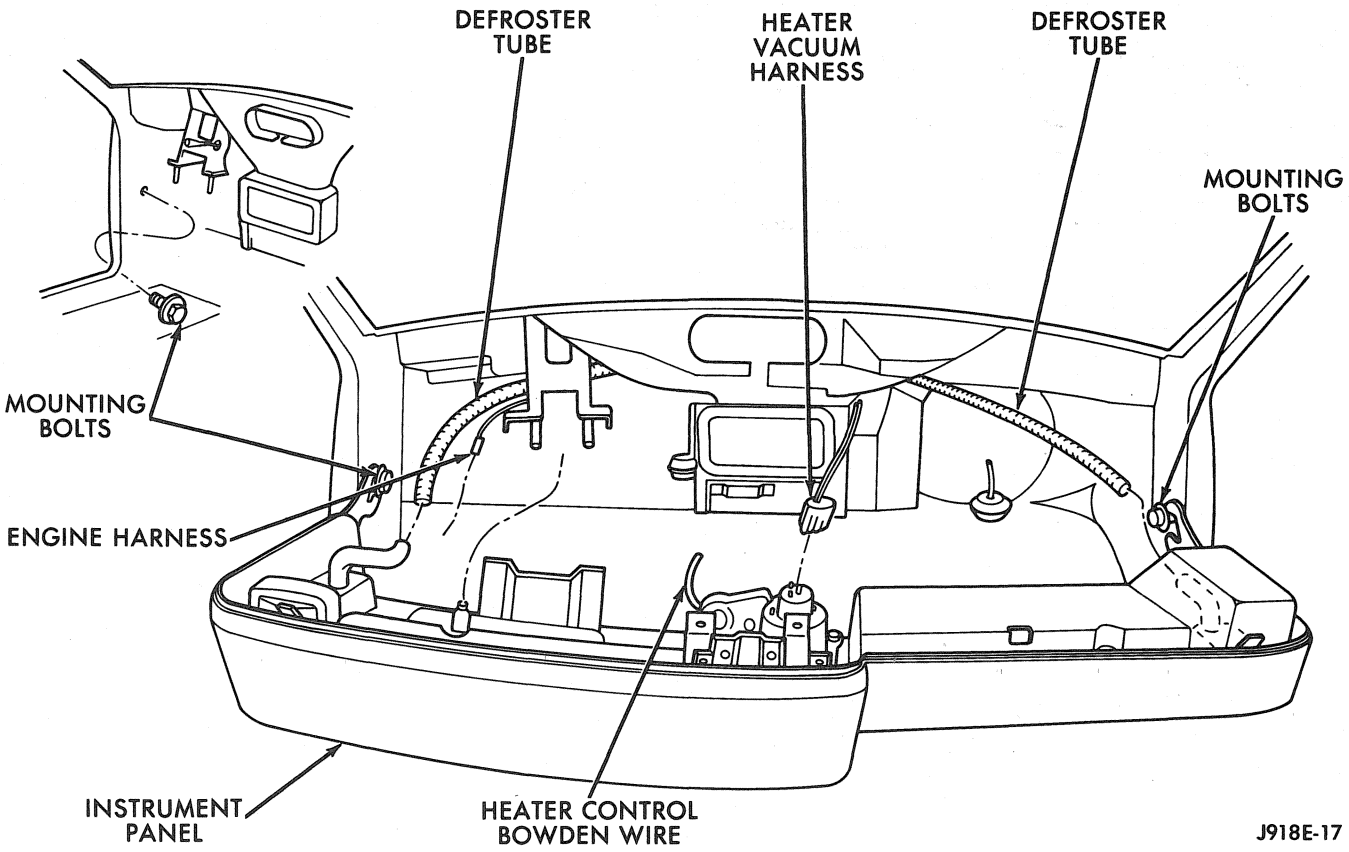


Fig. 15 Instrument Panel Install

SPECIFICATIONS

GAUGE CALIBRATION

Fuel Gauge Calibration	
Pointer Position	**Resistance**
Empty Graduation (+0° / -4°)	105 ohms
Full Graduation (+6° / -0°)	5 ohms
1/2 Graduation (±3.5°)	33 ohms

Oil Pressure Gauge Calibration	
Pointer Position	**Resistance**
0 psi Graduation (±2°)	1 ohm
40 psi Graduation (±3.5°)	46 ohms
80 psi Graduation (±3°)	87 ohms

Speedometer Calibration	
Pointer Position	**Frequency**
20 mph (+4.5 / -1.5)	44.4 Hz
55 mph (+3.3 / -0.3)	122.2 Hz
75 mph (+3.3 / -0.3)	166.5 Hz

Tachometer Calibration	
Pointer Position	**Frequency**
2000 rpm (±140)	66.7 Hz
5000 rpm (±140)	166.7 Hz

Temperature Gauge Calibration	
Pointer Position	**Resistance**
100°F Graduation (±3.5°)	1365 ohms
220°F Graduation (±2.5°)	93.5 ohms
260°F Graduation (±2.5°)	55.1 ohms

Voltmeter Calibration	
Pointer Position	**Input Voltage**
12 Graduation (±6°)	12 volts
16 Graduation (±3°)	16 volts

AUDIO SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
ANTENNA	2
IGNITION-OFF DRAW FUSE	1
IN-LINE FUSE	1
RADIO ILLUMINATION RELAY	1
RADIO NOISE SUPPRESSION	2
RADIOS	1
SPEAKERS	2
DIAGNOSIS AND TESTING	
ANTENNA	5
AUDIO SYSTEM	3
RADIO FREQUENCY INTERFERENCE	6
RADIO ILLUMINATION RELAY	4
RADIO	4
SPEAKER	5
REMOVAL AND INSTALLATION	
ANTENNA	9
RADIO ILLUMINATION RELAY	7
RADIO	6
SOUND BAR	8
SPEAKER	7

GENERAL INFORMATION

INTRODUCTION

Following are general descriptions of the major components used in both the standard and optional equipment audio systems. Refer to 8W-47 Audio System in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

RADIOS

Radio options include an AM/FM stereo or an AM/FM stereo/cassette receiver. All receivers are stereo Electronically-Tuned Radios (ETR) and include a clock function. For more information on radio features, setting procedures, and control functions, refer to the owner's manual in the vehicle glove box.

IN-LINE FUSE

When the ignition switch is in the On or Accessory position, the radio receives battery feed through a fuse in the fuseblock module. However, there is also an additional in-line fuse in the back of each radio chassis. The in-line fuse will blow to protect the vehicle electrical system in the event of an internal radio failure (Fig. 1). If the radio fails to operate, and the fuses in the fuseblock module and power distribution center are okay, be certain to check the condition of the in-line fuse before attempting further audio system diagnosis.

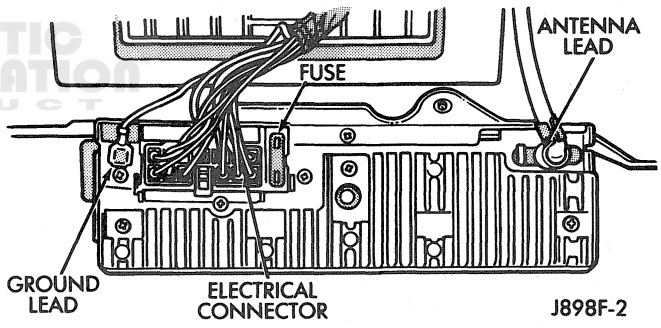


Fig. 1 In-Line Radio Fuse

IGNITION-OFF DRAW FUSE

All vehicles are equipped with an Ignition-Off Draw (IOD) fuse that is removed when the vehicle is shipped from the factory. This fuse feeds various accessories that require current when the ignition switch is in the Off position, including the clock and radio station preset memory functions. The fuse is removed to prevent battery discharge during vehicle storage.

The IOD fuse should be checked if the radio station preset memory or clock functions are erratic or inoperative. The IOD fuse is located in the Power Distribution Center (PDC). Refer to the PDC label for IOD fuse identification and location.

RADIO ILLUMINATION RELAY

The radio illumination relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, cur-

DESCRIPTION AND OPERATION (Continued)

rent capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The radio illumination relay controls the source of battery feed for radio/clock display illumination. When the headlamp switch is in the off position, the radio illumination relay coil is de-energized. When the relay is de-energized, the radio/clock display receives full battery voltage through the normally closed contacts of the relay. This results in the radio/clock display being illuminated at full brightness for easier visibility in daylight.

When the park lamps or headlamps are on, the radio illumination relay coil is energized. With the relay energized, the normally closed contacts of the relay open, and the normally open contacts of the relay close. This causes the radio/clock display to receive battery feed through the panel lamps dimmer switch. The radio/clock display illumination brightness can now be adjusted with the other panel lamps for night visibility.

The radio illumination relay is located in the relay center. The relay center is attached to the driver's side lower instrument panel reinforcement, just inboard of the steering column.

SPEAKERS

Speaker system options include two, four or six speaker locations. On two-speaker systems, one speaker is located in each front door. Four-speaker systems add one speaker at each end of a rear-mounted overhead sound bar. The premium six-speaker option upgrades all of the speakers in the above locations to premium models, and adds one premium tweeter at each end of the lower instrument panel.

ANTENNA

All models use a fixed-length, stainless steel rod-type antenna mast, installed at the right front fender of the vehicle. The antenna mast is connected to the center wire of the coaxial antenna cable, and is not grounded to any part of the vehicle.

To eliminate static, the antenna base must have a good ground. The coaxial antenna cable shield (the outer wire mesh of the cable) is grounded to the antenna base, and to the radio chassis.

The factory installed ETRs automatically compensate for radio antenna trim. Therefore, no antenna trimmer adjustment is required, or possible, when replacing the receiver or the antenna.

RADIO NOISE SUPPRESSION

Radio Frequency Interference (RFI) and Electro-Magnetic Interference (EMI) noise suppression is accomplished primarily through circuitry internal to the radio receivers. These internal suppression devices are only serviced as part of the radio receiver.

External suppression devices that are serviced, and should be checked in the case of RFI or EMI noise complaints, include the following:

- Radio antenna base ground
- Radio chassis ground strap or bracket
- Engine-to-body ground strap (if equipped)
- Resistor-type spark plugs
- Radio suppression-type secondary ignition wiring.

In addition, if the source of RFI or EMI noise is identified as a component on the vehicle (i.e., generator, blower motor, etc.), the ground path for that component should be checked. If excessive resistance is found in that circuit, repair that circuit as required before considering any component replacement.

Fleet vehicles are available with an extra-cost RFI-suppressed Powertrain Control Module (PCM). This unit reduces interference generated by the PCM on some radio frequencies used in two-way radio communications. However, this unit will not resolve complaints of RFI in the commercial AM or FM radio frequency ranges.

DIAGNOSIS AND TESTING

AUDIO SYSTEM

Audio System Diagnosis		
CONDITION	**POSSIBLE CAUSE**	**CORRECTION**
NO AUDIO.	1. Fuse faulty. 2. Radio connector faulty. 3. Wiring faulty. 4. Ground faulty. 5. Radio faulty. 6. Speakers faulty.	1. Check radio fuses in fuseblock module and radio chassis. Replace fuses, if required. 2. Check for loose or corroded radio connector. Repair, if required. 3. Check for battery voltage at radio connector. Repair wiring, if required. 4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required. 5. Exchange or replace radio, if required. 6. See speaker diagnosis, in this group.
NO DISPLAY.	1. Fuse faulty. 2. Radio connector faulty. 3. Wiring faulty. 4. Ground faulty. 5. Illumination relay faulty. 6. Radio faulty.	1. Check radio fuses in fuseblock module. Replace fuses, if required. 2. Check for loose or corroded radio connector. Repair, if required. 3. Check for battery voltage at radio connector. Repair wiring, if required. 4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required. 5. See radio illumination relay diagnosis in this group. Repair circuits or replace relay, as required. 6. Exchange or replace radio, if required.
NO MEMORY.	1. Fuse faulty. 2. Radio connector faulty. 3. Wiring faulty. 4. Ground faulty. 5. Radio faulty.	1. Check ignition-off draw fuse. Replace fuse, if required. 2. Check for loose or corroded radio connector. Repair, if required. 3. Check for battery voltage at radio connector. Repair wiring, if required. 4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required. 5. Exchange or replace radio, if required.
POOR RADIO RECEPTION.	1. Antenna faulty. 2. Ground faulty. 3. Radio faulty.	1. See antenna diagnosis, in this group. Repair or replace antenna, if required. 2. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.. 3. Exchange or replace radio, if required.
NO/POOR TAPE OPERATION.	1. Faulty tape. 2. Foreign objects behind tape door. 3. Faulty tape deck.	1. Insert known good tape and test operation. 2. Remove foreign objects and test operation. 3. Exchange or replace radio, if required.

DIAGNOSIS AND TESTING (Continued)

RADIO

For circuit descriptions and diagrams, refer to 8W-47 - Audio System in Group 8W - Wiring Diagrams.

CAUTION: The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

(1) Check the fuses in the fuseblock module and in the back of the radio chassis. If OK, go to Step 2. If not OK, replace the faulty fuse(s).

(2) Turn the ignition switch to the On position. Check for battery voltage at the fuse in the fuseblock module. If OK, go to Step 3. If not OK, repair the open circuit as required.

(3) Turn the ignition switch to the Off position. Disconnect the battery negative cable. Remove the instrument cluster bezel. Remove the radio, but do not unplug the radio connectors. Check for continuity between the radio chassis and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the ground circuit as required.

(4) Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavity of the radio connector. If OK, go to Step 5. If not OK, repair the open circuit as required.

(5) Turn the ignition switch to the Off position. Check for battery voltage at the fused B(+) circuit cavity of the radio connector. If OK, replace the faulty radio. If not OK, repair the open circuit as required.

RADIO ILLUMINATION RELAY

If the relay fails any one of the Relay Tests, it is faulty and should be replaced. If the relay passes the Relay Tests, proceed to the Relay Circuit Tests.

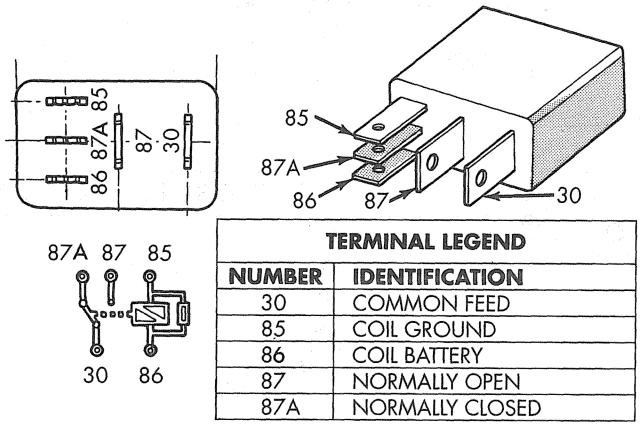
RELAY TESTS

Remove the relay from the relay center to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Tests in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Radio Illumination Relay Connections

RELAY CIRCUIT TESTS

With relay still removed, perform the following tests:

(1) The relay common feed terminal cavity (30) is connected to the LCD illumination circuit of the radio. There should be continuity between the cavity for relay terminal 30 and the radio display output circuit cavity of the radio connector at all times. If OK, go to Step 2. If not OK, repair the open circuit as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position. This circuit provides fused ignition-switched output to the radio display when the headlamp switch is off. There should be battery voltage present at the cavity for relay terminal 87A with the ignition switch in the On position. If OK, go to Step 3. If not OK, repair the open circuit as required.

(3) The relay normally open terminal (87) is connected to terminal 30 in the energized position. This circuit provides instrument panel dimmer controlled feed to the radio display when the headlamp switch is on. There should be voltage present at the cavity for relay terminal 87 when the headlamp switch is on. Also, the voltage reading should vary as the panel dimmer switch is rotated. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is energized when the headlamp switch is on. There should be battery voltage at the cavity for relay terminal 86 when the park lamps or headlamps are on. If OK, go to Step 5. If not OK, repair the open circuit as required.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. It is grounded at all times. Check for continuity to ground at the cavity for relay terminal 85. If not OK, repair the circuit to ground as required.

DIAGNOSIS AND TESTING (Continued)

SPEAKER

For circuit descriptions and diagrams, refer to 8W-47 - Audio System in Group 8W - Wiring Diagrams.

CAUTION: The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

(1) Turn the radio on and adjust the balance and fader controls to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to Step 2.

(2) Turn the radio off. Disconnect the battery negative cable. Remove the instrument cluster bezel and remove the radio. Check both the speaker feed (+) and return (-) circuit cavities at the radio connector for continuity to ground. There should be no continuity. If OK, go to Step 3. If not OK, repair the faulty speaker circuit(s) as required.

(3) Check the resistance between the speaker feed (+) and return (-) cavities for each speaker location. The meter should read between 3 and 8 ohms (speaker resistance). If OK, see the radio diagnosis. If not OK, go to Step 4.

(4) Unplug the speaker wiring connector at the speaker. Check for continuity between the speaker feed (+) circuit cavities at the radio and at the speaker connectors. Repeat the check between the speaker return (-) circuit cavities at the radio and at the speaker connectors. In each case, there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open circuit as required.

ANTENNA

The following four tests are used to diagnose the antenna with an ohmmeter:

- **Test 1** - Mast to ground test
- **Test 2** - Tip-of-mast to tip-of-conductor test
- **Test 3** - Body ground to battery ground test
- **Test 4** - Body ground to coaxial shield test.

The ohmmeter test lead connections for each test are shown in Antenna Tests (Fig. 2).

TEST 1

Test 1 determines if the antenna mast is insulated from the base. Proceed as follows:

(1) Disconnect the antenna cable lead from the radio chassis and isolate.

(2) Connect one ohmmeter lead to the tip of the antenna mast and the other lead to the antenna base. Check for continuity.

(3) There should be no continuity. If continuity is found, replace the faulty or damaged antenna base and cable assembly.

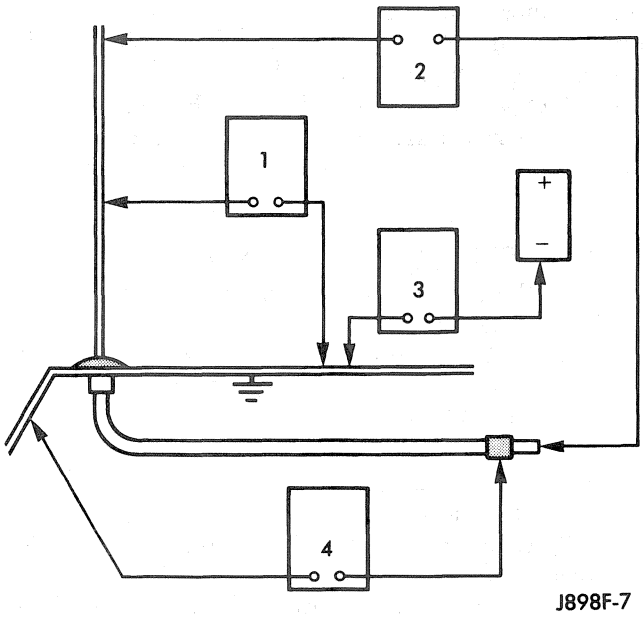


Fig. 2 Antenna Tests

TEST 2

Test 2 checks the antenna for an open circuit as follows:

(1) Disconnect the antenna cable lead from the radio chassis.

(2) Connect one ohmmeter test lead to the tip of the antenna mast. Connect the remaining lead to the tip of the antenna cable lead (the part inserted into the radio).

(3) Continuity should exist (the ohmmeter should only register a fraction of an ohm). High or infinite resistance indicates damage to the base and cable assembly. Replace the faulty base and cable, if required.

TEST 3

Test 3 checks the condition of the vehicle body ground connection. This test should be performed with the battery positive cable removed from the battery. Disconnect both battery cables, the negative cable first. Reconnect the battery negative cable and perform the test as follows:

(1) Connect one ohmmeter test lead to the vehicle fender and the other lead to the battery negative post.

(2) The resistance should be less than one ohm.

(3) If the resistance is more than one ohm, check the braided ground strap connected to the engine and the vehicle body for being loose, corroded, or damaged. Repair the ground strap connection, if required.

TEST 4

Test 4 checks the condition of the ground between the antenna base and the vehicle body as follows:

DIAGNOSIS AND TESTING (Continued)

(1) Connect one ohmmeter test lead to the fender and the other lead to the crimp on the coaxial antenna cable shield.

(2) The resistance should be less then one ohm.

(3) If the resistance is more than one ohm, clean and/or tighten the antenna base to fender mounting hardware.

RADIO FREQUENCY INTERFERENCE

Inspect the ground connections at the following:

- Blower motor
- Electric fuel pump
- Generator
- Ignition module
- Wiper motor
- Antenna coaxial ground
- Radio ground
- Body-to-engine braided ground strap (if equipped).

Clean, tighten or repair the connections as required.

Also inspect the following secondary ignition system components:

- Spark plug wire routing and condition
- Distributor cap and rotor
- Ignition coil
- Spark plugs.

Reroute the spark plug wires or replace the faulty components as required.

REMOVAL AND INSTALLATION

RADIO

(1) Disconnect the battery negative cable.

(2) Remove the upper and lower steering column shrouds and the steering column to instrument panel bezel gap hider. If equipped with tilt steering, apply tape to the tilt mechanism on top of the steering column to protect the instrument cluster bezel from damage during removal.

(3) Remove the four instrument cluster bezel attaching screws and remove the bezel (Fig. 3).

(4) Remove the two radio attaching screws (Fig. 4).

(5) Slide the radio chassis out of the instrument panel far enough to disconnect the radio electrical connector, the ground lead and the antenna lead (Fig. 5). Remove the radio from the instrument panel.

(6) Connect the radio harness, the ground and the antenna connectors.

(7) Slide the radio chassis into the instrument panel, routing the wire harness above and to the right of the radio cavity.

(8) While installing the radio, make sure that the clip on the top of radio is engaged in the mating slot of the instrument panel (Fig. 6).

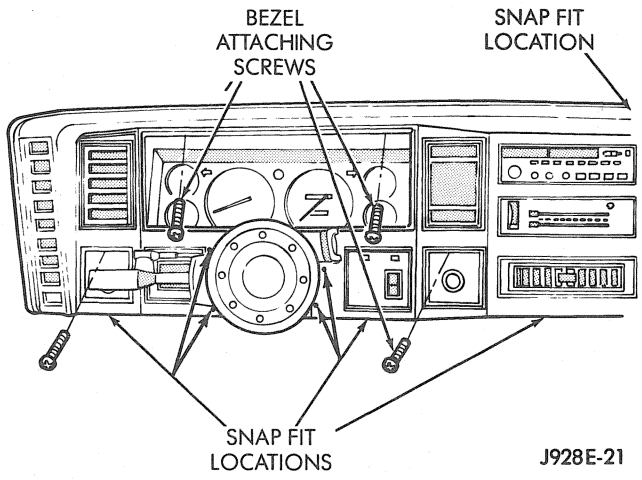


Fig. 3 Instrument Bezel Remove/Install

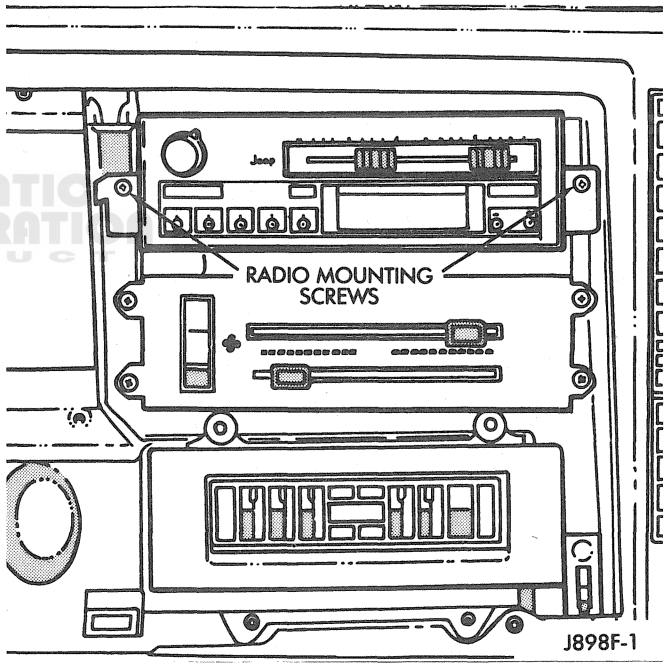


Fig. 4 Radio Mounting Screws Remove/Install

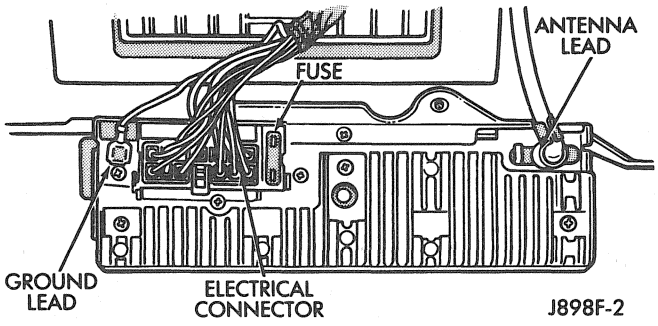


Fig. 5 Radio Wiring Remove/Install

(9) Reverse the removal procedures to complete the installation.

REMOVAL AND INSTALLATION (Continued)

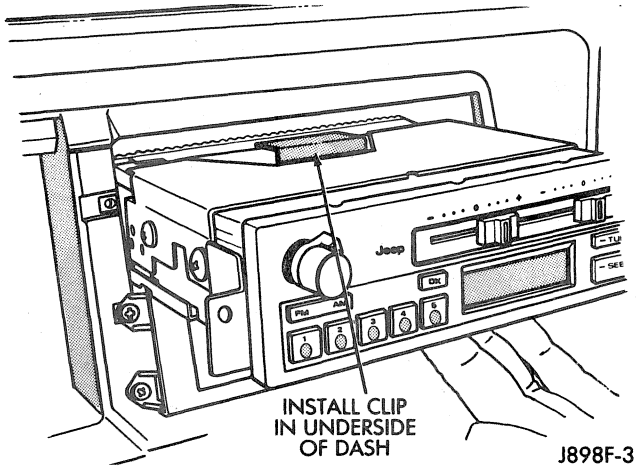


Fig. 6 Radio Clip Install

RADIO ILLUMINATION RELAY

(1) Disconnect the battery negative cable.

(2) Locate the relay in the relay center, under the driver's side of the lower instrument panel just inboard of the steering column (Fig. 7).

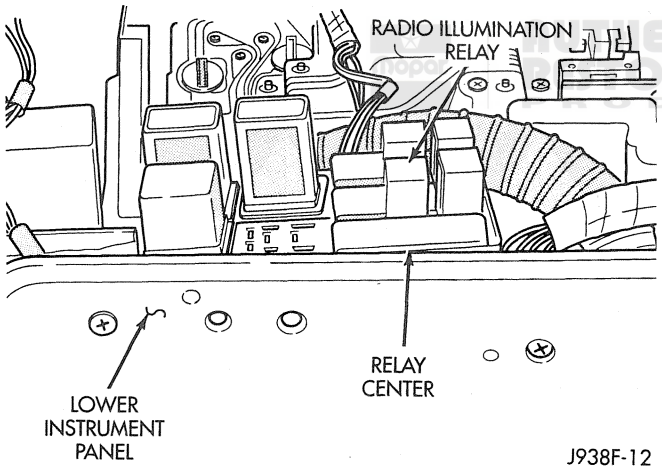


Fig. 7 Radio Illumination Relay

(3) Remove the relay by unplugging it from the relay center.

(4) To install the relay, align the terminals with the cavities in the relay center and push the relay firmly into place.

(5) Connect the battery negative cable.

(6) Test the relay operation.

SPEAKER

INSTRUMENT PANEL

(1) Remove the parking brake assembly retaining screw from the lower instrument panel (Fig. 8).

(2) Remove the screws from the lower instrument panel and remove the panel (Fig. 9).

(3) Unplug the speaker wire harness connector.

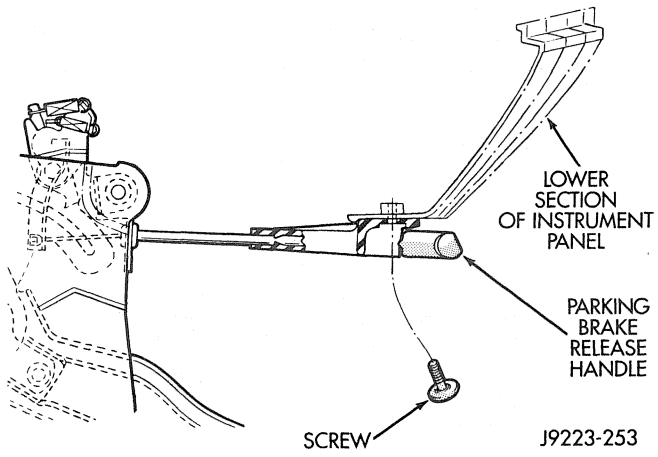


Fig. 8 Parking Brake Assembly Remove/Install

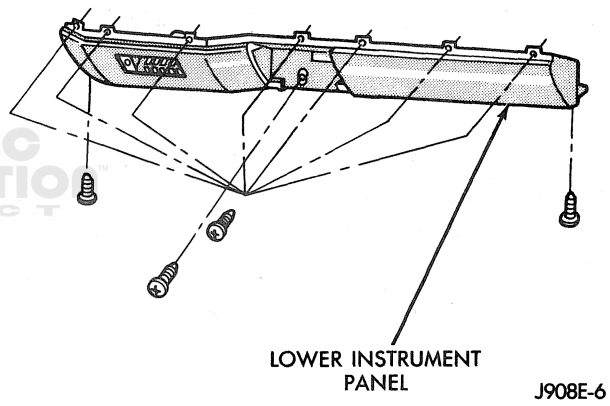


Fig. 9 Lower Instrument Panel Remove/Install

(4) Remove the speaker mounting screws and remove the speaker from the lower instrument panel (Fig. 10).

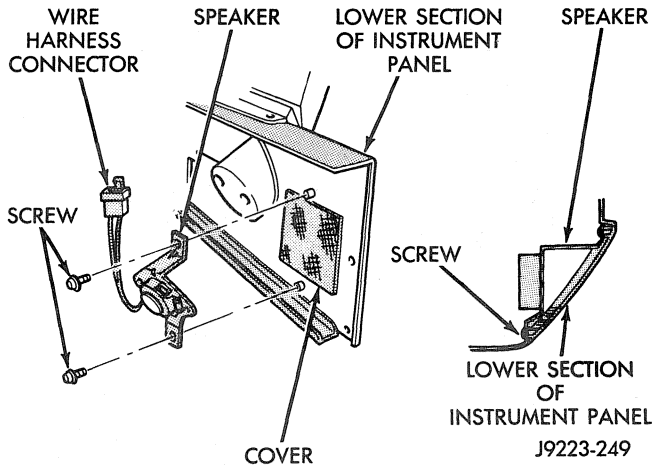


Fig. 10 Instrument Panel Speaker Remove/Install

(5) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

FRONT DOOR

(1) Remove the inside remote door latch release and control panel retaining screws (Fig. 11).

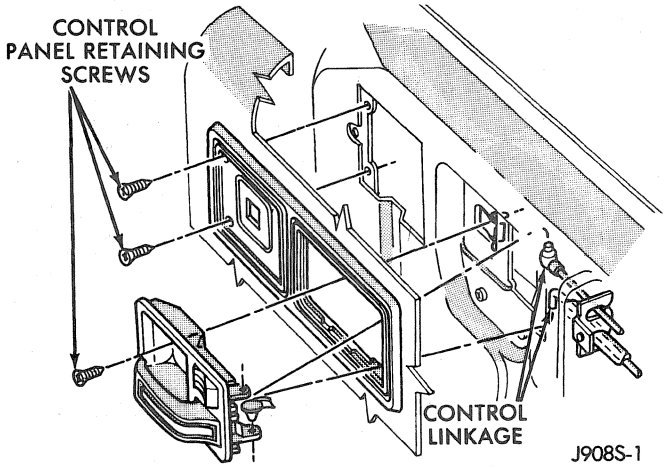


Fig. 11 Control Panel Remove/Install

(2) Disconnect the latch control linkage and the control panel wire harness retainer clip and connector.

(3) Remove the latch release and control panel assembly.

(4) Remove the door armrest lower retaining screws.

(5) Swing the armrest downward to a vertical position. This is necessary to disconnect the armrest from the upper retainer clip (Fig. 12).

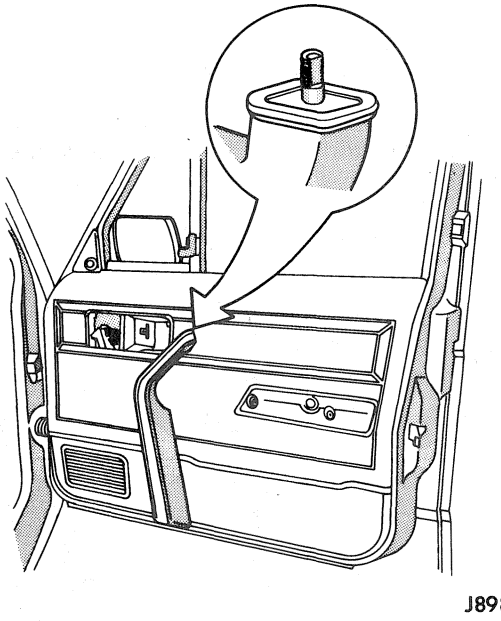


Fig. 12 Armrest Retainer Clip

(6) Pull the armrest straight out from the door trim panel.

(7) Remove the trim panel by prying around the door perimeter with a wide, flat-bladed tool, starting at the bottom of the panel (Fig. 13).

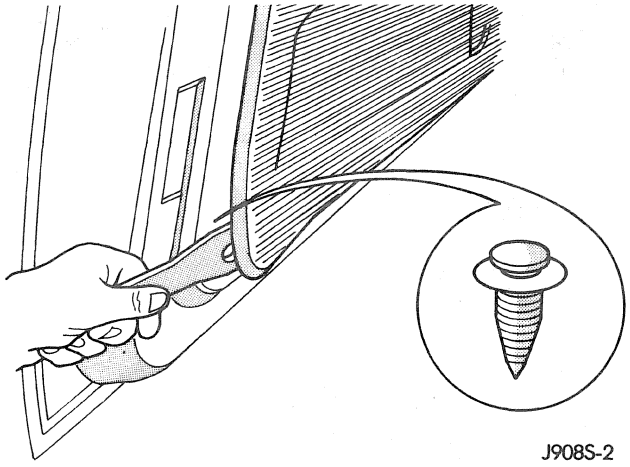


Fig. 13 Door Trim Panel Remove

(8) Remove the speaker mounting screws and disconnect the speaker wire harness connector.

(9) Reverse the removal procedures to install.

SOUND BAR

(1) Remove the sound bar as described in this group.

(2) Remove the grille from the speaker by straightening the four folded-over mounting tabs on the inside of the sound bar. Then, from the outside of the sound bar, gently pull the grille from around the circumference of the speaker.

(3) Drill out the four rivets securing the speaker to the sound bar.

(4) Remove the speaker from the sound bar.

(5) Reverse the removal procedures to install. Use new rivets to secure the speaker.

SOUND BAR

(1) Disconnect the battery negative cable.

(2) If so equipped, remove the cargo compartment-mounted spare tire.

(3) Remove the lens from the cargo lamp housing.

(4) If so equipped, remove the rear roof side rail-mounted grab handles.

(5) Remove the screws securing the rear roof side rail garnish moldings.

(6) Remove the left and right rear roof side rail garnish moldings.

(7) Remove and discard the two push-on retainers from the pins inside the front and rear of the cargo lamp housing. These retainers secure the sound bar to the rear roof bow.

(8) While pulling gently outward on the upper front corner of the liftgate pillar trim, slide the sound

REMOVAL AND INSTALLATION (Continued)

bar towards the front of the vehicle. Only slide the sound bar far enough to clear the liftgate pillar trim.

(9) Lower the sound bar far enough to disconnect the wiring from both speakers and the cargo lamp. Remove the adhesive tape securing the wiring to the inside of the sound bar.

(10) Remove the sound bar from the vehicle.

(11) Reverse the removal procedures to install. Use two new push-on retainers on the pins in the cargo lamp housing.

ANTENNA

(1) Remove the right fender inner splash panel mounting nuts and move the panel aside to gain access to the antenna base and cable (Fig. 14).

NOTE: The splash panel screws may be covered with undercoating.

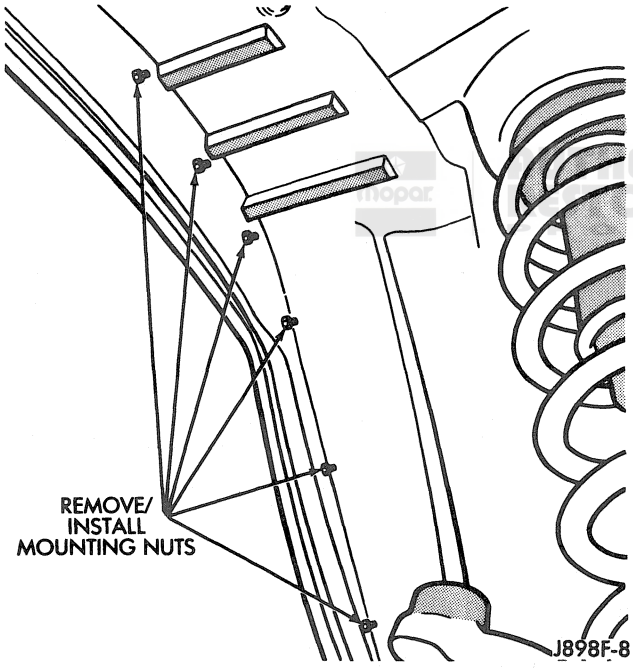


Fig. 14 Fender Inner Splash Panel Remove/Install

(2) Remove the antenna mast, the antenna nut and the antenna pad from the top of the fender (Fig. 15).

(3) Remove the right cowl side trim panel.

CAUTION: Do not pull on the antenna coaxial cable, or it may be damaged.

(4) Disconnect the antenna lead by pulling and twisting apart the metal connectors (Fig. 16).

(5) Pull the rubber grommet out of the cowl side panel.

(6) Remove the antenna body and cable assembly from inside the wheelhouse.

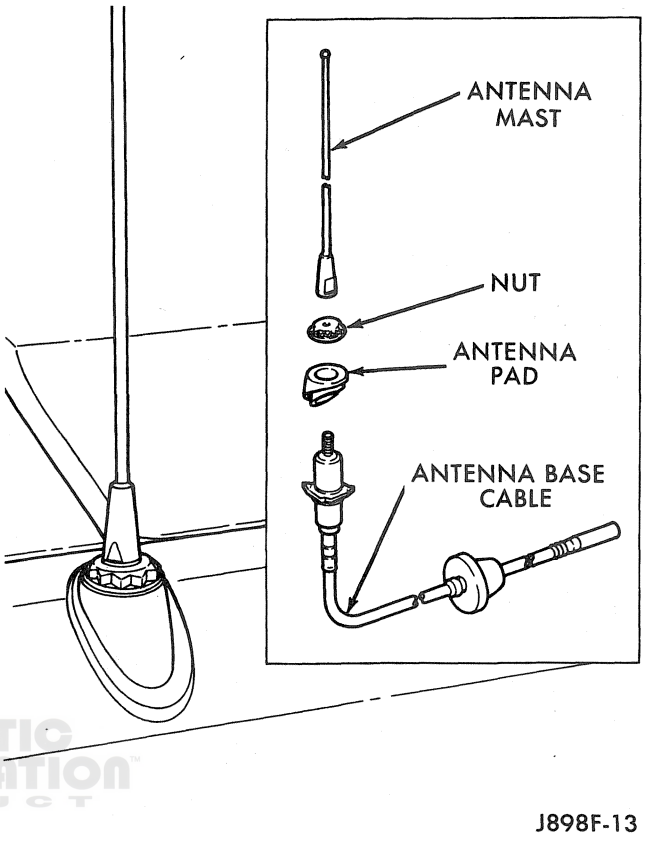


Fig. 15 Antenna Remove/Install

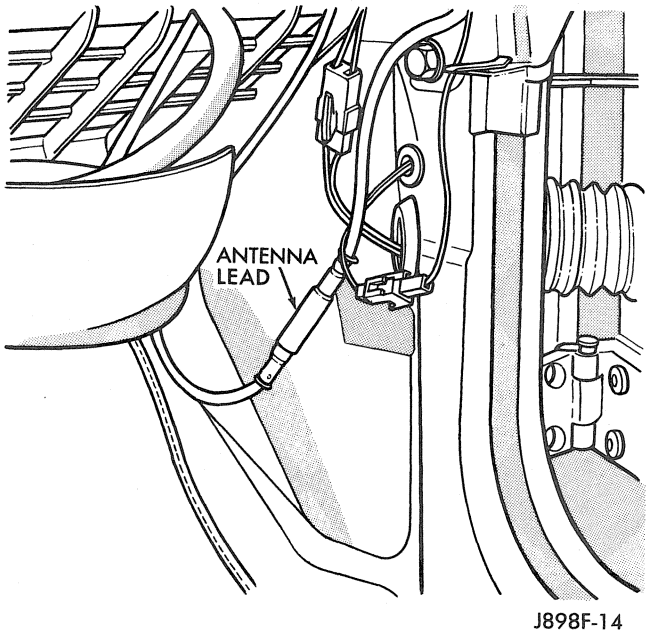


Fig. 16 Disconnect Antenna Lead

(7) Reverse the removal procedures to install.

(8) Test the antenna and radio operation.

(9) Apply a rubberized undercoating material to the splash panel screws.

HORN SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
HORN RELAY	1
HORN SWITCH	1
HORN	1
DIAGNOSIS AND TESTING	
HORN RELAY	1
HORN SWITCH	2
HORN	2
REMOVAL AND INSTALLATION	
HORN RELAY	3
HORN SWITCH	3
HORN	4

GENERAL INFORMATION

INTRODUCTION

Following are general descriptions of the major components in the factory-installed horn systems. Refer to 8W-41 - Horns/Cigar Lighter in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

HORN RELAY

The horn relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The horn relay is a electro-mechanical device that switches current to the horn when the horn switch on the steering wheel is depressed. See the Diagnosis and Testing section of this group for more information on the horn relay's operation.

The horn relay is located in the relay center. The relay center is attached to the driver's side lower instrument panel reinforcement, just inboard of the steering column.

If a problem is encountered with a continuously sounding horn, it can usually be quickly resolved by removing the horn relay from the relay center until further diagnosis is completed.

HORN SWITCH

Two horn switches are installed in the steering wheel, one on each side of the center-mounted driver's airbag module. When either switch is depressed it completes a circuit to ground for the coil side of the horn relay. The steering wheel and steering column must be properly grounded for the horn switches to function. The horn switches are serviced only as a set with their wiring. If either switch should fail, both switches must be replaced.

HORN

Dual electric diaphragm-type horns are standard equipment. The high-note horn is mounted and grounded to the left radiator closure panel brace, behind the front bumper. The low-note horn is connected in parallel with the high-note horn. The low note horn is mounted and grounded to the right radiator closure panel brace, behind the front bumper.

NOTE: A cadmium-plated screw is used to mount the horns. Do not substitute other types of screws, as they may become corroded and cause a loss of horn ground.

DIAGNOSIS AND TESTING

HORN RELAY

For circuit descriptions and diagrams, refer to 8W-41 - Horns/Cigar Lighter in Group 8W - Wiring Diagrams.

RELAY TESTS

The horn relay is located in the relay center. The relay center is attached to the driver's side lower instrument panel reinforcement, just inboard of the steering column.

Remove the horn relay from the relay center to perform the following tests:

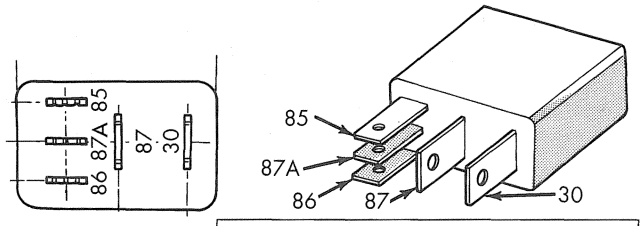
(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and

DIAGNOSIS AND TESTING (Continued)

no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Test in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Horn Relay

RELAY CIRCUIT TESTS

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuseblock module as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the horn(s). There should be continuity between the cavity for relay terminal 87 and the horn(s) terminal(s) at all times. If OK, go to Step 4. If not OK, repair the open circuit to the horn(s) as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is grounded through the horn switch when the horn switch is depressed. Check for continuity to ground at the cavity for relay terminal 86. There should be continuity with the horn switch depressed, and no continuity with the horn switch released. If OK, go to Step 5. If not OK, see the diagnosis for the Horn Switch in this group.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. It is connected to battery voltage and should be hot at all times. Check for battery voltage at the cavity for relay terminal 86. If not OK, repair the open circuit to the fuseblock module as required.

HORN SWITCH

For circuit descriptions and diagrams, refer to 8W-41 - Horns/Cigar Lighter in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the battery negative cable. Remove the lower instrument panel. Check for continuity between the metal steering column jacket and a good ground. There should be continuity. If OK, go to Step 2. If not OK, refer to Group 19 - Steering and check for proper installation of the steering column ground clip.

(2) Remove the horn relay from the relay center. Unplug the horn wire connector. Check for continuity between the steering column half of the horn switch wire connector and a good ground. There should be no continuity. If OK, go to Step 2. If not OK, repair the short circuit as required.

(3) Check for continuity between the steering column half of the horn switch wire connector and the horn relay control circuit cavity in the relay center. There should be continuity. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) Check for continuity between the horn switch half of the horn switch wire connector and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, replace the faulty horn switches.

(5) Depress one horn switch and check for continuity between the horn switch half of the horn switch wire connector and a good ground. There should be continuity. Repeat this test for the other horn switch. If either switch is not OK, replace the faulty horn switches.

HORN

For circuit descriptions and diagrams, refer to 8W-41 - Horns/Cigar Lighter in Group 8W - Wiring Diagrams.

(1) Measure the resistance between the horn mounting bracket and a good ground. There should be zero ohms resistance. If OK, go to Step 2. If not OK, repair the horn ground connection as required.

(2) Disconnect the horn wiring connector. Depress the horn switch. There should be battery voltage at the horn connector. If OK, replace the faulty horn. If

DIAGNOSIS AND TESTING (Continued)

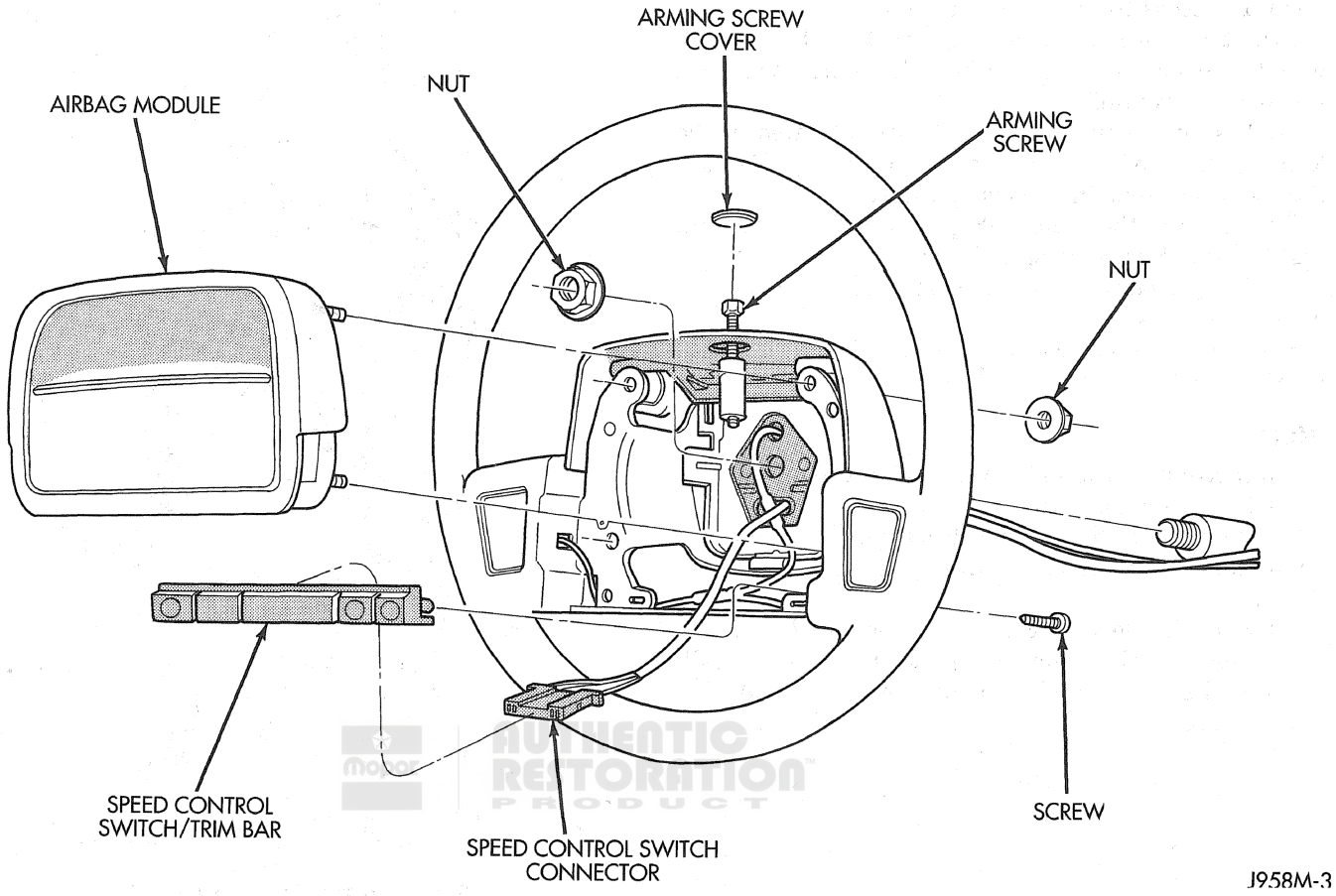


Fig. 1 Airbag Module Remove/Install

not OK, repair the open circuit to the horn relay as required.

REMOVAL AND INSTALLATION

HORN RELAY

(1) Disconnect the battery negative cable.

(2) Locate the horn relay in the relay center, under the driver's side of the lower instrument panel just inboard of the steering column.

(3) Remove the horn relay by unplugging it from the relay center.

(4) Install the horn relay by aligning the relay terminals with the cavities in the relay center and plugging the relay firmly into place.

(5) Connect the battery negative cable.

(6) Test the relay operation.

HORN SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the battery negative cable.

WARNING: DO NOT USE POWER-DRIVEN TOOLS WHEN SERVICING THE AIRBAG MODULE, OR THE STEERING COLUMN COMPONENTS OF AN AIRBAG-EQUIPPED VEHICLE. FAILURE TO TAKE THIS PRECAUTION COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY

(2) Using a small screwdriver, remove the plastic cover plug from the top outer surface of the steering wheel hub (Fig. 1). Exit the vehicle and disarm the airbag by reaching through the driver's side window and turning the arming screw counterclockwise to its travel limit. This is done using an 8mm socket and manual drive.

(3) From the back side of the steering wheel, remove the four nuts attaching the airbag module to the steering wheel. This is done using a 10mm socket and manual drive.

(4) Remove the airbag module from the steering wheel.

REMOVAL AND INSTALLATION (Continued)

(5) To access the horn switch retaining screws, pry out the trim cover buttons on the back of the steering wheel spokes, directly behind the horn switches. Remove the retaining screws.

(6) Disconnect the horn switch wires located in the lower portion of steering wheel hub cavity. Remove the switches from the steering wheel.

(7) Reverse the removal procedures to install. Tighten the hardware as follows:

- Airbag module nuts - 9 to 11 N·m (80 to 100 in. lbs.)
- Airbag arming screw - not to exceed 1 to 1.5 N·m (10 to 15 in. lbs.).

HORN

(1) Disconnect the battery negative cable.

(2) Raise and support the vehicle.

(3) Remove the front underbody splash shield.

(4) Remove the horn mounting bolt and the horn (Fig. 2).

(5) Remove the wire connector from the horn.

(6) Reverse the removal procedures to install. Tighten the horn bracket mounting bolt to 20 N·m (15 ft. lbs.).

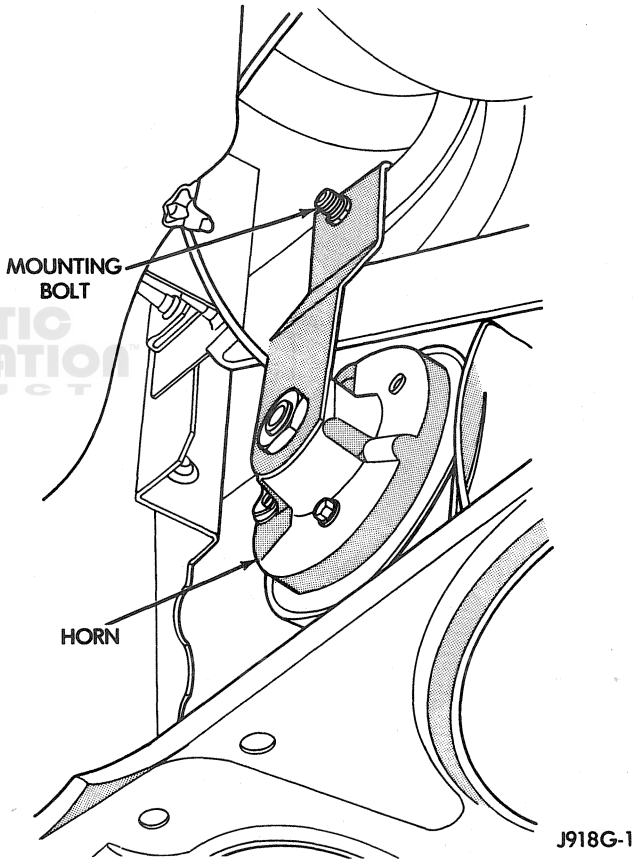


Fig. 2 Horns Remove/Install

VEHICLE SPEED CONTROL SYSTEM

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
POWERTRAIN CONTROL MODULE	2
SERVO CABLE	2
SPEED CONTROL SERVO	1
SPEED CONTROL SWITCH	1
STOP LAMP SWITCH	1
VACUUM RESERVOIR	2
VEHICLE SPEED SENSOR	2
DIAGNOSIS AND TESTING	
ON-BOARD DIAGNOSTICS TEST	2
POWERTRAIN CONTROL MODULE (PCM)	6
ROAD TEST	2
SPEED CONTROL ELECTRICAL TEST	5
SPEED CONTROL SERVO	6
SPEED CONTROL SWITCH	5
STOP LAMP SWITCH	6
VACUUM SUPPLY TEST	6
VEHICLE SPEED SENSOR	5
REMOVAL AND INSTALLATION	
POWERTRAIN CONTROL MODULE	8
SERVO CABLE	8
SPEED CONTROL SERVO	7
SPEED CONTROL SWITCH	7
STOP LAMP SWITCH	8
VACUUM RESERVOIR	8
VEHICLE SPEED SENSOR	9
SPECIFICATIONS	
TORQUE SPECIFICATIONS	9

AUTHENTIC RESTORATION PRODUCT

GENERAL INFORMATION

INTRODUCTION

The vehicle speed control system is electronically controlled and vacuum operated. The system is designed to operate between approximately 35 and 85 mph (56 and 137 km/h). Following are general descriptions of the major components in the speed control system. Refer to Group 8W, Wiring Diagrams for complete circuit descriptions and wiring diagrams.

DESCRIPTION AND OPERATION

SPEED CONTROL SERVO

The speed control servo is mounted to a bracket on the right side inner fender shield in the engine compartment. The servo unit consists of a solenoid valve body, a vacuum servo and the mounting bracket. The PCM controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

SPEED CONTROL SWITCH

The speed control switch module is mounted to the center of the steering wheel below the driver's airbag module. Three **momentary** contact switches, supporting six different speed control functions are used. The outputs from these switches are filtered into one input. The Powertrain Control Module (PCM) determines which output has been applied through **resistive multiplexing.** The input circuit voltage is measured by the PCM to determine which switch function has been selected.

An indicator lamp (LED) located on the switch module is energized by the PCM. This occurs when the speed control system has been engaged.

The three switches are labeled: OFF/ON, RESUME/ACCEL, SET/DECEL. Refer to the owner's manual for more information on speed control switch functions and setting procedures. The individual switches cannot be repaired. If one individual switch fails, or the indicator lamp fails, the entire switch module must be replaced.

STOP LAMP SWITCH

Vehicles equipped with the speed control option use a dual function stop lamp switch. The switch is mounted in the same location as the conventional stop lamp switch, on the brake pedal mounting bracket under the instrument panel. The PCM monitors the state of the dual function stop lamp switch. Refer to Group 5, Brakes for more information on stop lamp switch service and adjustment procedures.

DESCRIPTION AND OPERATION (Continued)

SERVO CABLE

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage. This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

POWERTRAIN CONTROL MODULE

The speed control electronic control circuitry is integrated into the Powertrain Control Module (PCM). The PCM is located in the engine compartment next to the air cleaner. The PCM speed control functions are monitored by the On-Board Diagnostics (OBD). All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects. See On-Board Diagnostic Tests in this group for more information. The PCM cannot be repaired and must be replaced if faulty.

VACUUM RESERVOIR

The vacuum reservoir is mounted behind the left end of the front bumper bar. The reservoir contains a one-way check valve to trap engine vacuum in the reservoir. When engine vacuum drops, as in climbing a grade while driving, the reservoir supplies the vacuum needed to maintain proper speed control operation. The vacuum reservoir cannot be repaired and must be replaced if faulty.

VEHICLE SPEED SENSOR

The Vehicle Speed Sensor (VSS) is a pulse generator mounted to an adapter near the transmission output shaft. The sensor is driven through the adapter by a speedometer pinion gear. The VSS pulse signal to the speedometer/odometer is monitored by the PCM speed control circuitry to determine vehicle speed and to maintain speed control set speed. Refer to the appropriate Powertrain Diagnostic Procedures manual for diagnosis and testing of this component. Refer to Group 14, Fuel System for removal/installation procedures.

DIAGNOSIS AND TESTING

ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to Group 8E, Instrument Panel and Gauges for speedometer diagnosis.

If a road test verifies a system problem and the speedometer operates properly, check for:

- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose or corroded electrical connections at the servo. Corrosion should be removed from electrical terminals and a light coating of Mopar MultiPurpose Grease, or equivalent, applied.
- Loose or leaking vacuum hoses or connections.
- Secure attachment of both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

ON-BOARD DIAGNOSTICS TEST

The Powertrain Control Module (PCM) monitors critical input and output circuits of the speed control system making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some circuits are checked continuously and some are checked only under certain conditions.

If the OBD system senses that a monitored circuit is bad, it will put a DTC into electronic memory. The DTC will stay in electronic memory as long as the circuit continues to be bad. The PCM is programmed to clear the memory after 50 engine starts if the problem does not occur again.

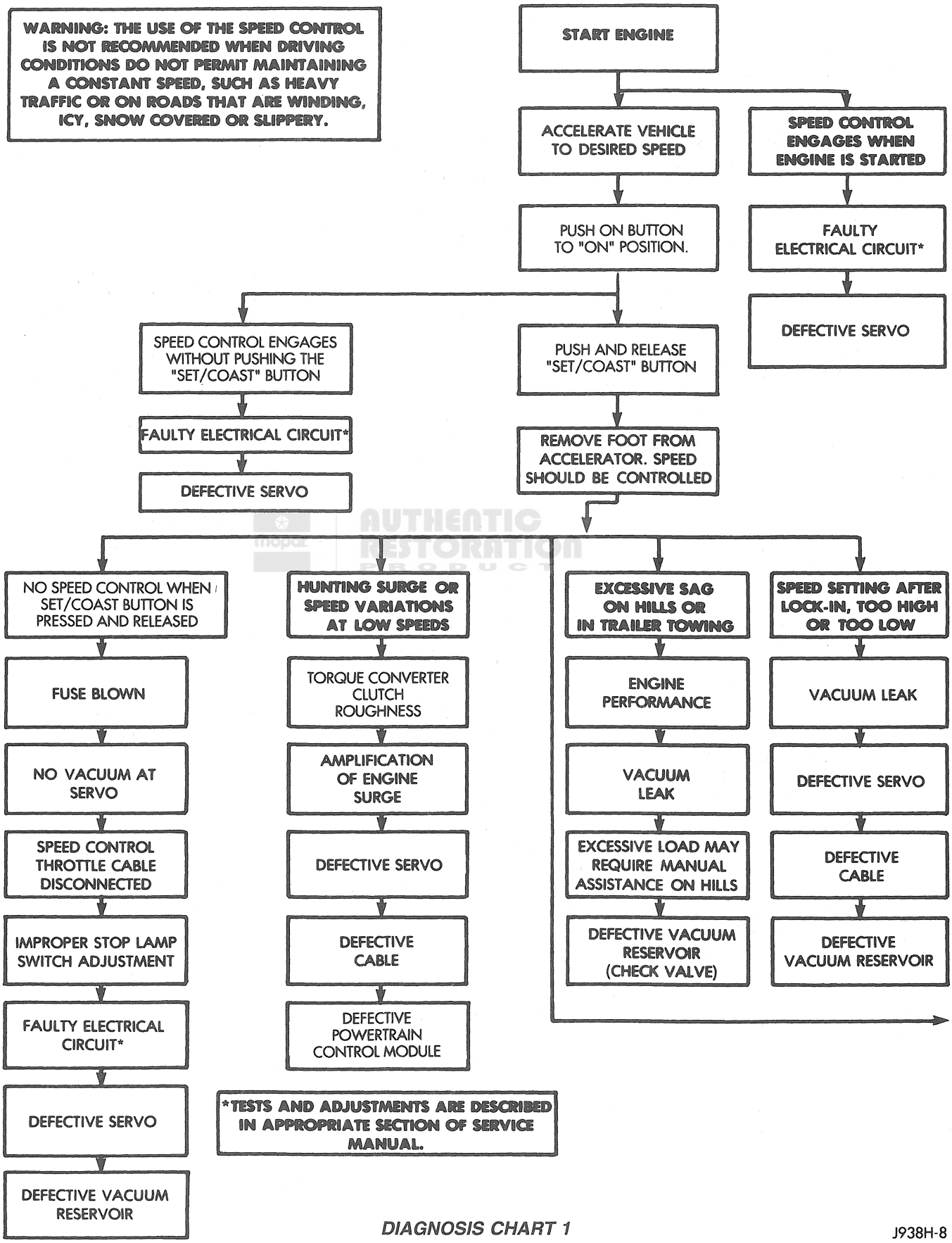
DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Codes (DTC's) are two-digit numbers flashed on the Malfunction Indicator (Check Engine) Lamp that identify which circuit is bad. A DTC description can also be read using the DRB scan tool. Refer to Group 25, Emission Control System for more DTC information.

A DTC does not identify which component in a circuit is bad. Thus, a DTC should be treated as a symptom, not as the cause for the problem. In some cases, because of the design of the diagnostic test procedure, a DTC can be the reason for another DTC to be set. Therefore, it is important that the test procedures be followed in sequence, to understand what caused a DTC to be set.

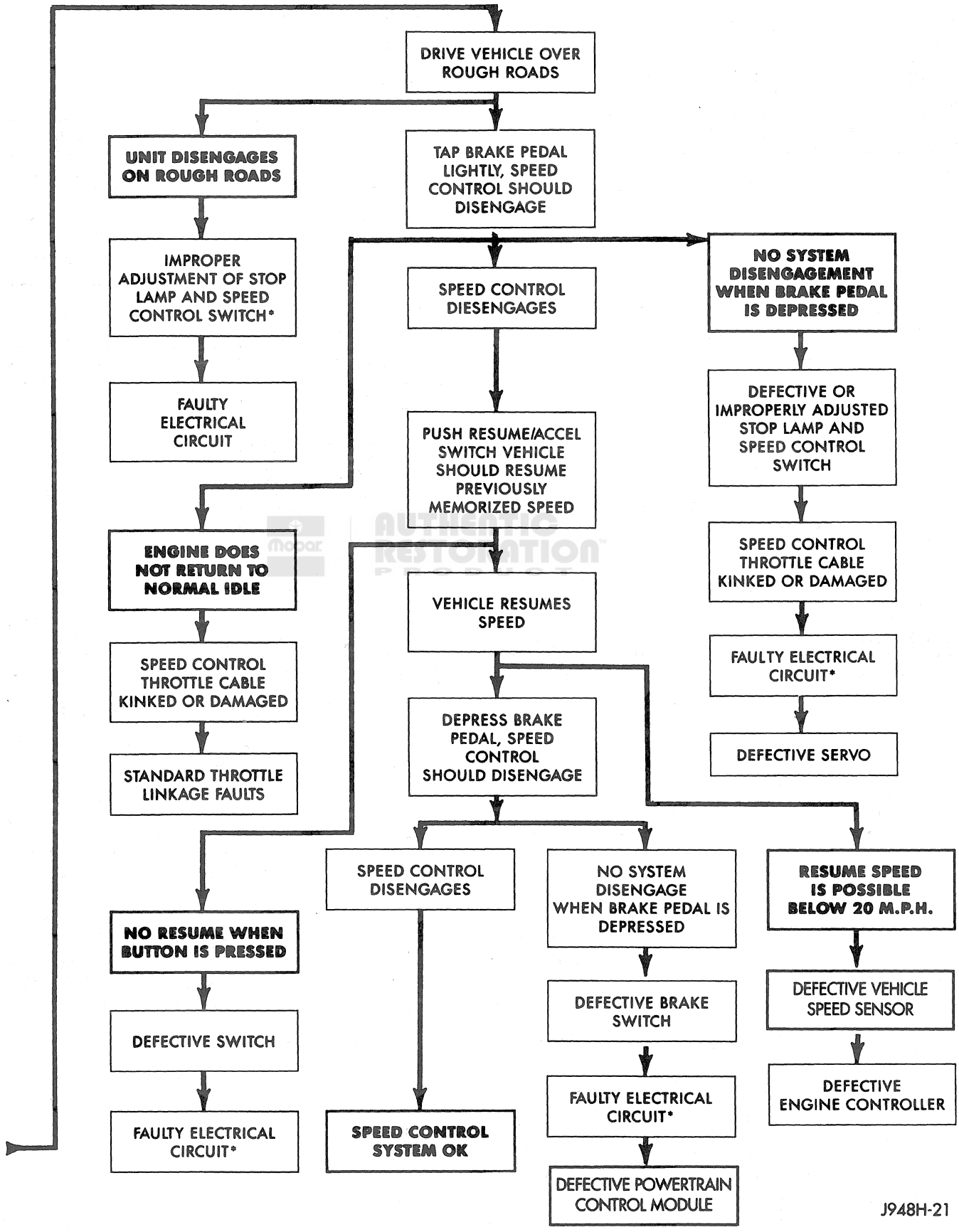
Refer to the following Speed Control Diagnostic Trouble Code chart for DTC's which apply to the

DIAGNOSIS AND TESTING (Continued)



DIAGNOSIS CHART 1

DIAGNOSIS AND TESTING (Continued)



DIAGNOSIS CHART 2

DIAGNOSIS AND TESTING (Continued)

speed control system. Refer to the appropriate Powertrain Diagnostic Procedures manual to diagnose an on-board diagnostic system trouble code.

RETRIEVING DIAGNOSTIC TROUBLE CODES

To start this function, cycle the ignition switch ON-OFF-ON-OFF-ON within 5 seconds. This will cause any DTC stored in the PCM memory to be displayed. The instrument panel mounted malfunction indicator (Check Engine) lamp will display a DTC by flashing on and off. There is a short pause between flashes and a longer pause between digits. All DTC's displayed are two-digit numbers, with an approximate four-second pause between codes.

An example of a DTC is as follows:

(1) Lamp on for 2 seconds, then turns off.

(2) Lamp flashes 1 time pauses and then flashes 5 times.

(3) Lamp pauses for 4 seconds, flashes 3 times, pauses, then flashes 4 times.

The two DTC's are 15 and 34. Any number of DTC's can be displayed, as long as they are in memory. The lamp will flash until all stored DTC's are displayed. A DTC code number 55 signifies the end of tests.

If a DTC number 15 or 34 is observed, refer to the appropriate Powertrain Diagnostic Procedures manual. Correct any problems found in your diagnosis, then recheck for a DTC after corrections are completed. Use the DRB scan tool to erase a DTC after repair.

SPEED CONTROL ELECTRICAL TEST

Two different test methods may be used to check the electronic speed control system. One involves using the DRB scan tool. If this test method is desired, refer to the appropriate Powertrain Diagnostic Procedures service manual.

The other test method will involve the use of a volt/ohm meter. The volt/ohm meter method is described within the tests on the following pages. Refer to Group 8W, Wiring Diagrams for speed control electrical schematics and connector location.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

When electrical connections are removed, corrosion should be removed from electrical terminals and a light coating of Mopar Multi-Purpose Grease, or equivalent, should be applied.

Inspect connectors for damaged terminals. A poor electrical connection can cause a complete or intermittent malfunction. For this reason, a poor connection may be misdiagnosed as a component malfunction.

VEHICLE SPEED SENSOR

For diagnosis and testing of the speed sensor, refer to the appropriate Powertrain Diagnostic Procedures service manual.

SPEED CONTROL SWITCH

For complete speed control system diagnosis, refer to the appropriate Powertrain Diagnostic Procedures manual. To test the speed control switch only, refer to the following:

WARNING: BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS, YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. WAIT 2 MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

SPEED CONTROL DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
15**	No Vehicle Speed Sensor Signal	No vehicle distance (speed) sensor signal detected during road load conditions.
34*	Speed Control Solenoid Circuits	An open or shorted condition detected in the Speed Control vacuum or vent solenoid circuits.
55*	N/A	Completion of fault code display on Check Engine Lamp.
* Check Engine Lamp will not illuminate at all times if this Diagnostic Trouble Code was recorded. Cycle ignition key as described in manual and observe code flashed by Check Engine Lamp.		
** Check Engine Lamp will illuminate during engine operation if this Diagnostic Trouble Code was recorded.		

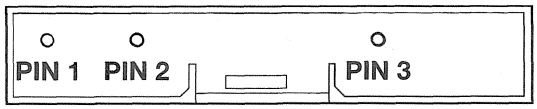
DIAGNOSIS AND TESTING (Continued)

(1) Disconnect negative battery cable. Wait 2 minutes for airbag system capacitor to discharge.

(2) Remove speed control switch module from steering wheel. Refer to the removal/installation section for procedures.

(3) Check speed control switch module continuity as shown in chart (Fig. 1). If OK, reinstall switch. If not OK, replace switch module assembly. The individual switches and the indicator lamp can not be serviced separately.

REAR VIEW OF SWITCH



SWITCH POSITION	RESISTANCE BETWEEN PINS 2 AND 3	RESISTANCE BETWEEN PINS 1 AND 2
NO SWITCHES DEPRESSED	OPEN CIRCUIT	806 ohms +/- 8 ohms
ON	909 ohms +/- 9 ohms	
RESUME/ACCEL	15,400 ohms +/- 154 ohms	
SET/COAST	6650 ohms +/- 66 ohms	

80468d39

Fig. 1 Speed Control Switch Continuity

STOP LAMP SWITCH

For continuity checks and switch adjustment, refer to Group 5, Brakes.

VACUUM SUPPLY TEST

(1) Disconnect vacuum hose at the servo and install a vacuum gauge into the disconnected hose.

(2) Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.

(3) If vacuum does not meet this requirement, check for vacuum leaks or poor engine performance.

SPEED CONTROL SERVO

For complete speed control system diagnosis, refer to the appropriate Powertrain Diagnostic Procedures manual. To test the speed control servo only, refer to the following:

The engine must be started and running for the following voltage tests.

(1) Start engine.

(2) Disconnect 4–way electrical connector at servo (Fig. 2) or (Fig. 3).

(3) Turn speed control switch to ON position.

(4) Check for battery voltage at pin–3 of wiring harness 4–way connector (Fig. 4). This is the 12 volt feed from the stoplamp switch. When the brake pedal is depressed, voltage should not be present at pin–3. If voltage is not present with brake pedal **not** depressed, check for continuity between servo and stop lamp switch. Also check stop lamp switch adjustment. Refer to Group 5, Brakes for procedures.

(5) Connect a small gauge jumper wire between the disconnected servo harness 4–way connector pin–3, and pin–3 on the servo. Check for battery voltage at pins–1, 2 and 4 of the servo. If battery voltage is not at these pins, replace the servo.

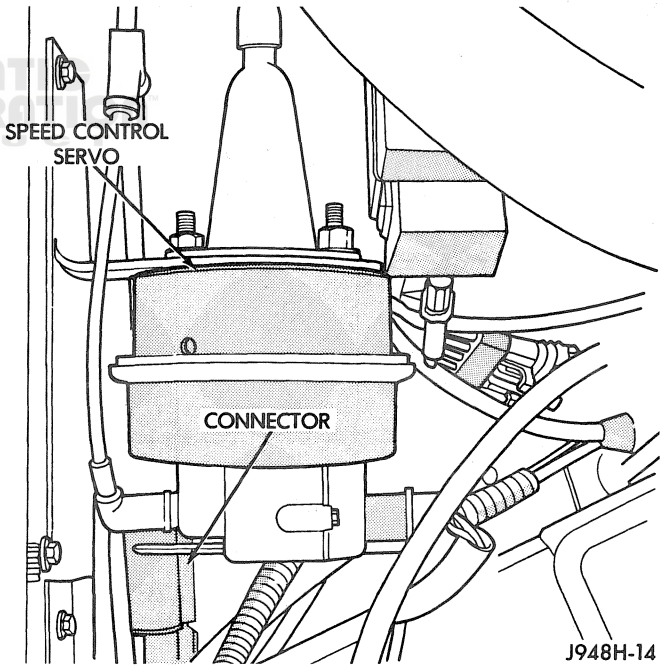


Fig. 2 Speed Control Servo Location—Left Hand Drive

(6) Turn ignition switch to OFF position. Check for continuity between disconnected servo harness 4–way connector pin–4 and a good ground. There should be continuity. If not OK, repair open circuit to ground as required.

POWERTRAIN CONTROL MODULE (PCM)

For complete PCM diagnosis on the speed control system, refer to the DRB scan tool and the appropriate Powertrain Diagnostic Procedures manual.

REMOVAL AND INSTALLATION (Continued)

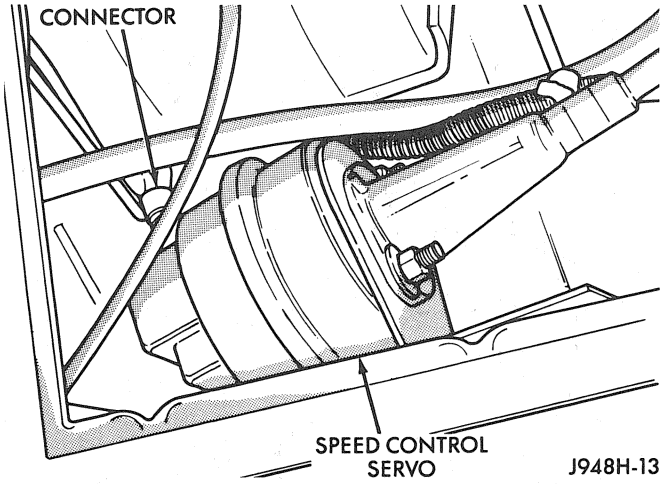


Fig. 3 Speed Control Servo Location—Right Hand Drive

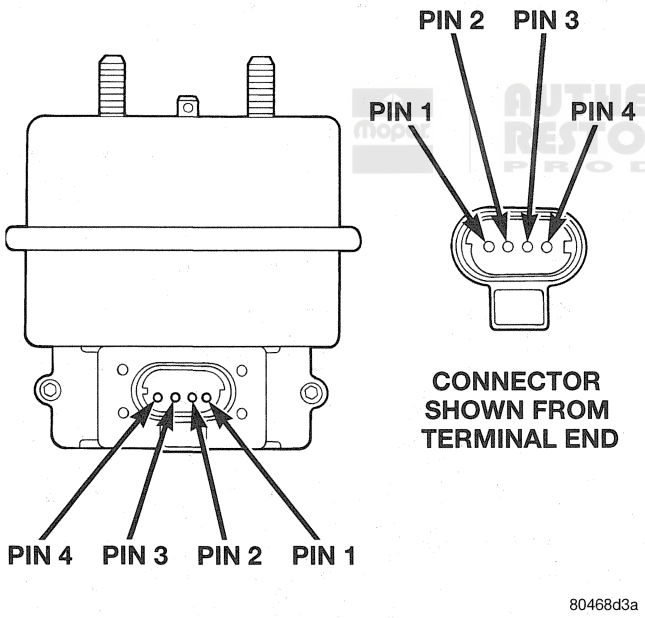


Fig. 4 Servo 4–Way Harness Connector

REMOVAL AND INSTALLATION

SPEED CONTROL SERVO

REMOVE/INSTALL

(1) Disconnect negative battery cable.
(2) Disconnect vacuum hose at servo.
(3) Disconnect electrical connector at servo.
(4) Remove 2 nuts on servo cable sleeve.
(5) Pull speed control cable away from servo to expose cable retaining clip.
(6) Remove clip attaching cable to servo.
(7) Pull servo away from mounting bracket.

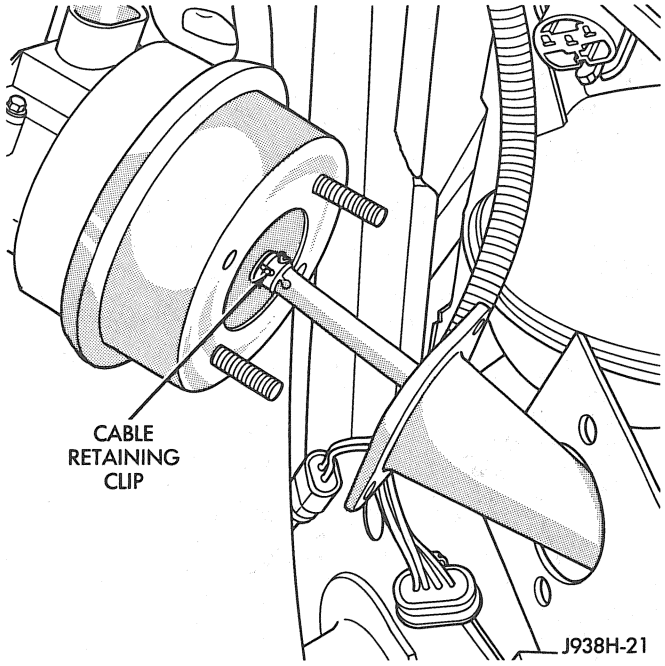


Fig. 5 Servo Cable Remove/Install

(8) To install, insert servo studs through holes in servo mounting bracket.
(9) Block throttle to full open position. Align hole in cable sleeve with hole in servo pin and install retaining clip.
(10) Reverse remaining removal procedures to install. Tighten servo mounting nuts to 6 N·m (50 in. lbs.) torque.

SPEED CONTROL SWITCH

WARNING: BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. WAIT 2 MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Disconnect and isolate negative battery cable from battery.
(2) From underside of steering wheel, remove 2 speed control switch mounting screws (Fig. 6).
(3) Pull switch module assembly from wheel and unplug electrical connector.

REMOVAL AND INSTALLATION (Continued)

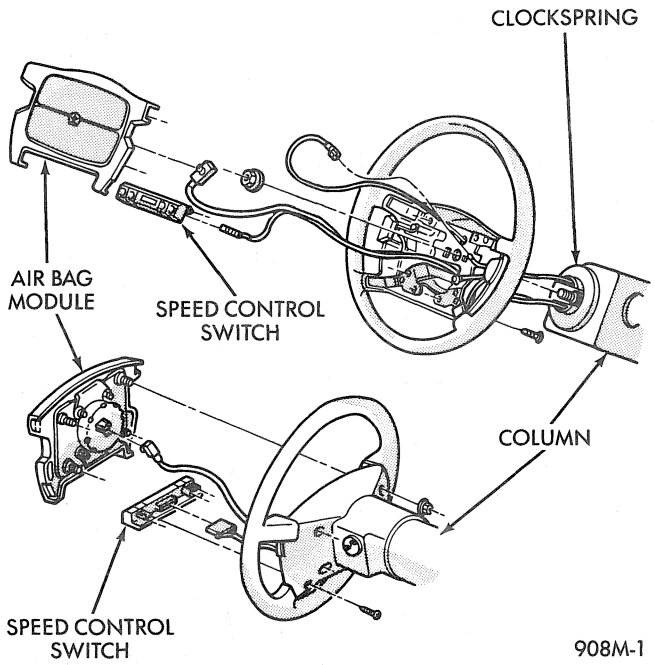


Fig. 6 Speed Control Switch Remove/Install

INSTALLATION

(1) Plug electrical connector into switch module.
(2) Install switch with 2 screws.
(3) Tighten screws to 1.5 N·m (15 in. lbs.) torque

STOP LAMP SWITCH

Refer to Group 5, Brakes for removal/installation and adjustment procedures.

SERVO CABLE

REMOVE/INSTALL

(1) Using finger pressure only, remove speed control cable connector at bellcrank by pushing connector off the bellcrank. DO NOT try to pull connector off perpendicular to the bellcrank.
(2) Squeeze tabs on speed control cable and push cable out of locking plate.
(3) Unclip cable from cable guide at valve cover.
(4) Remove servo cable from servo as described in Speed Control Servo—Remove/Install.
(5) Reverse removal procedures to install.

POWERTRAIN CONTROL MODULE

For Removal/Installation refer to Group 14, Fuel Injection System.

VACUUM RESERVOIR

REMOVE/INSTALL

The vacuum reservoir is located behind the front bumper bar.
(1) Remove vacuum hose at reservoir.

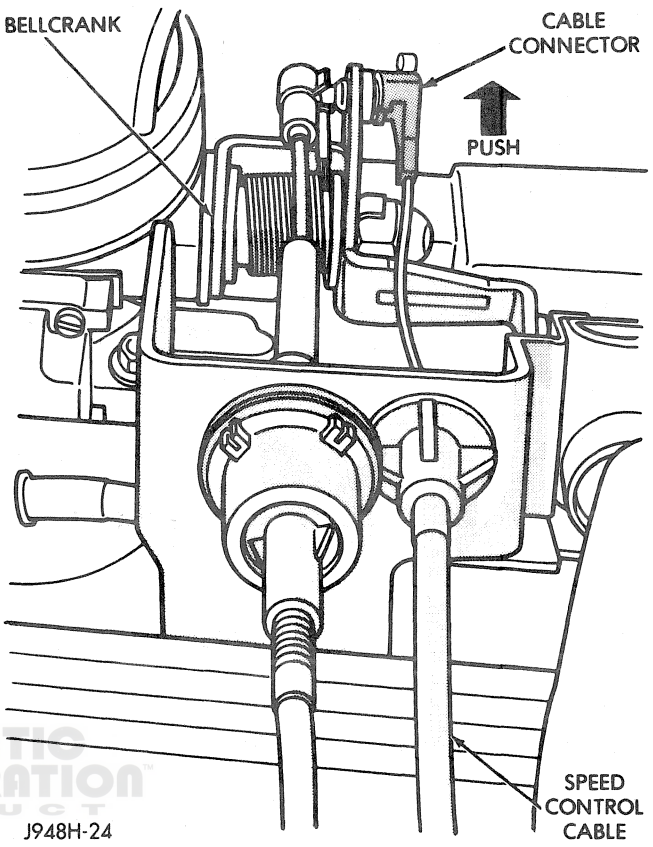


Fig. 7 Servo Cable to Bellcrank—Remove/Install

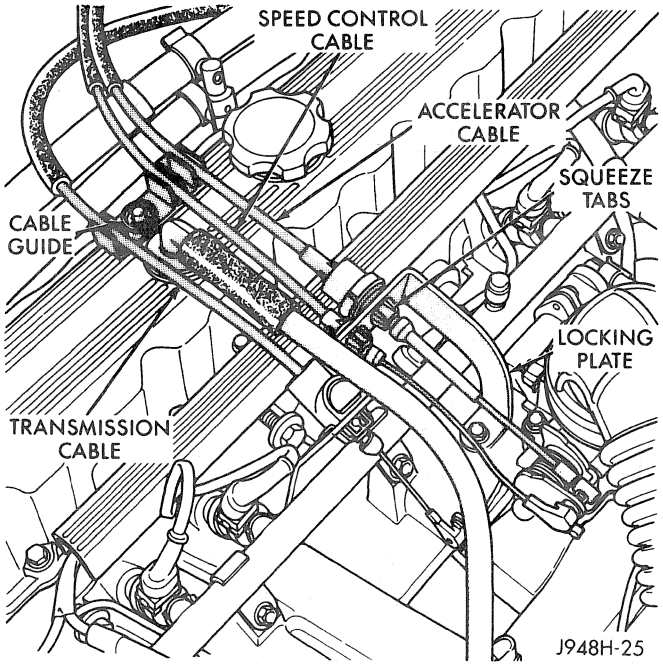


Fig. 8 Servo Cable to Locking Plate—Remove/Install

(2) Remove 2 screws at reservoir.
(3) Remove reservoir from bumper bar.

REMOVAL AND INSTALLATION (Continued)

(4) Reverse the removal procedures for installation.

(5) Tighten mounting screws to 8.5 N·m (75 in. lbs.) torque.

VEHICLE SPEED SENSOR

For Removal/Installation of the Vehicle Speed Sensor refer to Group 14, Fuel System.

Mopar AUTHENTIC RESTORATION PRODUCT

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	Torque
Servo Mounting Bracket Nuts	6 N·m (50 in. lbs.)
Switch Module Mounting Screws	1.5 N·m (15 in. lbs.)
Vacuum Reservoir Mounting Nuts	8.5 N·m (75 in. lbs.)

TURN SIGNAL AND HAZARD WARNING SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
COMBINATION FLASHER	1
HAZARD WARNING SYSTEM	1
MULTI-FUNCTION SWITCH	2
TURN SIGNAL INDICATOR LAMPS	2
TURN SIGNAL LAMPS	2
TURN SIGNAL SYSTEM	1
DIAGNOSIS AND TESTING	
INTRODUCTION	2
MULTI-FUNCTION SWITCH	3
TURN SIGNAL/HAZARD WARNING SYSTEM	2
REMOVAL AND INSTALLATION	
COMBINATION FLASHER	3
MULTI-FUNCTION SWITCH	3

GENERAL INFORMATION

INTRODUCTION

Following are general descriptions of the major components in the turn signal and hazard warning systems. Refer to 8W-52 - Turn Signals in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

TURN SIGNAL SYSTEM

With the ignition switch in the On or Accessory position, and the multi-function switch control lever moved up (right turn) or down (left turn), the turn signal system is activated.

When the turn signal system is activated, the selected (right or left) turn signal indicator lamp, front park/turn signal lamp and rear tail/stop/turn signal lamp bulbs will flash. With the headlamp switch in the Off position, the front turn signal and front side marker lamps flash in unison. With the headlamp switch in the On position, the front turn signal and front side marker lamps flash alternately.

HAZARD WARNING SYSTEM

The hazard warning system is activated by a switch button in the multi-function switch. The button is located on the top of the steering column between the steering wheel and the instrument panel. The hazard warning switch button is identified with a double triangle.

The hazard warning system is connected to an unswitched battery feed so that the system remains functional, regardless of the ignition switch position. Push the switch button in to activate the hazard warning system, and push in on the button again to turn the system off. When the hazard warning system is activated, the right and left turn signal indicators, front park/turn signal lamps and rear tail/stop/turn signal lamps will flash.

COMBINATION FLASHER

The combination flasher functions as both the turn signal system and hazard warning system flasher. The combination flasher is a smart relay that is located in the relay center, under the lower instrument panel and inboard of the steering column.

The combination flasher is designed to handle the current flow requirements of the factory installed lighting. If supplemental lighting is added to the turn signal lamp circuits, such as when towing a trailer with lights, the combination flasher will automatically compensate. This allows the flash rate to remain the same, regardless of electrical load increases. However, if a bulb fails in the turn signal lamp circuits, the flash rate of the remaining bulbs in that circuit will increase to 120 flashes per minute, or higher.

While the combination flasher shares the terminal orientation (footprint) of a International Standards Organization (ISO)-type relay, the internal circuitry is much different. The combination flasher contains active electronic integrated circuitry elements. Do not substitute any other relay for the combination flasher.

The combination flasher cannot be repaired and, if faulty, it must be replaced. Also, because of the combination flasher's active elements, it cannot be tested with conventional automotive electrical test equipment. If the flasher is believed to be faulty, test the turn signal and hazard warning system circuits as described in this group. Then, replace the combination flasher with a known good unit to confirm system operation.

DESCRIPTION AND OPERATION (Continued)

MULTI-FUNCTION SWITCH

The multi-function switch assembly is mounted to the left side of the steering column (Fig. 1). This switch contains circuitry for the following functions:

- Turn signals
- Hazard warning
- Headlamp beam selection
- Headlamp optical horn
- Windshield wipers
- Windshield washers.

The information contained in this group addresses only the switch functions for the turn signal and hazard warning circuits. For information relative to the other switch functions, refer to the appropriate group. However, the multi-function switch cannot be repaired. If any function of the switch is faulty, the entire switch assembly must be replaced.

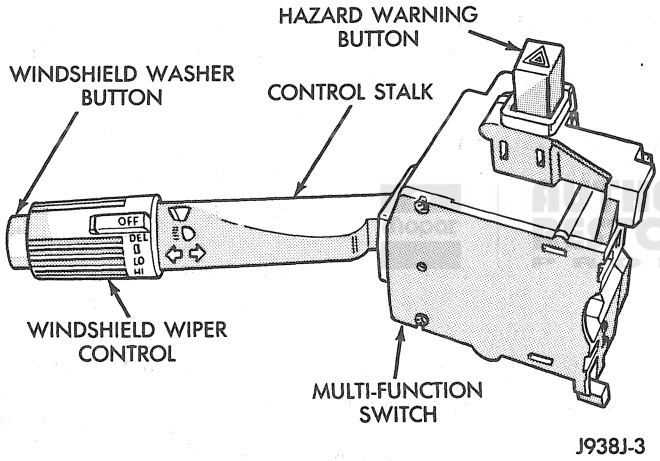


Fig. 1 Multi-Function Switch

TURN SIGNAL INDICATOR LAMPS

The turn signal indicator lamps are located in the instrument cluster. They flash with the exterior turn signal lamps to give the driver a visual indication that a turn signal or the hazard warning system is operating. For diagnosis and service of this component, refer to Group 8E - Instrument Panel Systems.

TURN SIGNAL LAMPS

The exterior lamps in the turn signal and hazard warning circuits include the front park/turn signal, and the rear tail/stop/turn signal. For diagnosis and service of these lamps, refer to Group 8L - Lamps.

DIAGNOSIS AND TESTING

INTRODUCTION

When diagnosing the turn signal or hazard warning circuits, remember that high generator output can burn out bulbs rapidly and repeatedly. If this is a problem on the vehicle being diagnosed, refer to Group 8C - Charging System for further diagnosis.

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL OR STEERING COLUMN COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

TURN SIGNAL/HAZARD WARNING SYSTEM

(1) Turn the ignition switch to the On position. Actuate the turn signal lever or hazard warning button. Observe the turn indicator lamp(s) in the instrument cluster. If the flash rate is very high, check for a turn signal bulb that is not lit. Replace that bulb or repair the circuits to that lamp, as required. Test the operation of the system again. If the turn indicator(s) fail to light, go to Step 2.

(2) Remove and inspect the turn signal fuse in the fuseblock module, or the hazard warning fuse in the Power Distribution Center (PDC). Replace the faulty fuse(s), if required, and go to Step 3.

(3) Remove the combination flasher from the relay center and replace it with a known good unit. Test the operation of the turn signal and hazard warning systems. If OK, discard the faulty combination flasher. If not OK, remove the test flasher and go to Step 4.

(4) With the ignition switch in the On position, check for battery voltage at the fused ignition switch output circuit cavity for the flasher in the relay center. If OK, go to Step 5. If not OK, repair the open circuit to the ignition switch as required.

(5) With the ignition switch in the Off position, check for battery voltage at the fused B(+) circuit cavity for the flasher in the relay center. If OK, go to Step 6. If not OK, repair the open circuit to the PDC as required.

(6) With the ignition switch in the Off position, check for continuity between the ground circuit cavity for the flasher in the relay center and a good ground. There should be continuity. If OK, go to Step 7. If not OK, repair the circuit to ground as required.

(7) Disconnect the multi-function switch connector. Check for continuity between the combination flasher output (hazard) circuit cavities of the relay center and the multi-function switch connector. There should be continuity. If OK, go to Step 8. If not OK, repair the open circuit as required.

(8) Check for continuity between the combination flasher output (turn signals) cavities of the relay center and the multi-function switch connector. There should be continuity. If OK, test the multi-function

DIAGNOSIS AND TESTING (Continued)

switch as described in this group. If not OK, repair the open circuit as required.

MULTI-FUNCTION SWITCH

Perform the diagnosis of the hazard warning and/or turn signal systems as described in this group before testing the multi-function switch. For circuit descriptions and diagrams, see 8W-52 - Turn Signals in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL OR STEERING COLUMN COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the multi-function switch connector as described in this group.

(2) Using an ohmmeter, perform the switch continuity checks at the switch terminals as shown in the chart (Fig. 2).

(3) If the switch fails any of the continuity checks, replace the faulty switch. If the switch is OK, repair the lighting circuits as required.

REMOVAL AND INSTALLATION

COMBINATION FLASHER

(1) Disconnect the battery negative cable.

(2) The relay center is located on the lower instrument panel reinforcement, under the instrument panel and inboard of the steering column. Unplug the combination flasher (blue) from the relay center.

(3) To install the flasher, align the terminals with the cavities in the relay center and push the flasher firmly into place.

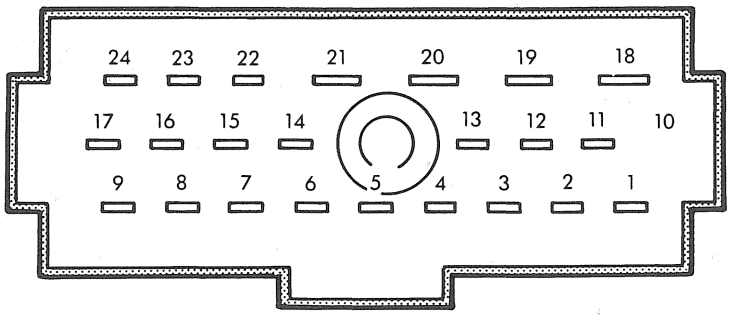
(4) Connect the battery negative cable.

(5) Test the combination flasher operation.

MULTI-FUNCTION SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL OR STEERING COLUMN COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the battery negative cable.



VIEW FROM TERMINAL CASE

SWITCH POSITIONS TURN SIGNAL	SWITCH POSITIONS HAZARD WARNING	CONTINUITY BETWEEN
NEUTRAL	OFF	12 AND 14 AND 15
LEFT	OFF	15 AND 16 AND 17
LEFT	OFF	12 AND 14
LEFT	OFF	22 AND 23 WITH OPTIONAL CORNER LAMPS
RIGHT	OFF	11 AND 12 AND 17
RIGHT	OFF	14 AND 15
RIGHT	OFF	23 AND 24 WITH OPTIONAL CORNER LAMPS
NEUTRAL	ON	11 AND 12 AND 13 AND 15 AND 16

908J-4

Fig. 2 Multi-Function Switch Continuity

REMOVAL AND INSTALLATION (Continued)

(2) Remove the tilt steering column lever, if equipped.

(3) Remove the lower instrument panel/knee blocker (Fig. 3).

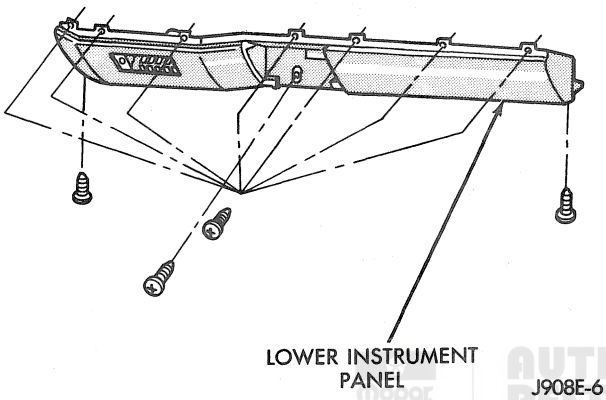


Fig. 3 Lower Instrument Panel/Knee Blocker Remove/Install

(4) Remove both the upper and lower shrouds from the steering column (Fig. 4).

(5) Remove the lower fixed column shroud.

(6) Loosen the steering column upper bracket nuts. Do not remove the nuts.

(7) Move the upper fixed column shroud to gain access to the rear of the multi-function switch (Fig. 5).

(8) Remove the multi-function switch tamper proof mounting screws (a Snap On tamper proof torx bit TTXR20B2 or equivalent is required).

(9) Gently pull the switch away from the column. Loosen the connector screw. The screw will remain in the connector.

(10) Remove the wiring connector from the multi-function switch.

(11) Reverse the removal procedures to install. Tighten the fasteners as follows:

- Multi-function switch connector screw - 1.9 N·m (17 in. lbs.)

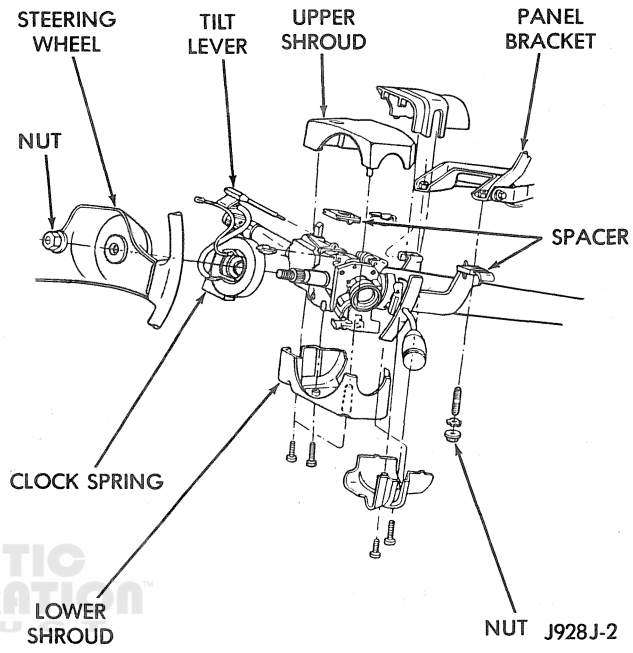


Fig. 4 Steering Column Shrouds Remove/Install

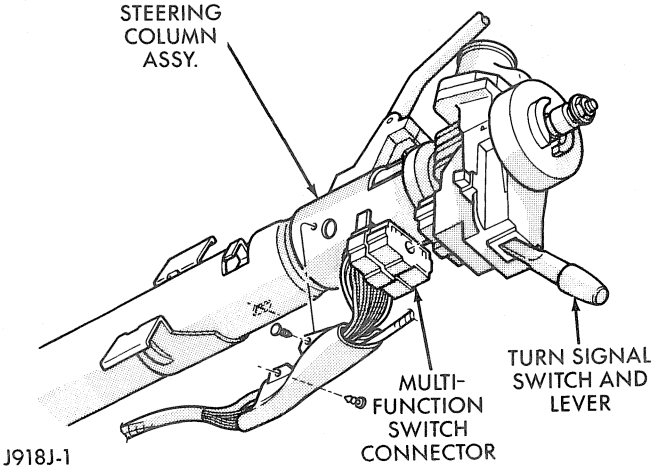


Fig. 5 Multi-Function Switch Connector

- Multi-function switch retaining screws - 1.9 N·m (17 in. lbs.)
- Steering column upper bracket nuts - 12 N·m (110 in. lbs.).

WIPER AND WASHER SYSTEMS

CONTENTS

	page		page
GENERAL INFORMATION		WIPER MOTORS	2
INTRODUCTION	1	**DIAGNOSIS AND TESTING**	
DESCRIPTION AND OPERATION		WASHER SYSTEMS	5
INTERMITTENT WIPE MODULE	3	WIPER AND WASHER SWITCHES	6
REAR WIPER AND WASHER SYSTEM	1	WIPER SYSTEMS	4
WASHER NOZZLES AND PLUMBING	3	**REMOVAL AND INSTALLATION**	
WASHER PUMPS	3	INTERMITTENT WIPE MODULE	8
WASHER RESERVOIR	3	WASHER PUMPS AND RESERVOIR	10
WINDSHIELD WASHER SYSTEM	1	WIPER AND WASHER SWITCHES	9
WINDSHIELD WIPER SYSTEM	1	WIPER ARMS	7
WIPER AND WASHER SWITCHES	2	WIPER LINKAGE AND PIVOTS	8
WIPER ARMS AND BLADES	2	WIPER MOTOR	8
WIPER LINKAGE AND PIVOTS	2		

GENERAL INFORMATION

INTRODUCTION

Following are general descriptions of the major components in the wiper and washer systems. Refer to 8W-53 - Wipers in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

WINDSHIELD WIPER SYSTEM

An intermittent wiper system is standard equipment. This system lets the driver select from two wiper speeds, or an intermittent wipe feature that allows a delay between wipes of 2 to 15 seconds.

The wipers will operate only when the ignition switch is in the Accessory or On positions. On left-hand drive models, a circuit breaker located in a connector on the side of the fuseblock module protects the circuitry of the wiper system. On right-hand drive models, a fuse in the fuseblock module protects the wiper system. Refer to the owner's manual for more information on wiper system controls and operation.

WINDSHIELD WASHER SYSTEM

A electrically operated windshield washer system is standard equipment. A reservoir in the engine compartment holds the washer fluid, which is pressurized by a pump when the washer (multi-function) switch is actuated. The washer pump feeds the pressurized washer fluid through the washer system plumbing to the washer nozzles.

An optional low washer fluid warning lamp on the instrument panel will warn the driver when the washer fluid level needs to be checked. Refer to Group 8E - Instrument Panel Systems for more information on this feature.

The washers will operate only when the ignition switch is in the Accessory or On positions. On left-hand drive models, a circuit breaker located in a connector on the side of the fuseblock module protects the circuitry of the washer system. On right-hand drive models, a fuse in the fuseblock module protects the washer system. Refer to the owner's manual for more information on washer system controls and operation.

REAR WIPER AND WASHER SYSTEM

A rear wiper and washer system is an available option on this model. The rear wiper is a fixed-cycle wipe system. A single switch on the instrument panel controls both the rear wiper and washer functions. The rear washer system shares the reservoir of the windshield washer system, but has its own dedicated washer pump and plumbing.

These systems will operate only when the ignition switch is in the Accessory or On positions. A fuse in the fuseblock module protects the circuitry of both the rear wiper and washer. Refer to the owner's manual for more information on the rear wiper and washer system controls and operation.

DESCRIPTION AND OPERATION (Continued)

WIPER ARMS AND BLADES

All Cherokee models have two 18-inch windshield wiper blades with replaceable rubber elements (squeegees). The rear wiper option includes a single 12-inch wiper blade with a replaceable rubber element (squeegee).

Caution should be exercised to protect the rubber squeegees from any petroleum-based cleaners or contaminants, which will rapidly deteriorate the rubber. If the squeegees are damaged, worn, or contaminated, they must be replaced.

Wiper squeegees exposed to the elements for a long time tend to lose their wiping effectiveness. Periodic cleaning of the squeegees is suggested to remove deposits of salt and road film. The wiper blades, arms, and windshield or rear glass should be cleaned with a sponge or cloth and a mild detergent or non-abrasive cleaner. If the squeegees continue to streak or smear, they should be replaced.

The blades are mounted to spring-loaded wiper arms. Spring tension of the wiper arms controls the pressure applied to the blades on the glass. The windshield wiper arms are attached by an integral latch to the two wiper pivots on the cowl grille panel at the base of the windshield. The rear wiper arm is attached by an integral latch directly to the rear wiper motor output shaft on the liftgate panel. The wiper arms and blades cannot be adjusted or repaired. If faulty, they must be replaced.

WIPER LINKAGE AND PIVOTS

The wiper linkage and pivot module is fastened with screws to the cowl top panel beneath the cowl plenum cover/grille panel. The two wiper pivot crank arms and the wiper motor crank arm each have ball studs on their ends, the left pivot ball stud is the longer of the three. A connecting link with a plastic socket-type bushing in the right end, and a plastic sleeve-type bushing in the left end, is fit over the pivot ball studs to join the two pivots.

The wiper drive link has a plastic socket-type bushing on each end. One end of the drive link is fit over the exposed end of the longer left pivot ball stud, while the other end is snap-fit over the ball stud on the wiper motor crank arm.

The wiper linkage, pivots, and bushings are only serviced as a complete unit. If any part of this assembly is faulty, the entire unit must be replaced. The wiper motor and motor crank arm are serviced separately.

WIPER MOTORS

FRONT

The two-speed permanent magnet wiper motor has an integral transmission and park switch. The motor is mounted to a bracket on the linkage and pivots assembly in the cowl plenum area. A reinforcement/stud plate with a rubber-isolated mounting bracket extends from cowl plenum side of the dash panel to the motor mounting bracket to provide additional support. The wiper motor output shaft passes through the mounting bracket, where a crank arm attached to the output shaft drives the wiper drive link.

Wiper speed is controlled by current flow to the appropriate set of brushes. The wiper motor completes its wipe cycle when the switch is turned to the Off position, and parks the blades in the lowest portion of the wipe pattern. The wiper motor cannot be repaired. If faulty, the entire wiper motor assembly must be replaced. The crank arm and reinforcement/stud plate are available for service.

REAR

The rear wiper motor is mounted with a bracket to the liftgate inner panel, below the rear glass and behind the liftgate trim. The motor output shaft passes through the liftgate outer panel where a gasket, bezel, and nut, seal and secure the unit to the liftgate outer panel. The rear wiper arm is mounted directly to the motor output shaft. The rear wiper motor unit provides three operating modes:

- Constant wipe that operates when the rear wipe switch is operated
- Constant wipe that operates when the rear washer is operated
- Park mode that runs the motor until the wiper blade reaches the park position after the rear wiper switch or ignition switch is turned to the Off position.

The rear wiper motor cannot be repaired. If faulty, the entire wiper motor assembly must be replaced.

WIPER AND WASHER SWITCHES

FRONT

The front wiper and washer switches are contained in the multi-function switch assembly. The multi-function switch assembly is mounted to the left side of the steering column. This switch contains circuitry for the following functions:

- Turn signals
- Hazard warning
- Headlamp beam selection
- Headlamp optical horn
- Windshield wipers
- Windshield washers.

The information contained in this group addresses only the switch functions for the wiper and washer systems. For information relative to the other switch functions, refer to the appropriate group. However, the multi-function switch cannot be repaired. If any

DESCRIPTION AND OPERATION (Continued)

function of the switch is faulty, the entire switch assembly must be replaced.

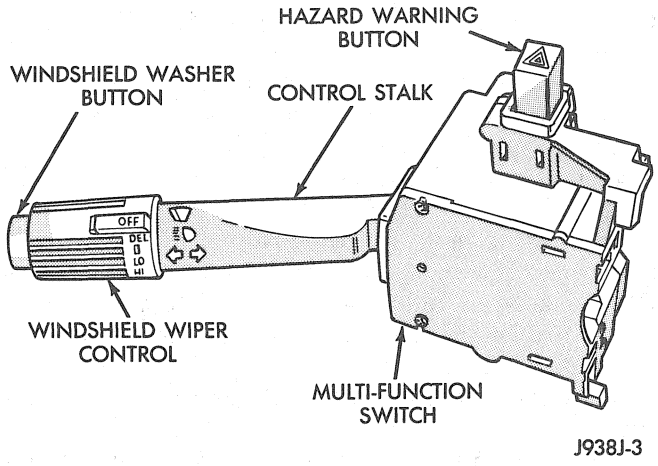


Fig. 1 Multi-Function Switch

REAR

The single two-function rear wiper switch is located on the instrument panel, right of the steering column. The rear wiper switch controls the rear wiper and washer functions. The rocker-type switch features a detent in the Wipe position, but only momentary contact in the Wash position. Both the rear wiper and rear washer motors will operate continuously for as long as the switch is held in the Wash position. The rear wiper switch cannot be repaired and, if faulty, it must be replaced.

INTERMITTENT WIPE MODULE

In addition to low and high speed, the intermittent wipe system has a delay mode. The delay mode has a range of 2 to 15 seconds.

The length of the delay is selected with a variable resistor in the wiper/washer (multi-function) switch, and is accomplished by electronic circuitry within the intermittent wipe module. If the washer knob is depressed while the wiper/washer switch is in the Off position, the intermittent wipe module will operate the wiper motor for approximately two wipes and automatically turn off the motor.

The intermittent wipe module is mounted to the lower instrument panel, behind the knee blocker and near the steering column, with a hook and loop fastener patch. The module cannot be repaired and, if faulty, must be replaced.

WASHER RESERVOIR

A single washer fluid reservoir is used for both the standard front and optional rear washer systems. The washer fluid reservoir is mounted to the right cowl top panel in the engine compartment on left-hand drive models, except with the diesel engine option. The reservoir is mounted between the left front fender and left inner fender shield, above the front of the front wheelhouse, on all right-hand drive models, and all models with a diesel engine option.

The washer pump and motor unit(s) has a threaded nipple, which is installed through a rubber grommet seal(s) inserted in a hole(s) in the bottom of the reservoir. A plastic nut(s) and washer(s) secure the washer pump nipple(s) from inside the cowl-mounted reservoir, and can be accessed through the reservoir filler neck. The washer pump nipple(s) are a press-fit into the grommet seal for the inner fender-mounted reservoir.

The inner fender-mounted reservoir has a separate filler neck. The filler neck snaps into the reservoir from the engine compartment side of the left inner fender shield. Both reservoirs have a provision for the optional low washer fluid level sensor. Refer to Group 8E - Instrument Panel Systems for diagnosis and service of the sensor. The reservoir, filler neck, and filler cap are each available for service.

WASHER PUMPS

The washer pump(s) and motor(s) are mounted near the bottom of the washer reservoir. A threaded nipple on the pump housing passes through a grommet(s) in the bottom of the reservoir. On vehicles with the cowl-mounted reservoir, a nut and washer is installed on the nipple from inside the reservoir. On vehicles with the inner fender-mounted reservoir, the pump nipple is press-fit into the reservoir grommet seal. On vehicles with the optional rear wiper/washer system and the inner fender-mounted reservoir, the front washer pump and motor is always mounted in the lower hole of the reservoir.

A permanently lubricated and sealed motor is coupled to a rotor-type pump. Washer fluid is gravity-fed from the reservoir to the pump. The pump then pressurizes the fluid and forces it through the plumbing to the nozzles, when the motor is energized. The pump and motor cannot be repaired. If faulty, the entire washer pump and motor unit must be replaced.

WASHER NOZZLES AND PLUMBING

FRONT

Pressurized washer fluid is fed through a single hose, attached to a nipple on the front washer pump, to a tee fitting located in the cowl plenum area beneath the cowl plenum cover/grille panel. Hoses from the tee fitting are routed to the two nozzles, which are riveted into openings in the cowl plenum cover/grille panel below the windshield. The two fluidic washer nozzles are not adjustable. The nozzles cannot be repaired and, if faulty, must be replaced.

DESCRIPTION AND OPERATION (Continued)

REAR

Pressurized washer fluid is fed through a single hose, attached to a nipple on the rear washer pump, to the liftgate. The hose is routed, from the front of the vehicle to the liftgate, with the passenger side body wiring harness. Inside the liftgate, the hose connects to a check valve, which prevents washer fluid drain-back or siphoning from occurring. From the check valve, another single hose is connected to a nipple that protrudes from inside of the rear wiper motor output shaft bezel. The fluid passes through the bezel nipple to the outside of the liftgate. There a single hose is routed through a plastic trough-like guard, snapped to the underside of the rear wiper arm, to the single rear washer nozzle. The nozzle snaps into place on the rear wiper arm. Both the nozzle and check valve are not repairable and, if faulty, should be replaced.

DIAGNOSIS AND TESTING

WIPER SYSTEMS

FRONT

For circuit descriptions and diagrams, refer to 8W-53 - Wipers in Group 8W - Wiring Diagrams.

(1) Remove the in-line circuit breaker near the fuseblock module (LHD), or the fuse from the fuseblock module (RHD), and turn the ignition switch to the Accessory or On position.

(a) Measure the voltage at the battery side of the circuit breaker or fuse. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the circuit from the ignition switch as required.

(b) Measure the voltage at the wiper system side of the circuit breaker or fuse. The meter should read battery voltage. If OK, go to Step 2. If not OK, replace the faulty circuit breaker or fuse.

(2) Unplug the wiper motor side of the wiring harness connector (gray) from the intermittent wipe module. Turn the ignition switch to the Accessory or On position.

(a) Measure the voltage at the fused ignition switch output circuit cavity of the unplugged wiring harness connector. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the open circuit as required.

(b) Turn the ignition switch to the Off position. Measure the resistance between the ground circuit cavity of the unplugged wiring harness connector and a good ground. The meter should read zero ohms. If OK, go to Step 3. If not OK, repair circuit to ground as required.

(3) Leave the ignition switch in the Off position. Back-probe the wiring harness connector at the wiper motor. Measure the resistance between the ground circuit cavity of the wiper motor connector and a good ground. The meter should read zero ohms. If OK, go to Step 4. If not OK, repair circuit to ground as required.

(4) Replace the intermittent wipe module with a known good unit. Test the wiper system operation in all modes. If OK, replace the faulty intermittent wipe module. If not OK, re-install the original module and go to Step 5.

(5) Test the multi-function switch, as described in this group. If the switch tests OK, go to Step 6. If not OK, replace the faulty switch and go to Step 7.

(6) Turn the ignition switch to the Accessory or On position. Place the multi-function switch in the positions indicated in the tests below, and back-probe the switch side of the wiring harness connector (black).

(a) Measure the voltage at the wiper switch low speed output circuit cavity of the connector with the wiper switch in the Low and Mist positions, and with the washer switch depressed. The meter should read battery voltage in each case. If OK, go to Step 2. If not OK, repair the open circuit as required.

(b) Measure the voltage at the wiper switch high speed output circuit cavity of the connector with the wiper switch in the High position. The meter should read battery voltage. If OK, go to Step 3. If not OK, repair the open circuit as required.

(c) Measure the voltage at the wiper motor park signal circuit cavity of the connector with the wiper switch in the Low or High position, then move the switch to the Off position. The meter should read battery voltage until the wipers park, and then read zero volts. If OK, go to Step 7. If not OK, repair the open circuit as required, then go to Step 7.

(7) To test the wiper motor, turn the ignition switch to the Accessory or On position. Place the multi-function switch in the positions indicated in the tests below, and back-probe the motor connector.

(a) Measure the voltage at the fused ignition switch output circuit cavity of the connector with the wiper switch in any position. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the open circuit as required.

(b) Measure the voltage at the wiper switch low speed output circuit cavity of the connector with the wiper switch in the Low position. The meter should read battery voltage. If OK, but the wipers do not operate, replace the faulty wiper motor. If not OK, repair the open circuit as required.

(c) Measure the voltage at the wiper switch high speed output circuit cavity of the connector with the wiper switch in the High position. The meter should read battery voltage. If OK, but the wipers

DIAGNOSIS AND TESTING (Continued)

do not operate, replace the faulty wiper motor. If not OK, repair the open circuit as required.

(d) Measure the voltage at the wiper park switch sense circuit cavity of the connector, with the wiper switch in the Low or High position, then move the switch to the Off position. The meter should read battery voltage when the switch is turned to the Off position, then zero volts after the wipers park. If battery voltage is present, but the wipers fail to park; or, if no battery voltage present, replace the faulty wiper motor.

REAR

For circuit descriptions and diagrams, refer to 8W-53 - Wipers in Group 8W - Wiring Diagrams.

(1) Check the fuse in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Turn the ignition switch to the On position, and place the rear wiper switch in the Wash position. Back-probe the rear wiper switch connector as indicated.

(a) Measure the voltage at the fused ignition switch output circuit cavity of the connector. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the open circuit as required.

(b) Measure the voltage at each of the remaining cavities of the connector. In each case the meter should read battery voltage. If OK, go to Step 3. If not OK, replace the faulty switch.

(3) Turn the ignition switch to the On position, and place the rear wiper switch in the Wipe position. Measure the voltage at the rear wiper motor control circuit cavity of the rear wiper switch connector. The meter should read battery voltage. If OK, go to Step 4. If not OK, replace the faulty switch.

(4) Turn the ignition switch to the Off position. Remove the liftgate inner trim panel. Measure the resistance between the ground circuit cavity of the rear wiper motor connector and a good ground. The meter should read zero ohms. If OK, go to Step 5. If not OK, repair the circuit to ground as required.

(5) Turn the ignition switch to the On position, and place the rear wiper switch in the Wash position. Measure the voltage at each of the remaining cavities of the motor connector. In each case the meter should read battery voltage. If OK, replace the faulty wiper motor. If not OK, repair the open circuit(s) as required.

WASHER SYSTEMS

FRONT

For circuit descriptions and diagrams, refer to 8W-53 - Wipers in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position. Depress the washer switch. Check whether the wipers operate. If OK, go to Step 2. If not OK, see the diagnosis for Windshield Wiper System in this group.

(2) Unplug the front washer pump connector. Measure the resistance between the ground circuit cavity of the pump connector and a good ground. The meter should read zero ohms. If OK, go to Step 3. If not OK, repair the ground circuit as required.

(3) Turn the ignition switch to the On position, and depress the washer switch.

(a) Measure the voltage at the washer pump switch signal circuit cavity of the wiper switch harness connector (black) at the intermittent wipe module. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the open circuit as required.

(b) Measure the voltage at the washer pump switch signal circuit cavity of the wiper motor harness connector (gray) at the intermittent wipe module. The meter should read battery voltage. If OK, go to Step 3. If not OK, replace the faulty module.

(c) Measure the voltage at the washer pump switch signal circuit cavity of the washer pump connector. The meter should read battery voltage. If OK, replace the faulty pump. If not OK, repair the open circuit as required.

REAR

For circuit descriptions and diagrams, refer to 8W-53 - Wipers in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position, and place the rear wiper/washer switch in the Wash position. Check whether the rear wiper is operating. If OK, go to Step 2. If not OK, replace the faulty fuse or repair the open circuit to the fuseblock module as required.

(2) Turn the ignition switch to the Off position and unplug the rear washer pump connector. Measure the resistance between the ground circuit cavity of the pump connector and a good ground. The meter should read zero ohms. If OK, go to Step 3. If not OK, repair the circuit to ground as required.

(3) Turn the ignition switch to the On position, and place the rear wiper/washer switch in the Wash position. Measure the voltage at the rear washer pump motor control circuit cavity of the rear washer pump connector. The meter should read battery voltage. If OK, replace the faulty pump. If not OK, go to Step 4.

(4) Remove the rear wiper/washer switch and reconnect below the instrument panel. Back-probe the switch connector with the ignition switch in the On position.

(a) Measure the voltage at the fused ignition switch output circuit cavity of the switch connector. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the open circuit as required.

DIAGNOSIS AND TESTING (Continued)

(b) Measure the voltage at the rear washer pump motor control circuit cavity of the switch connector, while holding the switch in the Wash position. The meter should read battery voltage. If OK, repair the open circuit to the pump as required. If not OK, replace the faulty switch.

WIPER AND WASHER SWITCHES

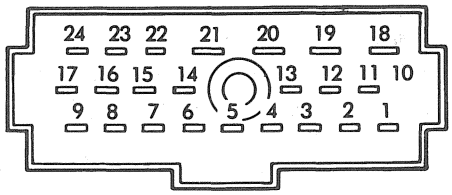
FRONT

Perform the diagnosis for the wiper and/or washer systems as described in this group before testing the multi-function switch. For circuit descriptions and diagrams, see 8W-53 - Wipers in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL OR STEERING COLUMN COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the multi-function switch connector as described in this group.

(2) Using an ohmmeter, perform the switch continuity checks at the switch terminals as shown in the chart (Fig. 2).



MULTIFUNCTION SWITCH PINS

SWITCH POSITION	CONTINUITY BETWEEN
OFF	PIN 6 AND PIN 7
DELAY	PIN 8 AND PIN 9 PIN 2 AND PIN 4 PIN 1 AND PIN 2 PIN 1 AND PIN 4
LOW	PIN 4 AND PIN 6
HIGH	PIN 4 AND PIN 5
WASH	PIN 3 AND PIN 4
*RESISTANCE AT MAXIMUM DELAY POSITION SHOULD BE BETWEEN 270,000 OHMS AND 330,000 OHMS. *RESISTANCE AT MINIMUM DELAY POSITION SHOULD BE ZERO WITH OHMMETER SET ON HIGH OHM SCALE.	

918J-4

Fig. 2 Multi-Function Switch Continuity

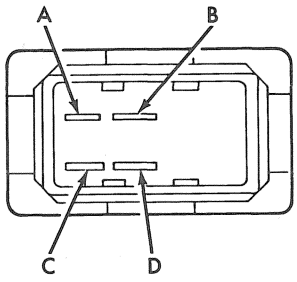
(3) If the switch fails any of the continuity checks, replace the faulty switch.

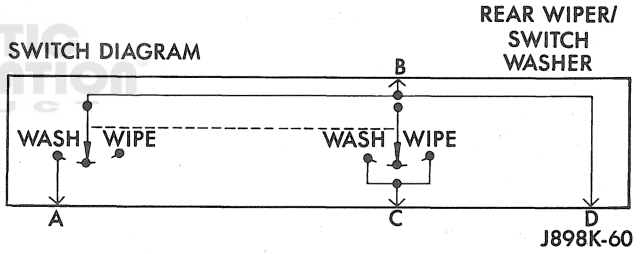
REAR

Perform the diagnosis for the rear wiper and/or washer systems as described in this group before testing the rear wiper and washer switch. For circuit descriptions and diagrams, see 8W-53 - Wipers in Group 8W - Wiring Diagrams.

(1) Remove the rear wiper and washer switch as described in this group.

(2) Using an ohmmeter, perform the switch continuity checks at the switch terminals as shown in the charts.





Rear Wiper and Washer Switch Circuit

SWITCH TEST

SWITCH POSITION	TERMINALS	ZERO OHMS
OFF (NORMAL)	B AND A	NO
	B AND C	NO
WIPE	B AND C	YES
	B AND A	NO
WASH	A AND B	YES
	B AND C	YES

J908K-17

Rear Wiper and Washer Switch Continuity

(3) If the switch fails any of the continuity checks, replace the faulty switch.

REMOVAL AND INSTALLATION

WIPER ARMS

FRONT

CAUTION: The use of a screwdriver or other prying tool to remove a wiper arm may distort it. This distortion could allow the arm to come off of the pivot shaft, regardless of how carefully it is installed.

(1) Lift the wiper arm to permit the latch to be pulled out to its holding position, then release the arm (Fig. 3). The arm will remain off the windshield with the latch in this position.

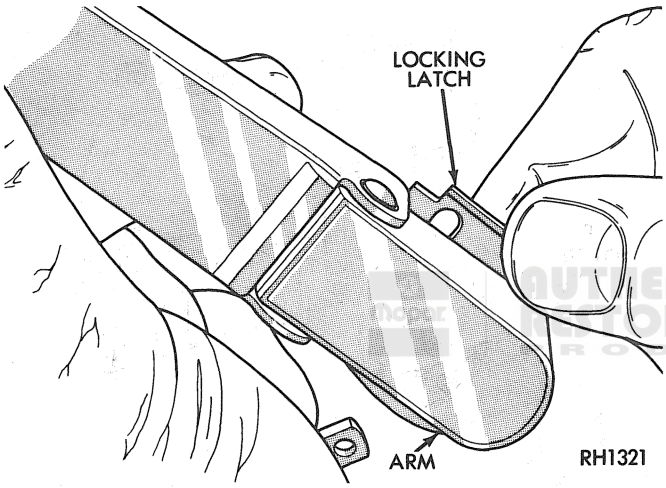


Fig. 3 Wiper Arm Remove/Install

(2) Remove the arm from the pivot using a rocking motion.

(3) Install the arm and blade with the wiper motor in the Park position. See the Wiper Arm Installation illustration (Fig. 4). Mount the arms on the pivot shafts so that the distance from the lower edge of the wiper arm tip to the upper edge of the lower windshield moulding is:

- 23 - 52 mm (0.90 - 2.04 inch) on the driver's side
- 33 - 62 mm (1.29 - 2.44 inch) on the passenger's side.

(4) Lift the wiper arm away from the windshield slightly to relieve the spring tension on the locking latch. Push the latch into the locked position and slowly release the arm until the wiper blade rests on the windshield.

(5) Operate the wipers with the windshield glass wet, then turn the wiper switch to the Off position. Check for the correct wiper arm positioning and readjust if required.

REAR

(1) Remove the wiper arm assembly from the pivot pin by depressing the tab and pulling straight out (Fig. 5).

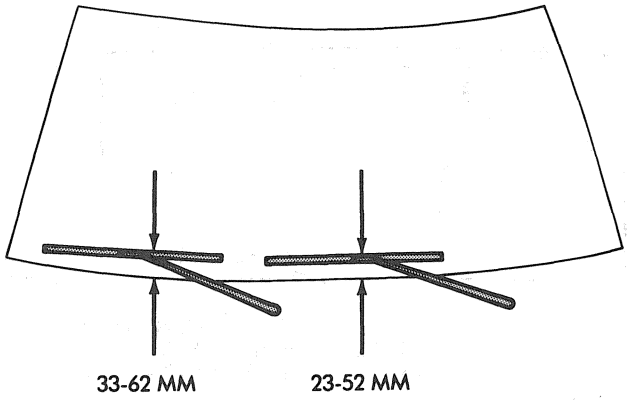


Fig. 4 Front Wiper Arm Installation

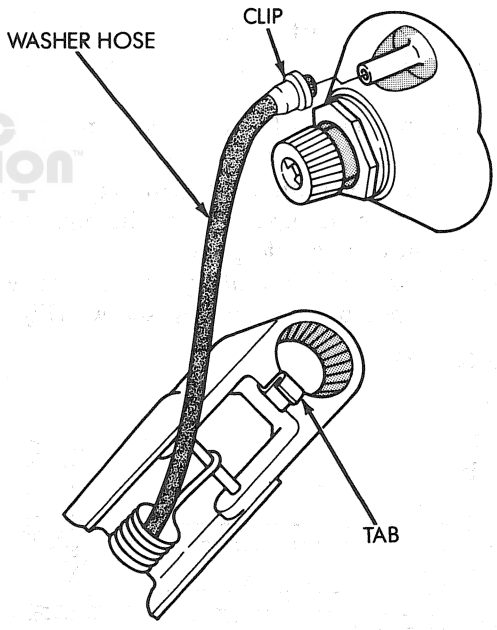


Fig. 5 Rear Wiper Arm Remove/Install

(2) Slide the washer hose retaining clip along the hose until the clip is off of the hose nipple.

(3) Disconnect the washer hose from the nipple.

(4) Lubricate the bezel nipple with a small amount of water. Then install the washer hose. Slide the retaining clip along the hose until it is over the hose on the nipple.

(5) Install the rear wiper arm with the wiper motor in the Park position. The rear wiper blade should be installed parallel to the window opening, and from 15 - 50 mm (0.59 - 1.96 inch) above the upper edge of the window seal, when the blade is parked on a wet window (Fig. 6).

REMOVAL AND INSTALLATION (Continued)

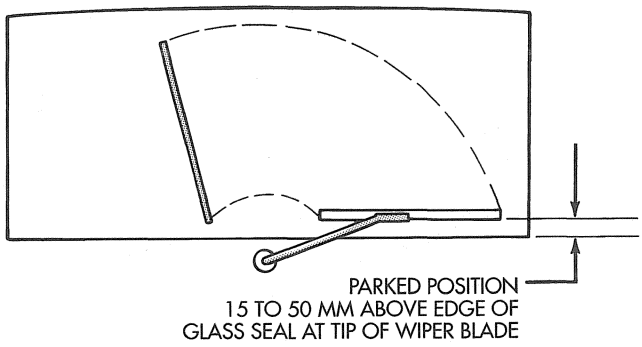


Fig. 6 Rear Wiper Arm Installation

WIPER MOTOR

FRONT

(1) Disconnect the battery negative cable.
(2) Remove the wiper arms as described in this group.
(3) Remove the screws from the cowl plenum cover/grille panel.
(4) Lift the cowl plenum cover/grille panel and disconnect the washer hose at the tee fitting. Remove the cowl plenum cover/grille panel.
(5) Remove the cowl mounting bracket attaching nuts and the wiper pivot attaching screws (Fig. 7).

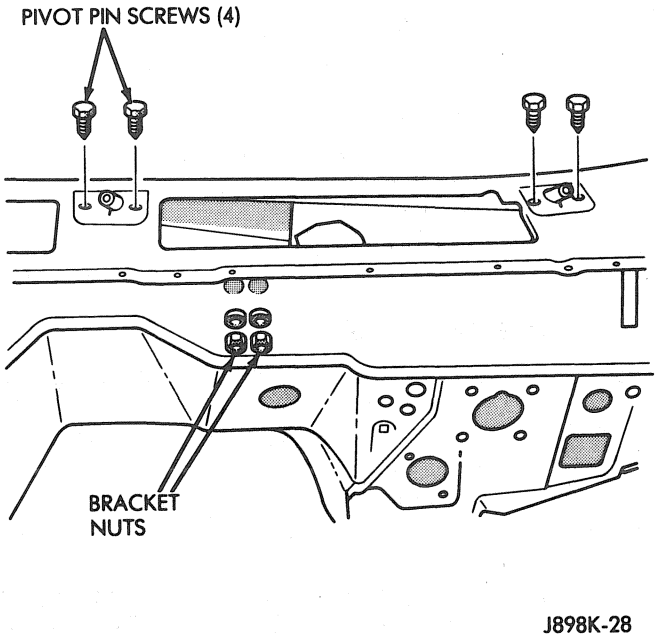


Fig. 7 Wiper Linkage Assembly Remove/Install

(6) Disconnect the wiper motor wiring harness and remove the motor and linkage assembly from the cowl plenum.
(7) Remove the plastic motor cover.
(8) Remove the bolts and nuts holding the motor to the linkage assembly bracket and remove the motor.
(9) Reverse the removal procedures to install. Tighten the wiper motor screws and nuts to 4 N·m (35 in. lbs.).

REAR

(1) Disconnect the battery negative cable.
(2) Remove the rear wiper arm as described in this group.
(3) Remove the pivot pin retaining nut (Fig. 8).

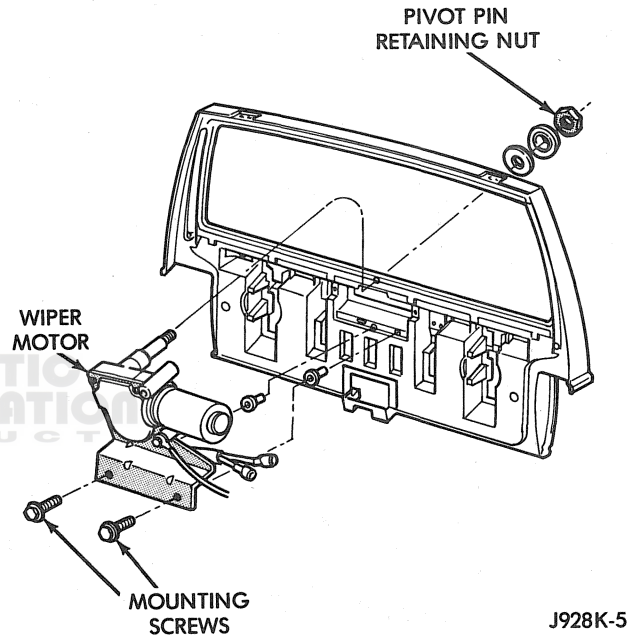


Fig. 8 Rear Wiper Motor Remove/Install

(4) Remove the external bezel and seal.
(5) Remove the liftgate inner trim panel.
(6) Disconnect the rear wiper motor wiring harness.
(7) Remove the wiper motor mounting bracket screws.
(8) Remove the wiper motor.
(9) Reverse the removal procedures to install. Tighten the pivot pin retaining nut to 4 N·m (32 in. lbs.).

WIPER LINKAGE AND PIVOTS

The wiper linkage and pivots can only be removed from the vehicle as a unit with the wiper motor. See Wiper Motors in this group for the service procedures.

INTERMITTENT WIPE MODULE

The intermittent wipe module is mounted to the lower instrument panel reinforcement, just outboard of the steering column and above the 16-way data

REMOVAL AND INSTALLATION (Continued)

link connector, with a hook and loop fastener patch. To remove the module:

(1) Disconnect the battery negative cable.

(2) Reach up under the lower instrument panel and pull the module away from the hook and loop fastener patch.

(3) Gently pull the module down from behind the instrument panel to remove the two harness connectors.

(4) Reverse the removal procedures to install.

WIPER AND WASHER SWITCHES

FRONT

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL OR STEERING COLUMN COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the battery negative cable.

(2) Remove the tilt steering column lever, if equipped.

(3) Remove the lower instrument panel/knee blocker assembly. Refer to Group 8E - Instrument Panel Systems for the procedures.

(4) Remove both the upper and lower shrouds from the steering column (Fig. 9).

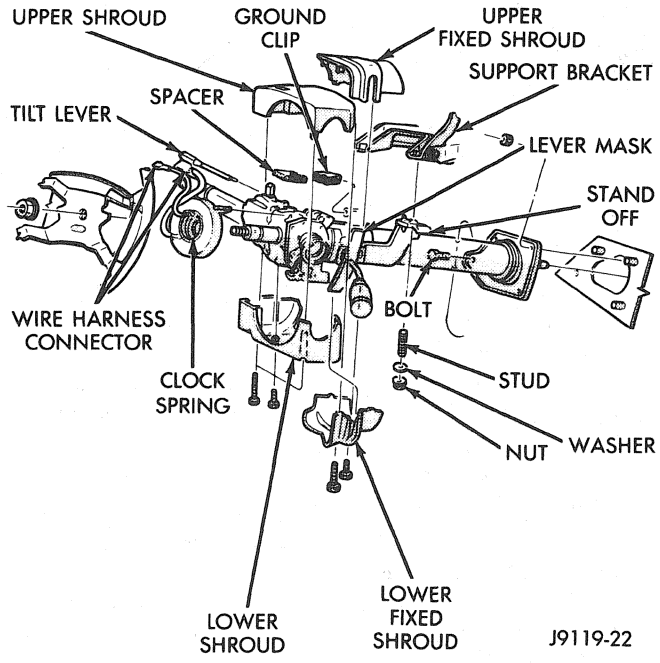


Fig. 9 Steering Column Shrouds Remove/Install

(5) Remove the lower fixed column shroud.

(6) Loosen the steering column upper bracket nuts. Do not remove the nuts.

(7) Move the upper fixed column shroud to gain access to the rear of the multi-function switch (Fig. 10).

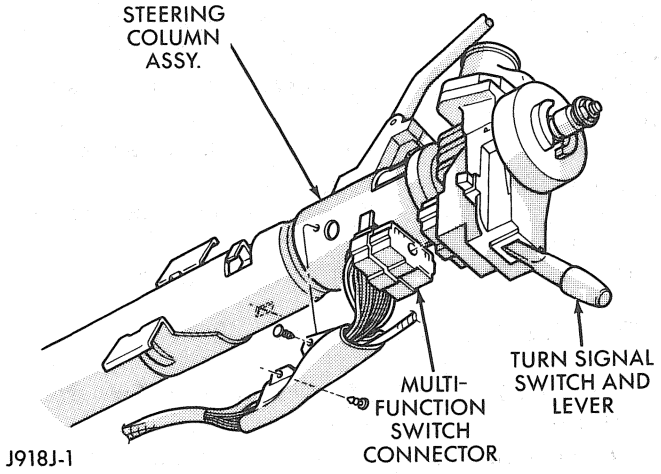


Fig. 10 Multi-Function Switch Connector

(8) Remove the multi-function switch tamper proof mounting screws (a Snap On tamper proof torx bit TTXR20B2 or equivalent is required.

(9) Gently pull the switch away from the column. Loosen the connector screw. The screw will remain in the connector.

(10) Remove the wiring connectors from the multi-function switch (Fig. 11).

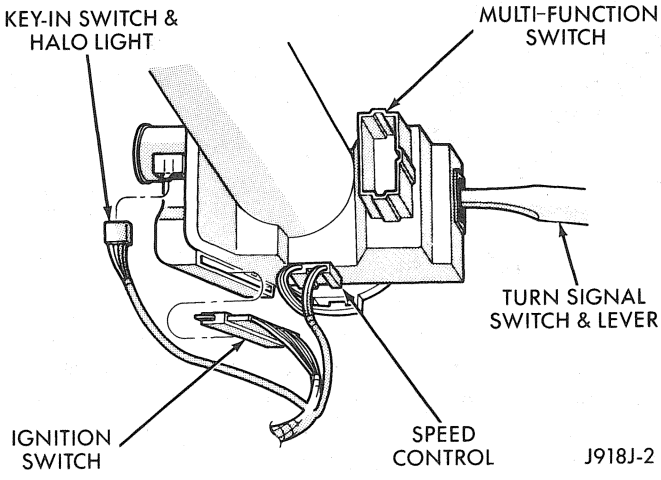


Fig. 11 Steering Column Connectors

(11) Reverse the removal procedures to install. Tighten the fasteners as follows:

- Multi-function switch connector screw - 1.9 N·m (17 in. lbs.)
- Multi-function switch retaining screws - 1.9 N·m (17 in. lbs.)

REMOVAL AND INSTALLATION (Continued)

• Steering column upper bracket nuts - 12 N·m (110 in. lbs.).

REAR

(1) Disconnect the battery negative cable.
(2) Remove the instrument cluster bezel. Refer to Group 8E - Instrument Panel Systems for the procedures.
(3) Remove the rear wiper and washer switch housing panel.
(4) Unplug the rear wiper and washer switch wiring harness connector.
(5) Slightly depress the switch mounting tabs and remove the switch.
(6) Reverse the removal procedures to install.

WASHER PUMPS AND RESERVOIR

LEFT-HAND DRIVE EXCEPT DIESEL ENGINE

(1) Disconnect the battery negative cable.
(2) Disconnect the wiring from the fluid level sensor, if equipped.
(3) Remove the two screws and one nut securing the washer reservoir (Fig. 12).

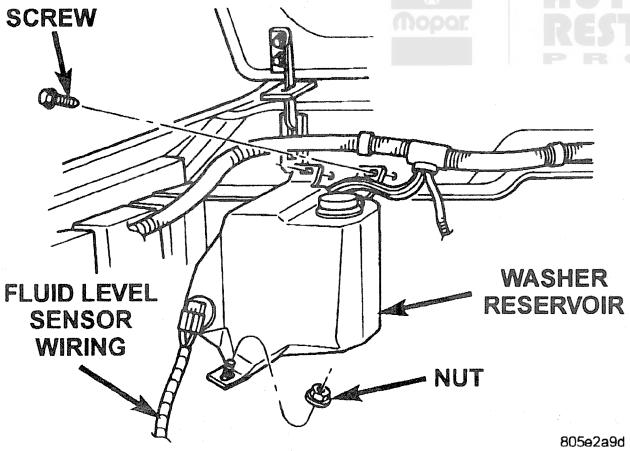


Fig. 12 Washer Reservoir Remove/Install -LHD except Diesel Engine

(4) Disconnect the hose(s) from the washer pump(s), and drain the solvent from the reservoir into a clean container for re-use (Fig. 13).
(5) Use a deep socket and extension, inserted through the reservoir filler neck, to remove the washer pump filter/nut from inside of the reservoir.
(6) Remove the pump from the reservoir.
(7) Reverse the removal procedures to install.

RIGHT-HAND DRIVE AND DIESEL ENGINE

(1) Disconnect the battery cables, negative cable first, and remove the battery.

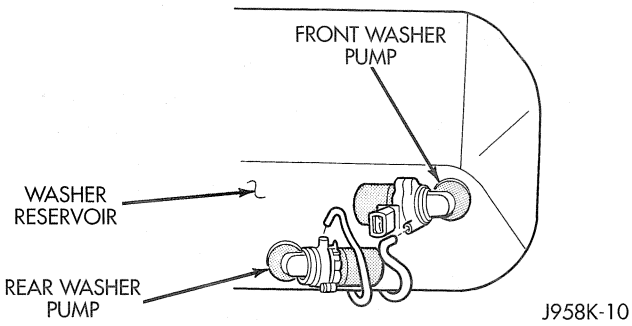


Fig. 13 Washer Pumps - LHD except Diesel Engine

(2) The reservoir filler neck is held into the reservoir by a grommet. Remove the reservoir filler neck by pulling sharply away from reservoir (Fig. 14).

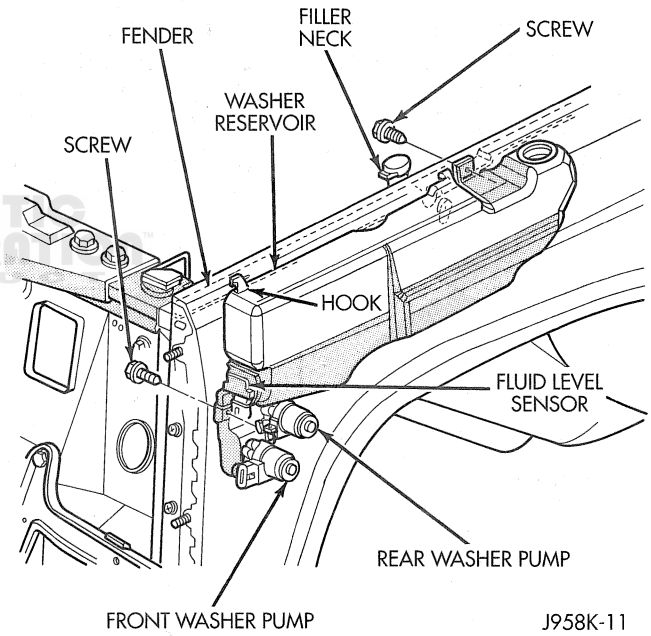


Fig. 14 Washer Reservoir and Pumps - RHD and Diesel Engine

(3) Remove the two reservoir mounting screws.
(4) Raise and support the vehicle, and remove the left front inner wheelhouse splash shield.
(5) Disconnect the hose(s) from the washer pump(s) and drain the solvent from the reservoir into a clean container for re-use.
(6) Disconnect the wiring from the pump(s) and the fluid level sensor, if equipped.
(7) Remove the washer pump(s) from the reservoir by pulling it out of the grommet.
(8) To remove the reservoir, slide it slightly towards the rear of the vehicle to release the two hooks from the inner fender slots. Then lower the front of the reservoir and slide the unit forward to remove.
(9) Reverse the removal procedures to install. Use a new grommet(s) when installing the washer pump(s).

LAMPS

CONTENTS

	page		page
BULB APPLICATION	18	LAMP DIAGNOSIS	1
HEADLAMP ALIGNMENT	6	LAMP SERVICE	14
LAMP BULB SERVICE	9	LAMP SYSTEMS	17

LAMP DIAGNOSIS

INDEX

	page		page
GENERAL INFORMATION		**DIAGNOSIS AND TESTING**	
DAYTIME RUNNING LAMP MODULE	1	DIAGNOSTIC PROCEDURES	2
GENERAL INFORMATION	1	FOG LAMP DIAGNOSIS	4
SAFETY PRECAUTIONS	1	HEADLAMP DELAY MODULE	5
SENTINEL HEADLAMP DELAY MODULE	1	HEADLAMP DIAGNOSIS	2

GENERAL INFORMATION

GENERAL INFORMATION

Each vehicle is equipped with various lamp assemblies. A good ground is necessary for proper lighting operation. Grounding is provided by the lamp socket when it comes in contact with the metal body, or through a separate ground wire.

When changing lamp bulbs check the socket for corrosion. If corrosion is present, clean it with a wire brush and coat the inside of the socket lightly with Mopar Multi-Purpose Grease or equivalent.

SAFETY PRECAUTIONS

WARNING: EYE PROTECTION SHOULD BE USED WHEN SERVICING GLASS COMPONENTS. PERSONAL INJURY CAN RESULT.

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result.

Do not use bulbs with higher candle power than indicated in the Bulb Application table at the end of this group. Damage to lamp can result.

Do not use fuses, circuit breakers or relays having greater amperage value than indicated on the fuse panel or in the Owners Manual.

When it is necessary to remove components to service another, it should not be necessary to apply excessive force or bend a component to remove it. Before damaging a trim component, verify hidden fasteners or captured edges are not holding the component in place.

SENTINEL HEADLAMP DELAY MODULE

The Headlamp Module delays the de-activation of the headlamps for 45 ± 15 seconds after the ignition switch is turned OFF. The driver engages the module by turning the ignition switch OFF, then turning the headlamps OFF.

DAYTIME RUNNING LAMP MODULE

The Daytime Running Lights (Headlamps) System is installed on vehicles manufactured for sale in Canada only. The headlamps are illuminated when the ignition switch is turned to the ON position. The DRL module receives a vehicle-moving signal from the vehicle speed sensor. This provides a constant **headlamps-on** condition as long as the vehicle is moving. The lamps are illuminated at less than 50 percent of normal intensity.

DIAGNOSIS AND TESTING

DIAGNOSTIC PROCEDURES

When a vehicle experiences problems with the headlamp system, verify the condition of the battery connections, charging system, headlamp bulbs, wire connectors, relay, high beam dimmer switch and headlamp switch. Refer to Group 8W, Wiring Diagrams for component locations and circuit information.

HEADLAMP DIAGNOSIS

Always begin any diagnosis by testing all of the fuses and circuit breakers in the system. Refer to Group 8W, Wiring Diagrams.

Conventional and halogen headlamps are interchangeable. It is recommended that they not be intermixed on a given vehicle.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING (Continued)

HEADLAMP DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMPS ARE DIM WITH ENGINE IDLING OR IGNITION TURNED OFF.	1. Loose or corroded battery cables. 2. Loose or worn generator drive belt. 3. Charging system output too low. 4. Battery has insufficient charge. 5. Battery is sulfated or shorted. 6. Poor lighting circuit Z1-ground. 7. Both headlamp bulbs defective.	1. Clean and secure battery cable clamps and posts. 2. Adjust or replace generator drive belt. 3. Test and repair charging system, refer to Group 8A. 4. Test battery state-of-charge, refer to Group 8A. 5. Load test battery, refer to Group 8A. 6. Test for voltage drop across Z1-ground locations, refer to Group 8W. 7. Replace both headlamp bulbs.
HEADLAMP BULBS BURN OUT FREQUENTLY.	1. Charging system output too high. 2. Loose or corroded terminals or splices in circuit.	1. Test and repair charging system, refer to Group 8A. 2. Inspect and repair all connectors and splices, refer to Group 8W.
HEADLAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE.*	1. Charging system output too low. 2. Poor headlamp circuit ground. 3. High resistance in headlamp circuit. 4. Both headlamp bulbs defective.	1. Test and repair charging system, refer to Group 8A. 2. Test voltage drop across Z1-ground, refer to Group 8W. 3. Test amperage draw of headlamp circuit. 4. Replace both headlamp bulbs.
HEADLAMPS FLASH RANDOMLY.	1. Poor headlamp circuit ground. 2. High resistance in headlamp circuit. 3. Faulty headlamp switch circuit breaker. 4. Loose or corroded terminals or splices in circuit.	1. Repair circuit ground, refer to Group 8W. 2. Test amperage draw of headlamp circuit. 3. Replace headlamp switch. 4. Repair connector terminals or splices, refer to Group 8W.
HEADLAMPS DO NOT ILLUMINATE.	1. No voltage to headlamps. 2. No ground at headlamps. 3. Faulty headlamp switch. 4. Faulty headlamp dimmer switch. 5. Broken connector terminal or wire splice in headlamp circuit.	1. Replace fuse, refer to group 8W. 2. Repair circuit ground, refer to Group 8W. 3. Replace headlamp switch. 4. Replace headlamp dimmer switch. 5. Repair connector terminal or wire splices.
* Canada vehicles must have lamps ON.		

DIAGNOSIS AND TESTING (Continued)

FOG LAMP DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FOG LAMPS ARE DIM WITH ENGINE IDLING OR IGNITION TURNED OFF.	1. Loose or corroded battery cables. 2. Loose or worn generator drive belt. 3. Charging system output too low. 4. Battery has insufficient charge. 5. Battery is sulfated or shorted. 6. Poor lighting circuit Z1-ground. 7. Both fog lamp bulbs defective.	1. Clean and secure battery cable clamps and posts. 2. Adjust or replace generator drive belt. 3. Test and repair charging system, refer to Group 8A. 4. Test battery state-of-charge, refer to Group 8A. 5. Load test battery, refer to Group 8A. 6. Test for voltage drop across Z1-ground locations, refer to Group 8W. 7. Replace both lamp bulbs.
FOG LAMP BULBS BURN OUT FREQUENTLY.	1. Charging system output too high. 2. Loose or corroded terminals or splices in circuit.	1. Test and repair charging system, refer to Group 8A. 2. Inspect and repair all connectors and splices, refer to Group 8W.
FOG LAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE.	1. Charging system output too low. 2. Poor fog lamp circuit ground. 3. High resistance in fog lamp circuit. 4. Both fog lamp bulbs defective.	1. Test and repair charging system, refer to Group 8A. 2. Test voltage drop across Z1-ground, refer to Group 8W. 3. Test amperage draw of fog lamp circuit. 4. Replace both fog lamp bulbs.
FOG LAMPS FLASH RANDOMLY.	1. Poor fog lamp circuit ground. 2. High resistance in fog lamp circuit. 3. Faulty fog lamp switch circuit breaker. 4. Loose or corroded terminals or splices in circuit.	1. Repair circuit ground, refer to Group 8W. 2. Test amperage draw of fog lamp circuit. 3. Replace fog lamp switch. 4. Repair connector terminals or splices, refer to Group 8W.
FOG LAMPS DO NOT ILLUMINATE.	1. Blown fuse for fog lamps. 2. No ground at fog lamps. 3. Faulty fog lamp switch. 4. Broken connector terminal or wire splice in fog lamp circuit.	1. Replace fuse, refer to group 8W. 2. Repair circuit ground, refer to Group 8W. 3. Replace fog lamp switch. 4. Repair connector terminal or wire splices.

AUTHENTIC AUTOMOTIVE PRODUCT

DIAGNOSIS AND TESTING (Continued)

HEADLAMP DELAY MODULE

DELAY FUNCTION INOPERATIVE

(1) Remove, inspect and test the HD LP DLY fuse. Replace if defective.

(2) Remove the delay module from the I/P. Do not disconnect the wire harness connector. Turn the ignition switch to the RUN position. Place the headlamp switch in headlamps ON position. Turn the ignition to the OFF position for a resistance test.

(3) Measure the resistance from the delay module terminal 4 to vehicle body ground. The ohmmeter should indicate zero ohms. If not, repair the open circuit in the wire harness to vehicle body ground.

(4) Measure the voltage between the delay module terminal 8 and vehicle body ground. The voltmeter should indicate battery voltage. If not, repair the open circuit in the wire harness to the instrument cluster indicator connector terminal 14.

(5) Measure the voltage between the delay module terminal 6 and vehicle body ground. The voltmeter should indicate battery voltage. If not, repair the open circuit in the wire harness to the headlamp switch.

(6) Measure the voltage between the delay module terminal 2 and vehicle body ground. The voltmeter should indicate battery voltage. If not, repair the open circuit in the wire harness to the fuse.

HEADLAMP ALIGNMENT

INDEX

page

GENERAL INFORMATION
HEADLAMP ALIGNMENT 6
SERVICE PROCEDURES
FOG LAMP ADJUSTMENT 7
HEADLAMP ADJUSTMENT 6
HEADLAMP ALIGNMENT PREPARATION 6
SPECIAL TOOLS
SPECIAL TOOLS—HEADLAMP ALIGNMENT 8

GENERAL INFORMATION

HEADLAMP ALIGNMENT

Headlamps can be aligned using the screen method provided in this section. Alignment Tool C-4466-A or equivalent can also be used. Refer to instructions provided with the tool for proper procedures. **The preferred headlamp alignment setting is 0 for the left/right adjustment and 1″ down for the up/down adjustment.**

SERVICE PROCEDURES

HEADLAMP ALIGNMENT PREPARATION

(1) Verify headlamp dimmer switch and high beam indicator operation.
(2) Correct defective components that could hinder proper headlamp alignment.
(3) Verify proper tire inflation.
(4) Clean headlamp lenses.
(5) Verify that luggage area is not heavily loaded.
(6) Fuel tank should be FULL. Add 2.94 kg (6.5 lbs.) of weight over the fuel tank for each estimated gallon of missing fuel.

ALIGNMENT SCREEN PREPARATION

(1) Position vehicle on a level surface perpendicular to a flat wall 7.62 meters (25 ft) away from front of headlamp lens (Fig. 1).
(2) If necessary, tape a line on the floor 7.62 meters (25 ft) away from and parallel to the wall.
(3) Measure from the floor up 1.27 meters (5 ft) and tape a line on the wall at the centerline of the vehicle. Sight along the centerline of the vehicle (from rear of vehicle forward) to verify accuracy of the line placement.
(4) Rock vehicle side-to-side three times to allow suspension to stabilize.
(5) Jounce front suspension three times by pushing downward on front bumper and releasing.
(6) Measure the distance from the center of headlamp lens to the floor. Transfer measurement to the alignment screen (with tape). Use this line for up/down adjustment reference.
(7) Measure distance from the centerline of the vehicle to the center of each headlamp being aligned. Transfer measurements to screen (with tape) to each side of vehicle centerline. Use these lines for left/right adjustment reference.

HEADLAMP ADJUSTMENT

A properly aimed low beam will project the top edge of high intensity pattern on the screen from 50 mm (2 in.) above to 50 mm (2 in.) below headlamp centerline. The side-to-side left edge of high intensity pattern should be from 50 mm (2 in.) left to 50 mm (2 in.) right of headlamp centerline). **The preferred headlamp alignment is 0 for the left/right adjustment and 1″ down for the up/down adjustment.** The high beams on a vehicle with dual headlamps cannot be aligned. The high beam pattern should be correct when the low beams are aligned properly.
(1) Remove screws and both headlamp bezels.
(2) Clean front of the headlamps.
(3) Place headlamps on LOW beam.
(4) Cover front of the headlamp that is not being adjusted.
(5) Turn vertical adjustment screw (Fig. 2) until the headlamp beam pattern on screen/wall is similar to the pattern depicted in the alignment screen figure.

NOTE: When using a headlamp aiming screen:

- Adjust the headlamps so that the beam horizontal position is at 0.
- Adjust the beam vertical position is 25 mm (1 in) downward from the lamp horizontal centerline.

(6) Rotate the horizontal adjustment screw until the headlamp beam pattern on the aiming screen/wall similar to the pattern in the alignment screen figure.
(7) Cover front of the headlamp that has been adjusted and adjust the other headlamp beam as instructed above.

SERVICE PROCEDURES (Continued)

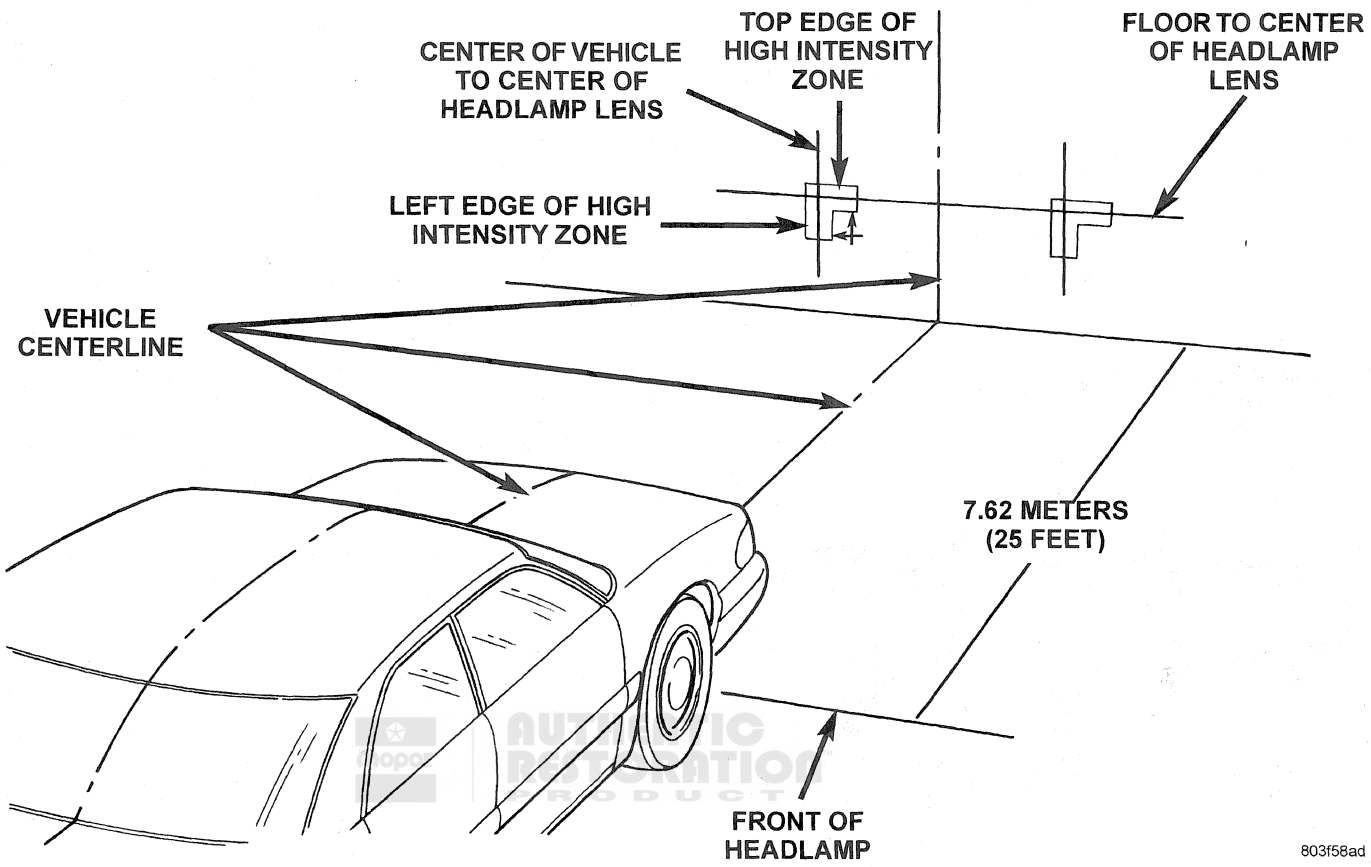
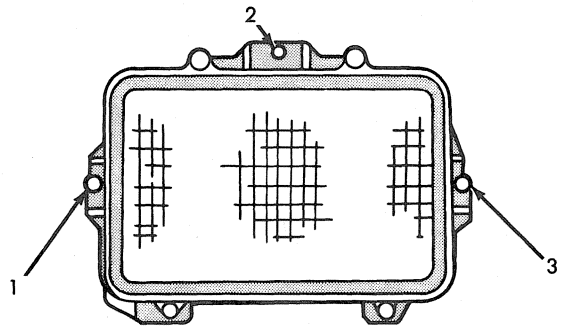


Fig. 1 Headlamp Alignment Screen—Typical



1. HORIZONTAL ADJ. SCREW - RH
2. VERTICAL ADJ. SCREW
3. HORIZONTAL ADJ. SCREW - LH

J908L-24

Fig. 2 Headlamp Beam Adjustment Screws

(8) Install headlamp bezels. Tighten the screws securely.

FOG LAMP ADJUSTMENT

Prepare an alignment screen. Refer to Alignment Screen Preparation paragraph in this section. A properly aligned fog lamp will project a pattern on the alignment screen 100 mm (4 in.) below the fog lamp centerline and straight ahead (Fig. 3).

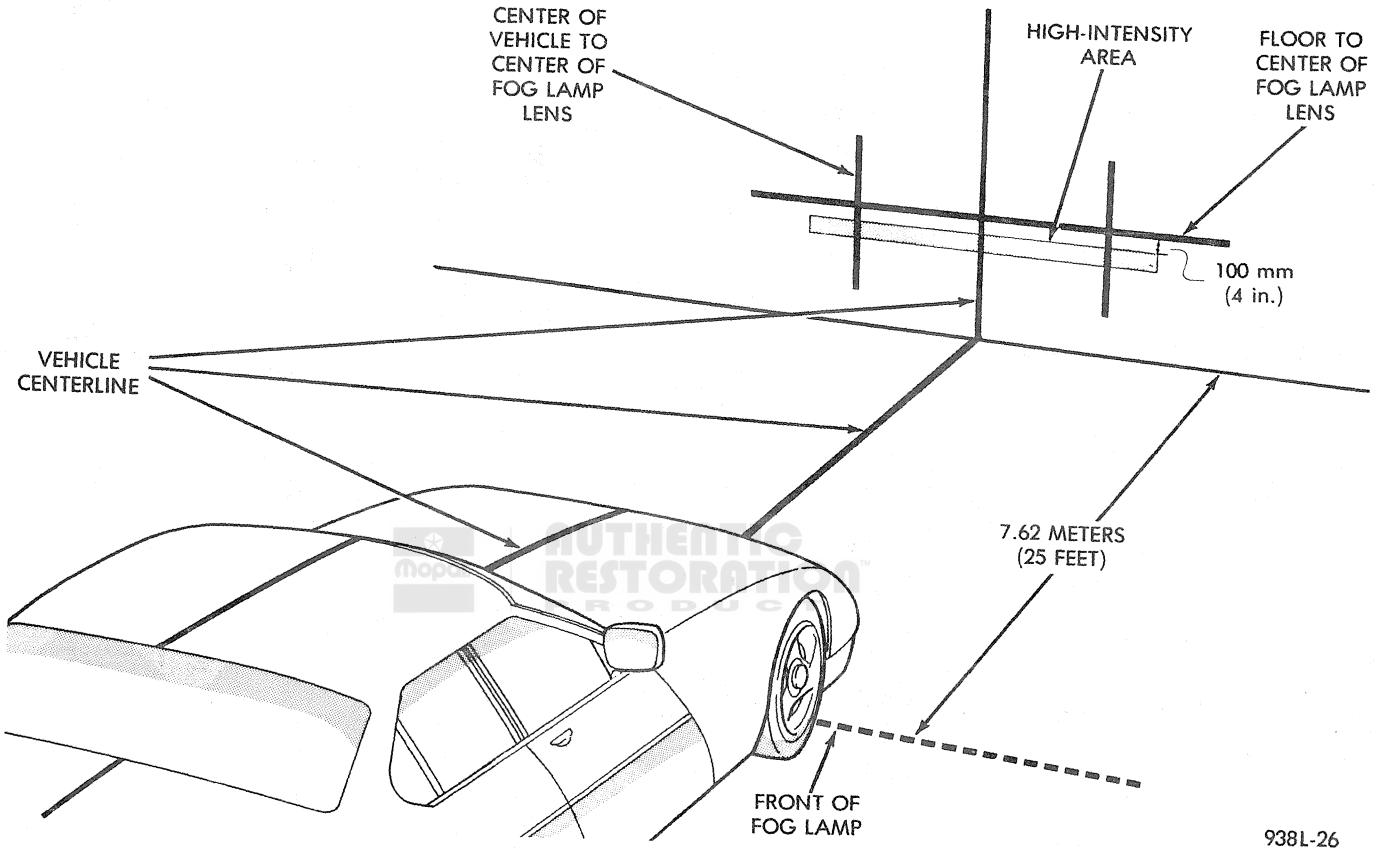
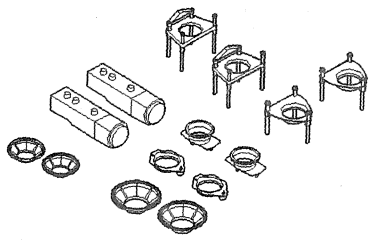


Fig. 3 Fog Lamp Alignment —Typical

SPECIAL TOOLS

HEADLAMP ALIGNMENT



Headlamp Aiming Kit C-4466–A

LAMP BULB SERVICE

INDEX

page

REMOVAL AND INSTALLATION
BACK-UP/REAR TURN SIGNAL/TAIL LAMP BULB 11
CENTER HIGH MOUNTED STOP LAMP (CHMSL) BULB 12
DOME LAMP BULB 12
FOG LAMP BULB 9
FRONT PARK/TURN SIGNAL LAMP BULB 10
HEADLAMP BULB 9
LICENSE PLATE LAMP BULB 11
MAP READING LAMP BULB 12
SIDE MARKER LAMP BULB 10
UNDERHOOD LAMP BULB 12
VISOR VANITY LAMP BULB 13

REMOVAL AND INSTALLATION

HEADLAMP BULB

REMOVAL

(1) Remove the screws and the headlamp bezel (Fig. 1).

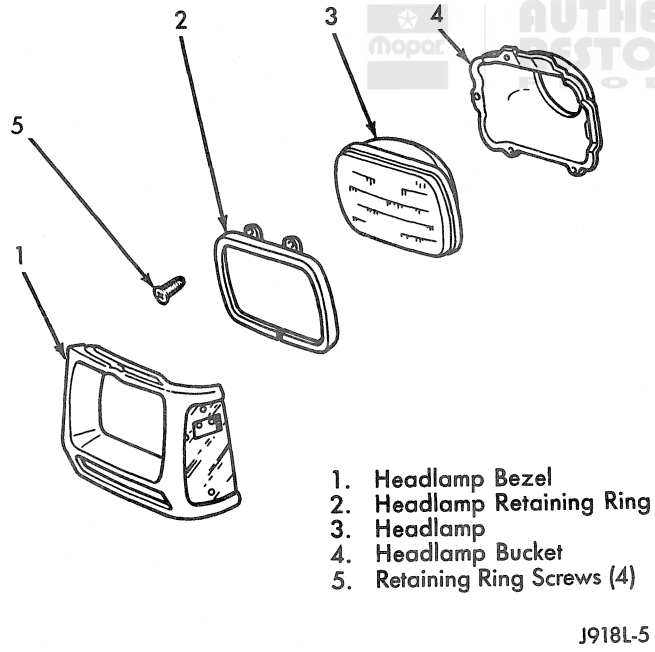


Fig. 1 Headlamp Components

(2) Remove the screws and headlamp bulb retaining ring.

(3) Disconnect the headlamp bulb wire harness connector and remove the bulb from the bucket.

INSTALLATION

(1) Position the bulb in the bucket and connect the wire harness connector.

(2) Position retaining ring on the headlamp bulb and install screws.

(3) Install the headlamp bezel. Tighten the screws securely.

FOG LAMP BULB

REMOVAL

(1) Remove the screws attaching the bezel to the lamp body (Fig. 2). Remove the bezel from the lamp body.

(2) Remove the lens and reflector from the lamp body.

(3) Remove the bulb holder from the lens and reflector.

(4) Remove the lamp element from the bulb holder.

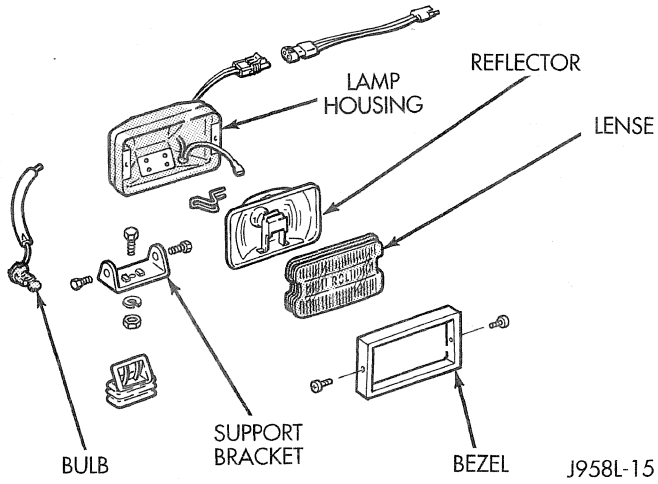


Fig. 2 Fog Lamp Components

INSTALLATION

CAUTION: Do not touch the bulb glass with fingers or other oily surfaces. Reduced bulb life will result.

(1) Install the lamp element in the bulb holder.

(2) Install the bulb holder in the lens and reflector.

REMOVAL AND INSTALLATION (Continued)

(3) Install the lens and reflector in the lamp body.
(4) Position the bezel on the lamp body and install the screws.

FRONT PARK/TURN SIGNAL LAMP BULB

REMOVAL

(1) Remove the headlamp bezel screw and the side marker lamp lens/housing screw (Fig. 3).

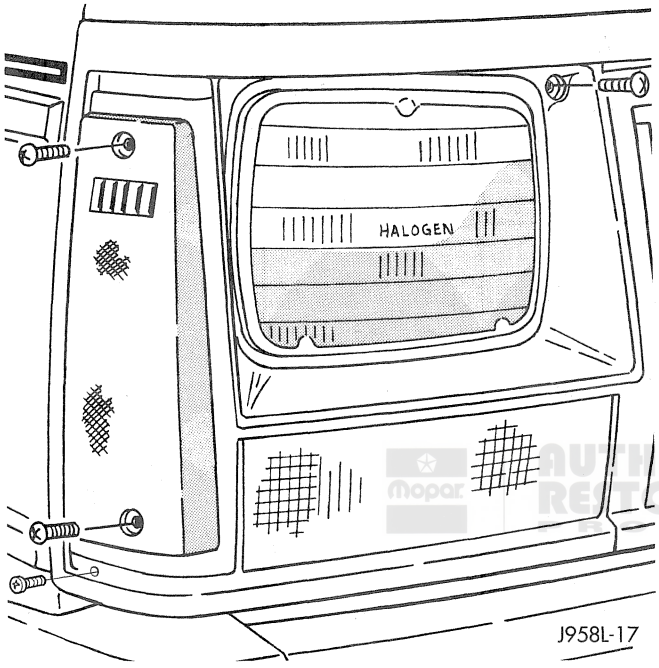


Fig. 3 Headlamp Bezel & Side Marker Lamp

(2) Separate the side marker lamp from the headlamp bezel and remove the screws from the headlamp bezel (Fig. 4).
(3) Remove screws from the park/turn signal lamp housing (Fig. 5).
(4) Separate the lamp housing from the headlamp bezel.
(5) Rotate the bulb socket one-third turn and remove it from the lamp housing.
(6) Remove bulb from socket.

INSTALLATION

(1) Install a replacement bulb in the socket.
(2) Install bulb and socket in the lamp housing.
(3) Position the park/turn signal lamp housing on the headlamp bezel.
(4) Install lamp housing screws. Tighten the screws.
(5) Install the outer screws in the headlamp bezel. Tighten the screws.
(6) Position the side marker lamp lens/housing on the headlamp bezel.
(7) Install side marker lamp lens/housing screws and headlamp bezel. Tighten the screws.

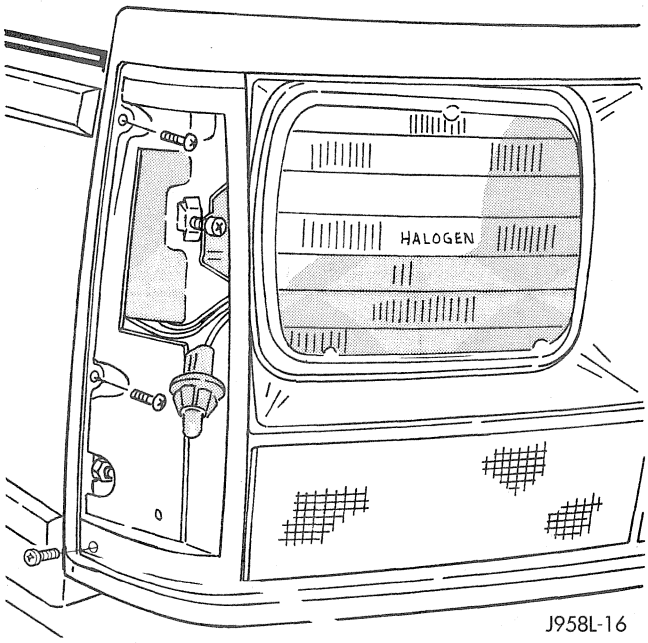


Fig. 4 Headlamp Bezel Removal/Installation

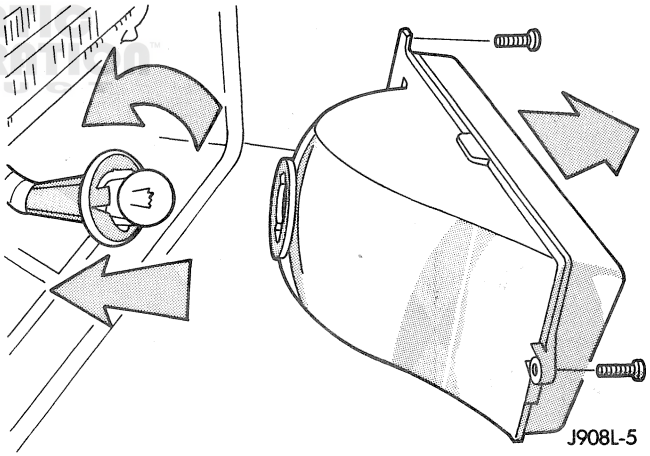


Fig. 5 Park/Turn Signal Lamp Housing Removal

SIDE MARKER LAMP BULB

REMOVAL

(1) Remove the screws from the side marker lamp lens and housing. Separate lens and housing from the headlamp bezel (Fig. 6).
(2) Remove the bulb and socket from the back side of the lamp housing.
(3) Remove bulb from socket.

INSTALLATION

(1) Install a replacement bulb in the socket.
(2) Install bulb and socket in the back of side marker lamp housing.
(3) Position the side marker lens and housing on the headlamp bezel.

REMOVAL AND INSTALLATION (Continued)

(4) Install the side marker lamp screws. Tighten the screws.

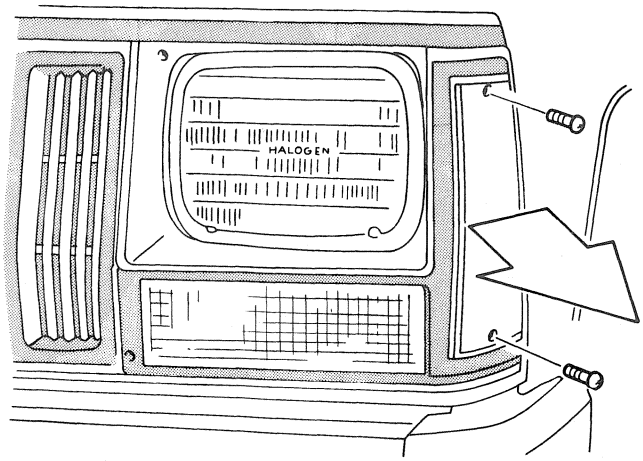


Fig. 6 Side Marker Lamp

BACK-UP/REAR TURN SIGNAL/TAIL LAMP BULB

REMOVAL

(1) Remove the tail lamp housing upper retaining screws (Fig. 7). Slide the lamp housing upward off the lower screw while tipping the top of the lamp away from the body and separate it from the rear of the vehicle.

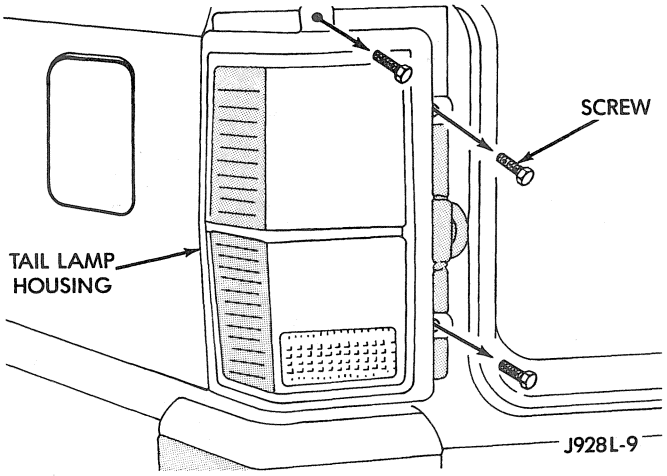


Fig. 7 Tail Lamp Housing

(2) Rotate the bulb socket one-third turn and remove the bulb socket from the lamp housing (Fig. 8).

(3) Remove the bulb from the socket.

INSTALLATION

(1) Install a replacement bulb in the socket.

(2) Install the bulb and socket in the lamp housing.

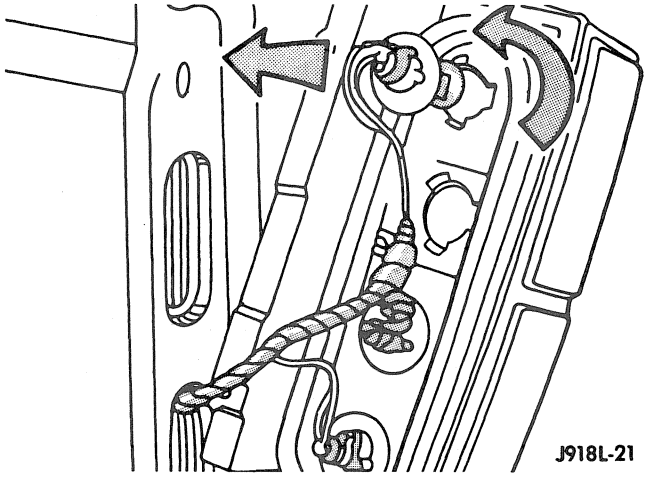


Fig. 8 Bulb Socket Removal

(3) Position the lamp housing in the opening at the rear of the vehicle.

(4) Install the lamp housing screws. Tighten the screws securely.

LICENSE PLATE LAMP BULB

REMOVAL

(1) Remove screws and the license plate lamp visor from the liftgate (Fig. 9).

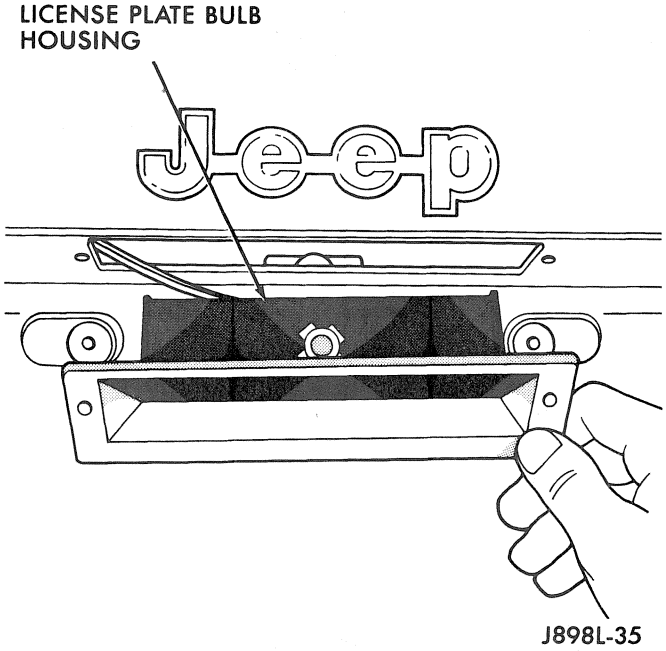


Fig. 9 License Plate Lamp Visor

(2) Remove the bulb from the lamp socket.

INSTALLATION

(1) Install a replacement bulb in the lamp socket.

(2) Position the license plate lamp visor on the liftgate and install screws. Tighten the screws securely.

REMOVAL AND INSTALLATION (Continued)

CENTER HIGH MOUNTED STOP LAMP (CHMSL) BULB

The CHMSL is mounted at the bottom of the rear window and has two bulbs.

REMOVAL

(1) Raise liftgate.
(2) Remove the trim plugs to gain access to the lamp mounting screws.
(3) Remove the screws holding the lamp housing to the body panel.
(4) Remove the screws that secure the lamp.
(5) Rotate bulb sockets 1/4 turn and pull from housing.
(6) Grasp bulb and pull from socket. (Fig. 10).

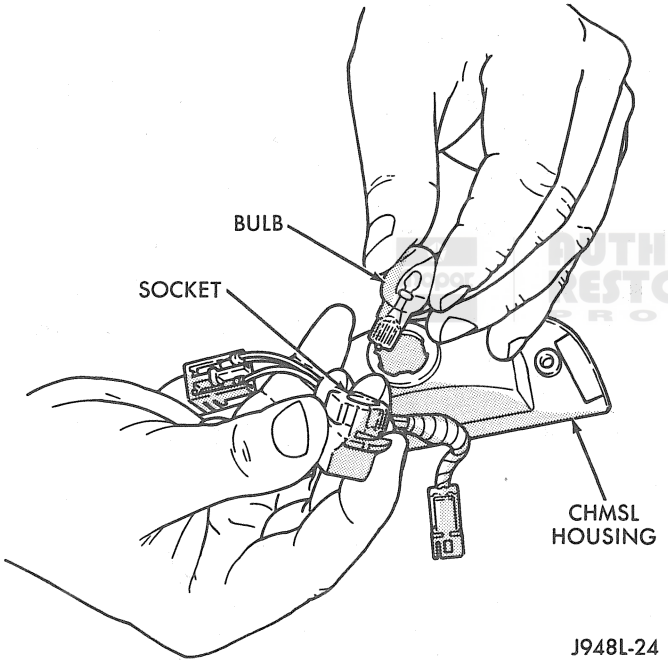


Fig. 10 Replacing CHMSL Bulb

INSTALLATION

(1) Push bulb into socket.
(2) Position socket in lamp and rotate 1/4 turn.
(3) Install the screws that secure the lamp.
(4) Install the screws holding the lamp housing to the body panel.
(5) Install the trim plugs.
(6) Close liftgate.

UNDERHOOD LAMP BULB

REMOVAL

(1) Disconnect the wire harness connector from the underhood lamp.
(2) Rotate the bulb counterclock-wise. Remove it from the lamp socket.

INSTALLATION

(1) Insert the replacement bulb in the lamp base socket. Rotate it clockwise.
(2) Connect the wire harness connector to the lamp.

DOME LAMP BULB

REMOVAL

(1) Remove the dome lamp lens by squeezing it at both sides. This will separate the lens retainer tabs from the lamp housing shoulders.
(2) Pull the lens downward to remove it from the lamp housing.
(3) Grasp bulb and pull from lamp.

INSTALLATION

(1) Position bulb in lamp and snap into place.
(2) Position the lens at the lamp housing and force it upward into the housing until the retainer tabs are seated on the lamp housing shoulders.

MAP READING LAMP BULB

REMOVAL

(1) Make a straight hook at the end of a large paper clip or wire (approximately 1.5-mm/0.06-in diameter).
(2) Insert the wire hook into the hole in the lamp lens and pull downward to detach the lens from the lamp housing (Fig. 11).

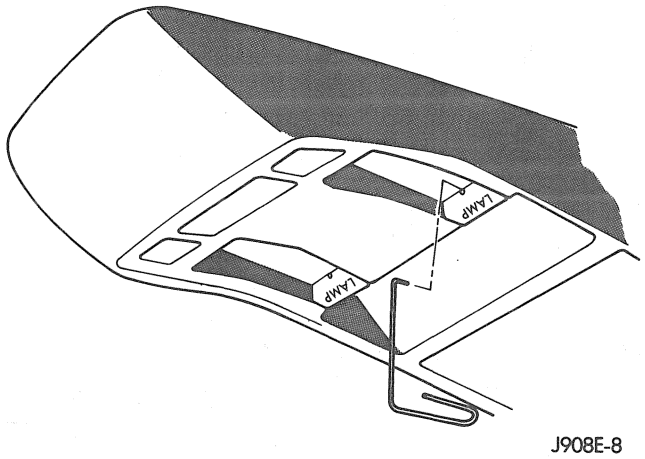


Fig. 11 Reading Lamp Lens Removal

(3) Pull the bulb frrom the socket.

INSTALLATION

(1) Position the bulb at the socket and snap into place.
(2) Insert the tab at the front of the lamp lens into the slot in the lamp housing—shown by arrow 1 (Fig. 12).

REMOVAL AND INSTALLATION (Continued)

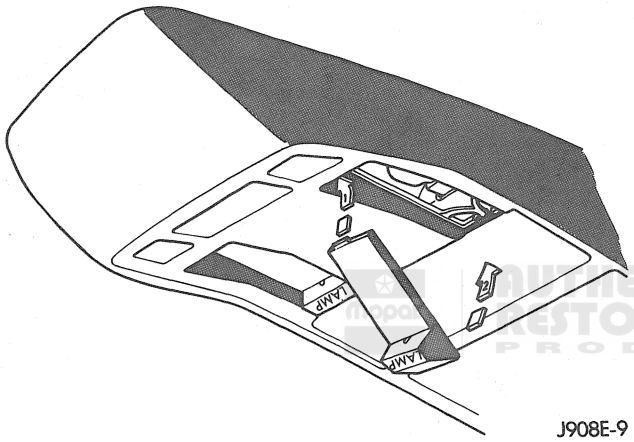


Fig. 12 Map Reading Lamp Lens Installation

(3) Force the rear of the lens upward until it is seated in the lamp housing—shown by arrow 2 (Fig. 12).

VISOR VANITY LAMP BULB

REMOVAL

(1) Using a small flat blade, carefully pry each corner of lens outward from lamp.
(2) Separate lens from lamp.
(3) Grasp bulb and pull outward.

INSTALLATION

(1) Position bulb in socket and push into place.
(2) Position lens on lamp and snap into place.

LAMP SERVICE

INDEX

page

REMOVAL AND INSTALLATION
BACK-UP/REAR TURN SIGNAL/TAIL LAMP 15
DOME LAMP 16
FOG LAMP 14
FRONT PARK/TURN SIGNAL LAMP 14
HEADLAMP 14
LICENSE PLATE LAMP 15
MAP/READING LAMP 16
SIDE MARKER LAMP 15
UNDERHOOD LAMP 15
VISOR VANITY LAMP 16

REMOVAL AND INSTALLATION

HEADLAMP

To remove the headlamp, refer to the headlamp bulb removal/installation paragraph in this section.

FOG LAMP

REMOVAL

(1) Disconnect the fog lamp wire harness connector.

(2) Remove the retaining nut and washer from each side of the support bracket and remove the fog lamp from the support bracket (Fig. 1).

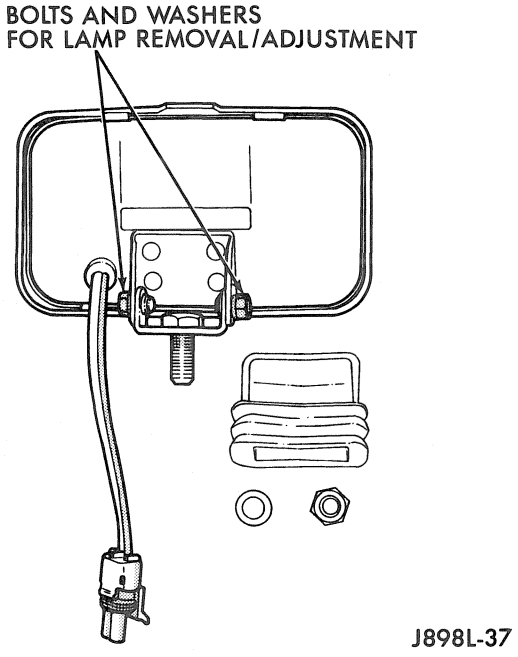


Fig. 1 Fog Lamp

INSTALLATION

(1) Position the fog lamp in the support bracket and install the washer and nut at each side of the bracket. Tighten the nuts securely.

(2) Connect the fog lamp wire harness connector.

FRONT PARK/TURN SIGNAL LAMP

REMOVAL

(1) Remove the headlamp bezel screw and the side marker lamp lens/housing screw.

(2) Separate the side marker lamp from the headlamp bezel and remove the screws from the headlamp bezel.

(3) Remove screws from the park/turn signal lamp housing (Fig. 2).

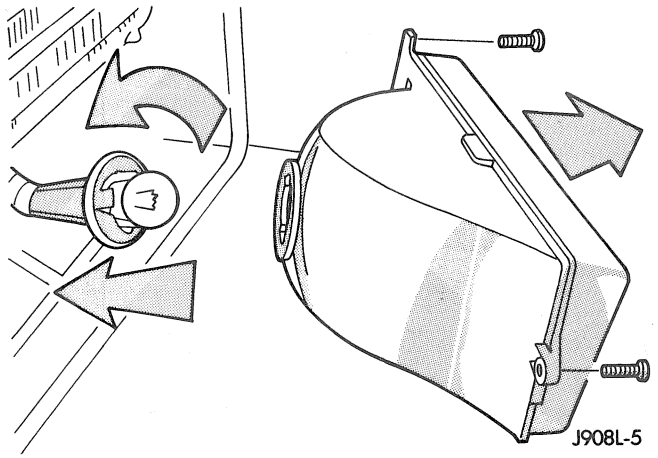


Fig. 2 Park/Turn Signal Lamp Housing Removal

(4) Separate the lamp housing from the headlamp bezel.

(5) Rotate the bulb socket one-third turn and remove it from the lamp housing.

(6) Remove bulb from socket.

INSTALLATION

(1) Install a replacement bulb in the socket.

(2) Install bulb and socket in the lamp housing.

(3) Position the park/turn signal lamp housing on the headlamp bezel.

REMOVAL AND INSTALLATION (Continued)

(4) Install lamp housing screws. Tighten the screws.
(5) Install the outer screws in the headlamp bezel. Tighten the screws.
(6) Position the side marker lamp lens/housing on the headlamp bezel.
(7) Install side marker lamp lens/housing screws and headlamp bezel. Tighten the screws.

SIDE MARKER LAMP

REMOVAL

(1) Remove the screws from the side marker lamp lens and housing. Separate lens and housing from the headlamp bezel.
(2) Remove the bulb and socket from the back side of the lamp housing.

INSTALLATION

(1) Install bulb and socket in the back of side marker lamp housing.
(2) Position the side marker lens and housing on the headlamp bezel.
(3) Install the side marker lamp screws. Tighten the screws.

BACK-UP/REAR TURN SIGNAL/TAIL LAMP

REMOVAL

(1) Remove the tail lamp housing upper retaining screws. Slide the lamp housing upward off the lower screw while tipping the top of the lamp away from the body and separate it from the rear of the vehicle.
(2) Rotate the bulb socket one-third turn and remove the bulb socket from the lamp housing.

INSTALLATION

(1) Install the bulb and socket in the lamp housing.
(2) Position the lamp housing in the opening at the rear of the vehicle.
(3) Install the lamp housing screws. Tighten the screws securely.

LICENSE PLATE LAMP

REMOVAL

(1) Remove screws and the license plate lamp visor from the liftgate (Fig. 3).
(2) Remove the bulb from the lamp socket.

INSTALLATION

(1) Install a replacement bulb in the lamp socket.
(2) Position the license plate lamp visor on the liftgate and install screws. Tighten the screws securely.

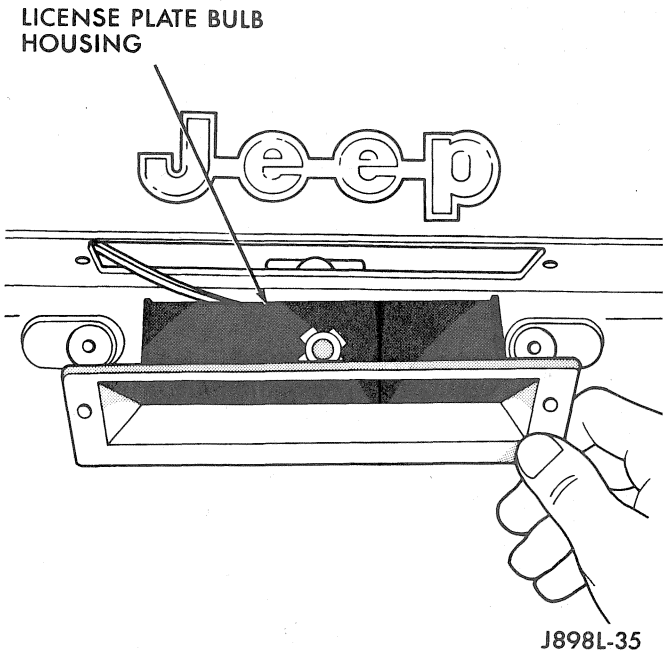


Fig. 3 License Plate Lamp Visor

UNDERHOOD LAMP

The underhood lamp is installed on the hood inner panel. The lamp illuminates when the hood is opened. The liquid ON/OFF switch that is integral with the lamp base controls the operation. The switch provides automatic ON/OFF functions each time the hood is opened and closed.

REMOVAL

(1) Disconnect the wire harness connector from the lamp.
(2) Rotate the bulb counterclock-wise. Remove it from the lamp base socket.
(3) Remove the screw that attaches the lamp reflector and support bracket (Fig. 4).
(4) Remove the lamp from the hood inner panel.

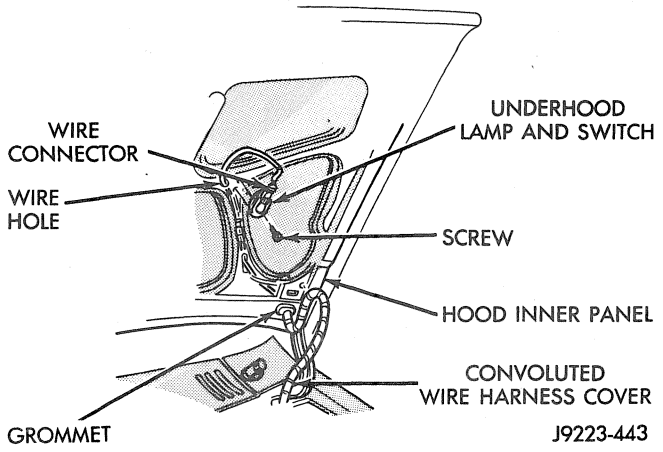


Fig. 4 Underlamp

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Position the underhood lamp on the hood inner panel.
(2) Install the screw through the lamp and into the hood panel. Tighten the screw securely.
(3) Insert a replacement bulb in the lamp base socket. Rotate it clockwise.
(4) Connect the wire harness connector to the lamp.

DOME LAMP

REMOVAL

(1) Remove the dome lamp lens by squeezing it at both sides. This will separate the lens retainer tabs from the lamp housing shoulders.
(2) Pull the lens downward to remove it from the lamp housing.
(3) Remove the lamp housing speed nuts (Fig. 5).
(4) Disconnect the wire harness connector.
(5) Remove the lamp housing from the headliner cavity.

INSTALLATION

(1) Position the dome lamp housing at the headliner cavity.
(2) Connect the wire harness connector.
(3) Install the lamp housing speed nuts.
(4) Position the lens at the lamp housing and force it upward into the housing until the retainer tabs are seated on the lamp housing shoulders.

MAP/READING LAMP

The map/reading lamp can be serviced by removing the overhead console. Refer to Group 8C, Overhead Console for removal/installation procedures.

VISOR VANITY LAMP

REMOVAL

(1) Fold down sunvisor.

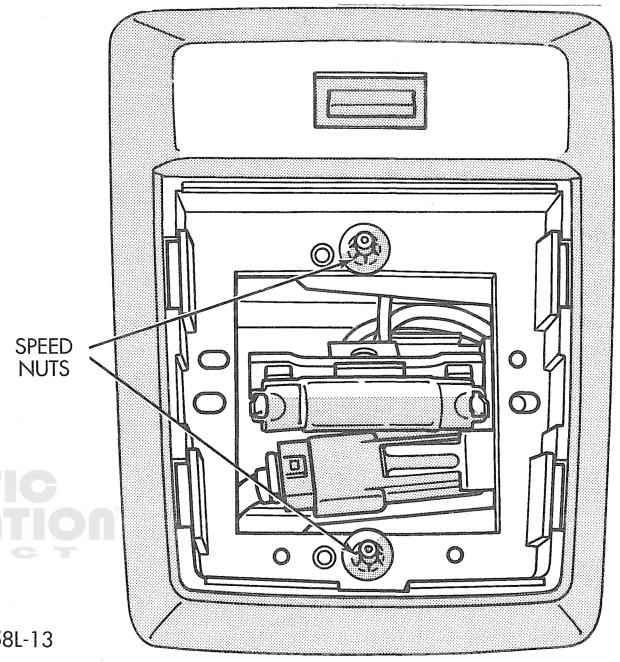


Fig. 5 Dome Lamp Removal/Installation

(2) Startng at the base of the lamp assembly and working right-to-left, use a small flat blade, carefully pry lamp from visor.
(3) Disconnect visor lamp wire connector and remove from vehicle.

INSTALLATION

(1) Position visor lamp at visor and connect visor lamp wire connector.
(2) Position visor lamp in visor and press into place.

LAMP SYSTEMS

INDEX

page

REMOVAL AND INSTALLATION
DAYTIME RUNNING LAMP MODULE 17
SENTINEL HEADLAMP DELAY MODULE 17

REMOVAL AND INSTALLATION

SENTINEL HEADLAMP DELAY MODULE

REMOVAL

(1) Remove the knee blocker.
(2) Remove the screw that attaches the module to the inside of the instrument panel.
(3) Disconnect the wire harness connector and remove the module from the instrument panel.

INSTALLATION

(1) Position the module inside the I/P and connect the wire harness connector to the module.
(2) Install the screw that attaches the module to the inside of the instrument panel.
(3) Install the knee blocker.

DAYTIME RUNNING LAMP MODULE

REMOVAL

The Daytime Running Lights (DRL) module is located on the right fender inner panel adjacent to the dash panel (Fig. 1).

(1) Disconnect the wire harness connector from the module.
(2) Remove the screws that attach the module to the fender inner panel.
(3) Remove the module from the fender inner panel.

INSTALLATION

(1) Position the module on the right fender inner panel.

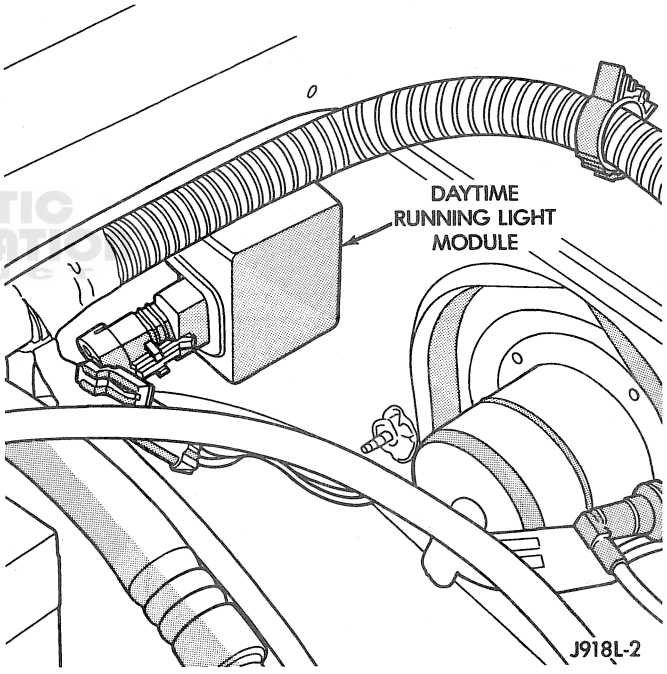


Fig. 1 Daytime Running Lamp Module

(2) Install the attaching screws. Tighten the screws securely.
(3) Connect the wire harness connector to the module.

BULB APPLICATION

INDEX

page

GENERAL INFORMATION
GENERAL INFORMATION 18
SPECIFICATIONS
EXTERIOR LAMPS 18
INTERIOR LAMPS 18

GENERAL INFORMATION

GENERAL INFORMATION

The following Bulb Application Tables lists the lamp title on the left side of the column and trade number or part number on the right.

CAUTION: Do not use bulbs that have a higher candle power than the bulb listed in the Bulb Application Table. Damage to lamp can result. Do not touch halogen bulbs with fingers or other oily surfaces. Bulb life will be reduced.

SPECIFICATIONS

EXTERIOR LAMPS

LAMP	BULB
Back-up	1156
Center High Mounted Stoplamp	922
Fog lamp	H3
Front Side Marker	194
Headlamp/Sealed Beam	H6054
License Plate	168
License Plate W/Outside Spare	67
Park/Turn Signal	2057NA
Tail/Stop	2057
Turn Signal	1156

INTERIOR LAMPS

Service procedures for most of the lamps in the instrument panel, Instrument cluster and switches are located in Group 8E, Instrument Panel and Gauges. Some components have lamps that can only be serviced by an Authorized Service Center (ASC) after the component is removed from the vehicle. Contact local dealer for location of nearest ASC.

LAMP	BULB
Cargo	561
Dome	561
Dome/Reading	906
Glove Compartment	194
Overhead Console	912
Under Hood	105
Vanity Mirror	74
Underpanel Courtesy	168

INDICATOR LAMPS

Service procedures for most of the lamps in the instrument panel, instrument cluster and switches are located in Group 8E, Instrument Panel and Gauges.

LAMP	BULB
A/C Control	74
Airbag	74
Anti-lock Brake	74
Ash Receiver	1891
Brake Warning	74
Check Engine	74
Cigar Lighter	53
Diesel Wait	74
Fasten Seat Belts	74
Four Wheel Drive	74
Generator	194
Generator/Diesel	74
Heater Control	74
High Beam	194
Illumination	194
Low Fuel	194
Low Washer Fluid	74
Radio	ASC
Rocker Switch	37
Seat Belt	74
Transfer Case	658
Transmission Floor Shift	658
Turn Signal	194
Shift	74
Water In Fuel	74

PASSIVE RESTRAINT SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
AIRBAG MODULE	1
ARMING/DISARMING MECHANISM	2
IMPACT SENSOR/INFLATOR ASSEMBLY	2
DIAGNOSIS AND TESTING	
AIRBAG SYSTEM	2
SERVICE PROCEDURES	
AIRBAG SYSTEM	2
CLEAN-UP PROCEDURE	2
REMOVAL AND INSTALLATION	
AIRBAG MODULE	3

GENERAL INFORMATION

INTRODUCTION

The driver's side airbag system is a standard equipment safety device on these models. It is designed to protect the driver from serious injury, caused by a frontal impact of the vehicle. If the airbag module assembly is defective and non-deployed, refer to the Chrysler Corporation current return list in the Warranty Policies and Procedures manual for proper handling procedures.

Following are general descriptions of the major components in the airbag system.

WARNING: THIS SYSTEM IS A SENSITIVE, COMPLEX MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS, YOU MUST FIRST DISARM THE AIRBAG FIRING MECHANISM. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

- **DO NOT USE POWER-DRIVEN TOOLS WHEN SERVICING THE MECHANICAL AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**
- **THE AIRBAG MODULE INFLATOR/SENSOR ASSEMBLY CONTAINS SODIUM AZIDE AND POTASSIUM NITRATE. THESE MATERIALS ARE POISONOUS AND EXTREMELY FLAMMABLE. CONTACT WITH ACID, WATER, OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES (SODIUM HYDROXIDE IS FORMED IN THE PRESENCE OF MOISTURE) OR COMBUSTIBLE COMPOUNDS. DO NOT ATTEMPT TO DISMANTLE THE MODULE OR TAMPER WITH ITS ARMING LEVER. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURES EXCEEDING 93°C (200°F).**
- **REPLACE AIRBAG SYSTEM COMPONENTS ONLY WITH PARTS SPECIFIED IN THE CHRYSLER MOPAR PARTS CATALOG. IT IS OF PARTICULAR IMPORTANCE THAT ANY COMPONENTS USED IN THIS MECHANICALLY-FIRED AIRBAG SYSTEM NOT BE MIXED WITH COMPONENTS FROM AN ELECTRICALLY-FIRED AIRBAG SYSTEM. SUBSTITUTE PARTS MAY APPEAR THE SAME, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.**
- **THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE CHRYSLER MOPAR PARTS CATALOG.**
- **WHEN A STEERING COLUMN HAS AN AIRBAG MODULE ATTACHED, NEVER PLACE THE COLUMN ON THE FLOOR OR ANY OTHER SURFACE WITH THE STEERING WHEEL OR AIRBAG MODULE FACE DOWN.**

DESCRIPTION AND OPERATION

AIRBAG MODULE

The airbag module protective cover is the only visible part of the system. The module is mounted directly to the steering wheel. Under the airbag module cover, the airbag cushion and its supporting com-

DESCRIPTION AND OPERATION (Continued)

ponents are contained. The airbag module contains a housing to which the cushion and impact sensor/inflator assembly are attached and sealed. The airbag module cannot be repaired, and must be replaced if deployed or in any way damaged.

The impact sensor/inflator assembly is mounted to the back of the module. The inflator seals the hole in the airbag cushion so it can discharge the gas it produces directly into the cushion. The protective cover is fitted to the front of the airbag module and forms a decorative cover in the center of the steering wheel. Upon airbag deployment, this cover will split horizontally.

STORAGE

The airbag module must be stored in its original, special container until used for service. Also, it must be stored in a clean, dry environment; away from sources of extreme heat, sparks, and high electrical energy. Always place or store the module on a surface with the trim cover facing up to minimize movement in case of accidental deployment.

IMPACT SENSOR/INFLATOR ASSEMBLY

The impact sensor/inflator assembly is mounted to the back of the airbag module. It seals the hole in the steering wheel side of the airbag cushion so that the gas produced in the inflator can be discharged directly into the cushion.

The impact sensor provides verification of the direction and severity of the impact. A spherical sensing mass housed in a cylinder will move forward and rotate a D-shaft when the vehicle is subjected to a frontal impact of sufficient severity. Airbag inflation is designed to occur at a precisely calibrated vehicle deceleration force, and is not linked to vehicle road speed.

The D-shaft retains two spring-loaded firing pins. When a firing pin is released by the D-shaft, it strikes and ignites a primer. The primer then reacts with the pelletized, solid generant contained in the inflator to produce the nitrogen gas that inflates the airbag cushion.

ARMING/DISARMING MECHANISM

The steering wheel hub incorporates an airbag arming/disarming mechanism and a specially designed nut-blocker. The nut-blocker serves as a safety to prevent removal of the airbag module until the unit has been disarmed. A removable plastic cover plug on the top, outer hub of the steering wheel allows access to the arming screw.

When the airbag module is disarmed, the arming screw will extend one inch upward from the outer surface of the steering wheel hub. This will prevent installation of the plastic cover plug. Also, the nut-blocker is retracted to allow access to the two upper airbag module mounting nuts.

When the airbag module is armed, the plastic cover plug will install flush with the outer surface of the steering wheel hub. In addition, the nut-blocker will prevent access to the two upper airbag module mounting nuts.

DIAGNOSIS AND TESTING

AIRBAG SYSTEM

The mechanical airbag system cannot be diagnosed or repaired. The only serviced component is the airbag module assembly. If the airbag module is damaged in any way, or deployed, it must be replaced.

SERVICE PROCEDURES

AIRBAG SYSTEM

UNDEPLOYED

At no time should any source of electricity be permitted near the inflator on the back of the airbag module. When carrying an undeployed airbag module, the trim cover should be pointed away from the body to minimize injury in the event of accidental deployment. If the module is placed on a bench or any other surface, the plastic trim cover should be face up to minimize movement in the event of an accidental deployment.

In addition, the airbag module should be disarmed whenever the steering wheel or steering column requires service or removal. Failure to observe this warning could result in accidental airbag deployment and possible personal injury. Refer to Group 19 - Steering for additional service procedures on the steering wheel and steering column.

DEPLOYED

Any vehicle which is to be returned to use after an airbag deployment, must have the airbag module replaced. This is a one-time component and cannot be reused.

CLEAN-UP PROCEDURE

Following an airbag deployment, the vehicle interior will contain a powdery residue. This residue is primarily sodium bicarbonate (baking soda), used as an airbag cushion lubricant. However, there will also be traces of sodium hydroxide powder, a chemical by-product of the generant used for airbag deployment. Since this powder can irritate the skin, eyes, nose, or throat, be sure to wear safety glasses, rubber gloves, and a long-sleeved shirt during cleanup (Fig. 1).

SERVICE PROCEDURES (Continued)

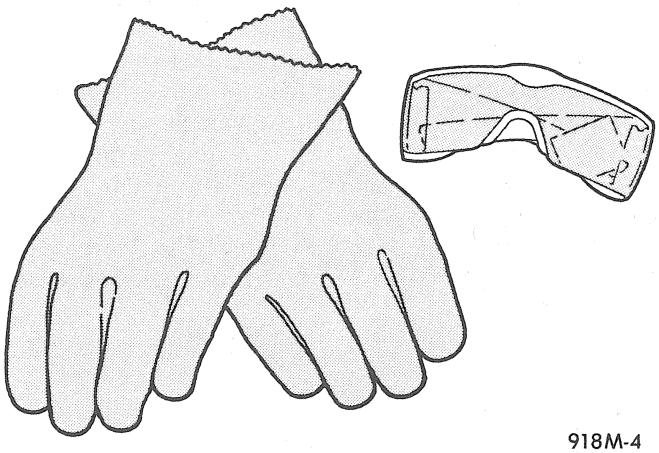


Fig. 1 Wear Safety Glasses and Rubber Gloves

WARNING: IF YOU EXPERIENCE SKIN IRRITATION DURING CLEANUP, RUN COOL WATER OVER THE AFFECTED AREA. ALSO, IF YOU EXPERIENCE IRRITATION OF THE NOSE OR THROAT, EXIT THE VEHICLE FOR FRESH AIR UNTIL THE IRRITATION CEASES. IF IRRITATION CONTINUES, SEE A PHYSICIAN.

Remove the airbag and airbag module from the vehicle. Use a vacuum cleaner to remove any residual powder from the vehicle interior. Clean from outside the vehicle and work your way inside, so that you avoid kneeling or sitting on an uncleaned area.

Be sure to vacuum the heater and air conditioning outlets as well (Fig. 2). Run the heater and air conditioning blower on the lowest speed setting and vacuum any powder expelled from the outlets. You may need to vacuum the interior of the vehicle a second time to recover all of the powder.

Place the deployed airbag and module in your vehicular scrap pile.

REMOVAL AND INSTALLATION

AIRBAG MODULE

WARNING: THIS SYSTEM IS A SENSITIVE, COMPLEX MECHANICAL UNIT. BEFORE ATTEMPTING TO REMOVE, OR INSTALL THE AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS, YOU MUST FIRST DISARM THE AIRBAG FIRING MECHANISM. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

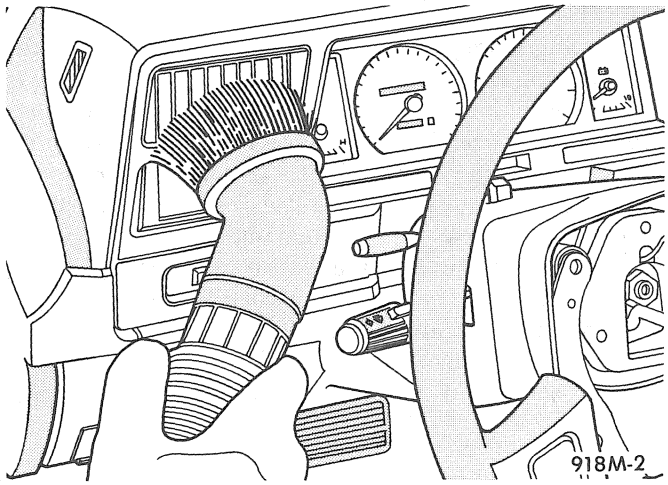


Fig. 2 Vacuum Heater and A/C Outlets

• WHEN REMOVING A DEPLOYED AIRBAG MODULE, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG MODULE AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

• DO NOT USE POWER-DRIVEN TOOLS WHEN SERVICING THE MECHANICAL AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the battery negative cable and isolate.

REMOVAL AND INSTALLATION (Continued)

(2) Using a small screwdriver, remove the plastic cover plug from the top outer surface of the steering wheel hub. Exit the vehicle and disarm the airbag firing mechanism by reaching through the driver's side window and turning the arming screw counterclockwise to its travel limit. When the screw has reached its travel limit, it will extend one inch above the outer surface of the steering wheel hub cover. This is done using an 8mm socket and manual drive.

(3) From the back side of the steering wheel, remove the four nuts attaching the airbag module to the steering wheel (Fig. 3). This is done using a 10mm socket and manual drive.

(4) Remove the airbag module from the steering wheel.

(5) Reverse the removal procedures to install. Tighten the airbag module attaching nuts to 9 to 11 N·m (80 to 100 in. lbs.). Exit the vehicle and arm the airbag firing mechanism by reaching through the driver's side window and turning the arming screw clockwise to its travel limit. The arming screw torque should not exceed 1.1 to 1.7 N·m (10 to 15 in. lbs.). Reinstall the plastic cover plug in the steering wheel hub.

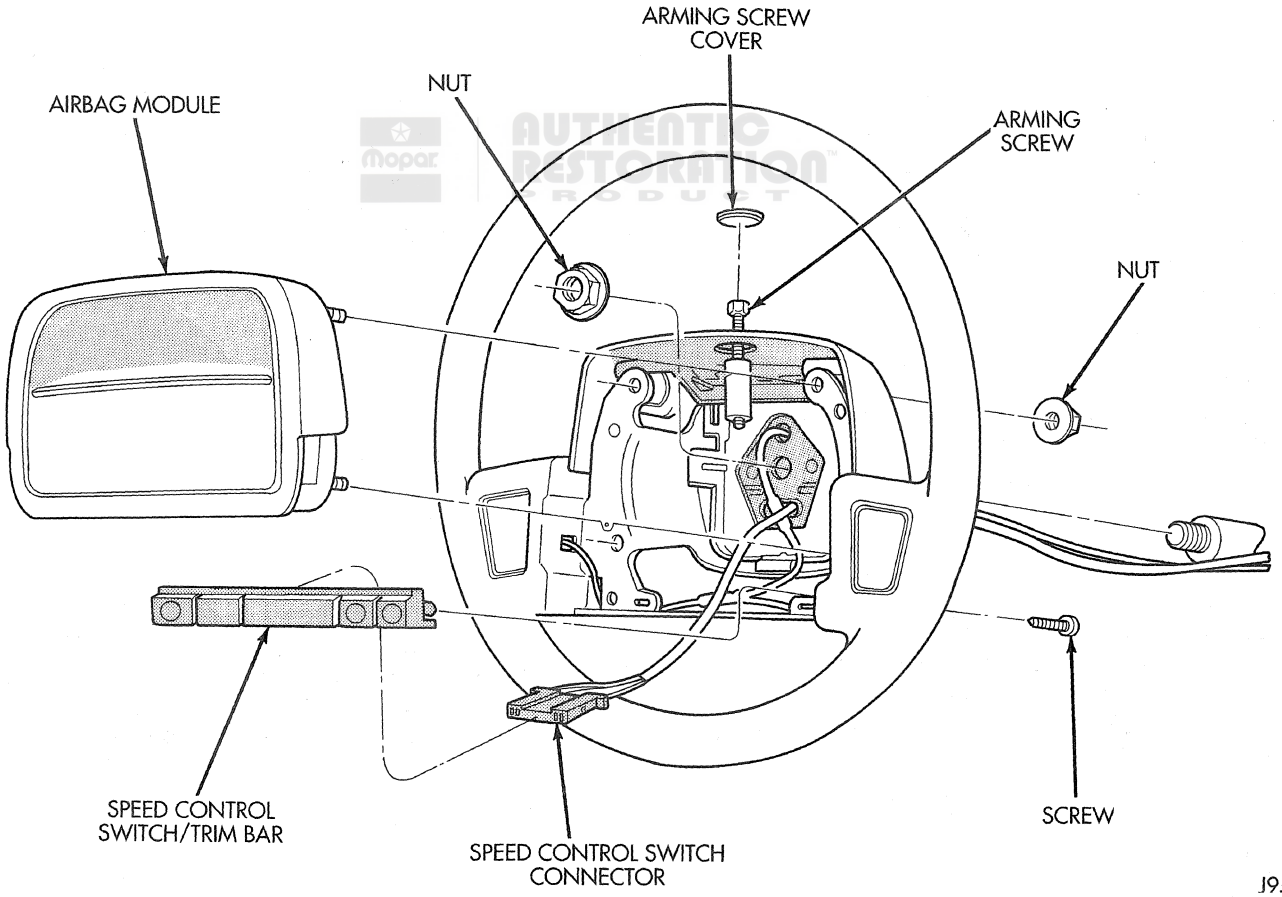


Fig. 3 Airbag Module Remove/Install

ELECTRICALLY HEATED SYSTEMS

CONTENTS

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
DEFOGGER GLASS GRID 1
DEFOGGER RELAY/TIMER 1
DEFOGGER SWITCH 1
DIAGNOSIS AND TESTING
DEFOGGER GLASS GRID 2
DEFOGGER RELAY/TIMER 2
DEFOGGER SWITCH 2
REAR WINDOW DEFOGGER SYSTEM 1
SERVICE PROCEDURES
DEFOGGER GLASS GRID REPAIRS 3
REMOVAL AND INSTALLATION
DEFOGGER RELAY/TIMER 4
DEFOGGER SWITCH 4

GENERAL INFORMATION

INTRODUCTION

The electrically heated rear window defogger is an available factory-installed option on these models. Following are general descriptions of the major components in the rear window defogger system. Refer to 8W-48 - Rear Window Defogger in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

DEFOGGER GLASS GRID

The heated rear window glass has two electrically conductive vertical bus bars and a series of horizontal grid lines made of a silver-ceramic material, which is baked on and bonded to the inside surface of the glass. The grid lines and bus bars comprise a parallel electrical circuit.

When the rear window defogger switch is placed in the On position, current is directed to the rear window grid lines through the bus bars. The grid lines heat the rear window to clear the surface of fog or snow. Protection for the heated grid circuit is provided by a fuse in the fuseblock module.

The grid lines and bus bars are highly resistant to abrasion. However, it is possible for an open to occur in an individual grid line, resulting in no current flow through the line. The grid lines can be damaged or scraped off with sharp instruments. Care should be taken when cleaning the glass or removing foreign materials, decals, or stickers from the glass. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

A repair kit is available to repair the grid lines and bus bars, or to reinstall the heated glass pigtail wires.

DEFOGGER SWITCH

The rear window defogger switch is mounted in the left instrument panel switch module, left of the steering column. The switch circuit is protected by a fuse in the fuseblock module. Actuating the switch energizes the defogger relay and electronic timer. A Light-Emitting Diode (LED) in the switch illuminates to indicate when the system is turned on. The defogger switch cannot be repaired. If faulty, the switch must be replaced.

DEFOGGER RELAY/TIMER

The defogger relay/timer is located in the relay center. The relay center is attached to the lower instrument panel reinforcement, under the instrument panel and just outboard of the steering column. When the rear defogger switch is actuated, the rear defogger relay is energized. This causes current to flow through the grid circuit for approximately ten minutes, or until the rear window defogger switch or ignition switch are turned off.

While the defogger relay/timer shares the terminal orientation (footprint) of a International Standards Organization (ISO)-type relay, the internal circuitry is much different. The defogger relay contains an electronic timer circuit. Do not substitute any other relay for the defogger relay/timer.

The defogger relay/timer cannot be repaired. If faulty, it must be replaced.

DIAGNOSIS AND TESTING

REAR WINDOW DEFOGGER SYSTEM

For circuit descriptions and diagrams, refer to 8W-48 - Rear Window Defogger in Group 8W - Wiring Diagrams. Electrically heated rear window defogger operation can be confirmed in one of the following manners:

DIAGNOSIS AND TESTING (Continued)

1. Turn the ignition switch to the On position. While monitoring the instrument panel voltmeter, set the rear window defogger switch in the On position. When the defogger switch is turned On, a distinct voltmeter needle deflection should be noted.

2. Turn the ignition switch to the On position. Set the rear window defogger switch in the On position. The rear window defogger operation can be checked by feeling the glass. A distinct difference in temperature between the grid lines and the adjacent clear glass can be detected within three to four minutes of operation.

3. Using a 12-volt DC voltmeter, contact terminal A (passenger's side) with the negative lead, and terminal B (driver's side) with the positive lead (Fig. 1). The voltmeter should read battery voltage.

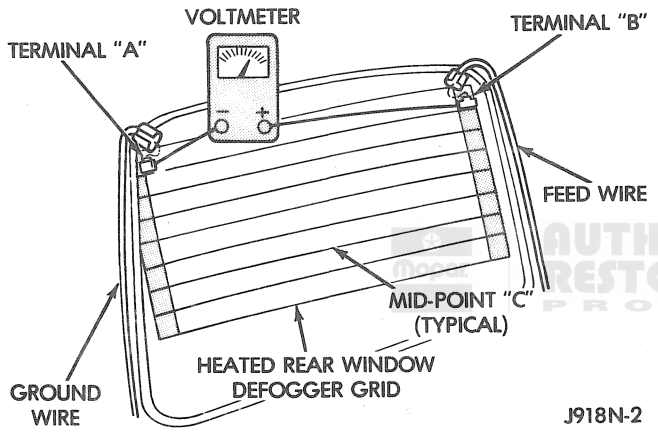


Fig. 1 Rear Window Glass Grid Test

The above checks will confirm system operation. Illumination of the switch LED means that there is power available at the output of the switch, but does not confirm that power is reaching the rear window grid lines.

If the rear window defogger does not operate, the problem should be isolated in the following manner:

(1) Confirm that the ignition switch is in the On position.

(2) Ensure that the heated rear window feed and ground wires are connected to the glass. Confirm that the ground wire has continuity to ground.

(3) Check the fuses in the power distribution center and in the fuseblock module. The fuses must be tight in their receptacles and all electrical connections must be secure.

When the above steps have been completed and the system is still inoperative, one or more of the following is faulty:

- Defogger switch
- Relay/timer
- Rear window grid lines (all grid lines would have to be broken or one of the feed wires disconnected for the entire system to be inoperative).

If setting the rear window defogger switch to the On position produces a severe voltmeter deflection, check for a short circuit.

DEFOGGER GLASS GRID

For circuit descriptions and diagrams, refer to 8W-48 - Rear Window Defogger in Group 8W - Wiring Diagrams. To detect breaks in the grid lines, the following procedure is required:

(1) Turn the ignition switch to the On position. Set the rear defogger switch in the On position. The indicator lamp should light. If OK, go to Step 2. If not OK, see the diagnosis for Defogger Switch/Relay/Timer in this group.

(2) Using a 12-volt DC voltmeter, contact the vertical bus bar on the passenger's side of the vehicle with the negative lead. With the positive lead, contact the vertical bus bar on the driver's side of the vehicle. The voltmeter should read battery voltage. If OK, go to Step 3. If not OK, repair the open circuit to the defogger switch module as required.

(3) With the negative lead of the voltmeter, contact a good body ground point. The voltage reading should not change. If OK, go to Step 4. If not OK, repair the circuit to ground as required.

(4) Connect the negative lead of the voltmeter to the passenger's side bus bar and touch each grid line at mid-point C with the positive lead. A reading of approximately six volts indicates a line is good. A reading of zero volts indicates a break in the grid line between mid-point C and the driver's side bus bar. A reading of 10-14 volts indicates a break between mid-point C and the passenger's side bus bar. Move the positive lead on the grid line towards the break and the voltage reading will change as soon as the break is crossed.

DEFOGGER SWITCH

Before testing the defogger switch, perform the tests shown in Rear Window Defogger System in this group. For circuit descriptions and diagrams, refer to 8W-48 - Rear Window Defogger in Group 8W - Wiring Diagrams.

(1) Remove the defogger switch from the instrument panel as described in this group.

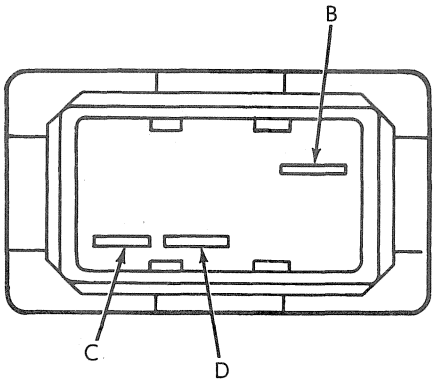
(2) Test the switch resistance as shown in Defogger Switch Tests (Fig. 2).

(3) If the switch tests are OK, see the Defogger Relay/Timer diagnosis in this group. If not OK, replace the faulty switch.

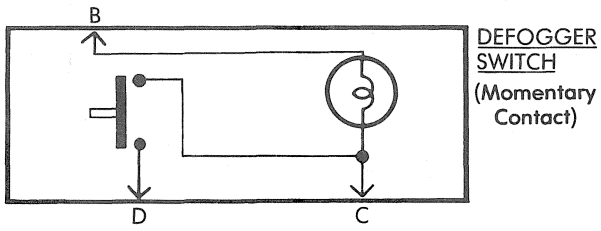
DEFOGGER RELAY/TIMER

Before testing the defogger relay/timer, perform the tests shown in Rear Window Defogger System and Defogger Switch, in this group. For circuit descrip-

DIAGNOSIS AND TESTING (Continued)



SWITCH DIAGRAM



SWITCH TEST

SWITCH POSITION	TERMINALS	ZERO OHMS
On/Off	B and D	Almost zero ohms (bulb filament) with switch button depressed
On/Off	D and C	
At Rest (Neutral)	B and C	Almost zero ohms (bulb filament)

J928N-1

Fig. 2 Defogger Switch Tests

tions and diagrams, refer to 8W-48 - Rear Window Defogger in Group 8W - Wiring Diagrams.

Remove the defogger relay/timer from the relay center. Turn the ignition switch to the On position for the voltage tests, and turn the ignition switch to the Off position for the resistance tests.

(1) Measure the voltage at the fused B(+) circuit cavity for the relay/timer in the relay center. The meter should read battery voltage. If OK, go to Step 2. If not OK, repair the open circuit from the fuseblock module as required.

(2) Measure the voltage at the fused ignition switch output circuit cavity for the relay/timer in the relay center. The meter should read battery voltage. If OK, go to Step 3. If not OK, repair the open circuit from the fuseblock module as required.

(3) Measure the resistance between the rear window defogger relay output circuit cavity for the relay/timer in the relay center and the left side of the defogger grid. The meter should read zero ohms. If OK, go to Step 4. If not OK, repair the circuit between the relay center and the defogger grid as required.

(4) Measure the resistance between the ground circuit cavity for the relay/timer in the relay center and a good ground. The meter should read zero ohms. If OK, go to Step 5. If not OK, repair the circuit between the relay center and ground as required.

(5) Measure the resistance between the rear window defogger switch signal circuit cavities for the relay/timer in the relay center and the defogger switch connector. The meter should read zero ohms. If OK, go to Step 6. If not OK, repair the circuit between the relay center and the defogger switch as required.

(6) Install the relay/timer in the relay center. Measure the voltage at the rear window defogger switch signal circuit terminal of the relay/timer. The meter should read approximately five volts. If not OK, replace the faulty defogger relay/timer.

SERVICE PROCEDURES

DEFOGGER GLASS GRID REPAIRS

Repair of the grid lines, bus bars or pigtail wires can be accomplished using a Mopar Rear Window Defogger Repair Kit (P/N 4267922) or equivalent.

WARNING: MATERIALS CONTAINED IN THE REPAIR KIT MAY CAUSE SKIN OR EYE IRRITATION. THE KIT CONTAINS EPOXY RESIN AND AMINE TYPE HARDENER, WHICH ARE HARMFUL IF SWALLOWED. AVOID CONTACT WITH THE SKIN AND EYES. FOR SKIN CONTACT, WASH THE AFFECTED AREAS WITH SOAP AND WATER. FOR CONTACT WITH THE EYES, FLUSH WITH PLENTY OF WATER. DO NOT TAKE INTERNALLY. IF TAKEN INTERNALLY, INDUCE VOMITING AND CALL A PHYSICIAN IMMEDIATELY. USE WITH ADEQUATE VENTILATION. DO NOT USE NEAR FIRE OR FLAME. CONTAINS FLAMMABLE SOLVENTS. KEEP OUT OF THE REACH OF CHILDREN.

(1) Mask the repair area so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the grid line or the bus bar on either side of the break (Fig. 3).

SERVICE PROCEDURES (Continued)

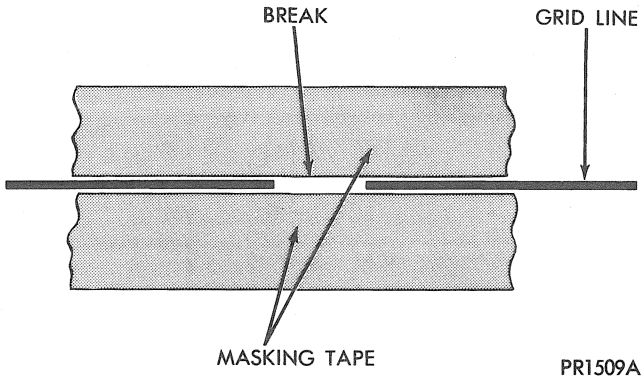


Fig. 3 Grid Line Repair - Typical

(2) Follow the instructions in the repair kit for preparing the damaged area.

(3) Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.

(4) For grid line repairs, mask the area to be repaired with masking tape or a template.

(5) Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 mm (0.75 in.).

(6) For a terminal or pigtail replacement, mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as the bus bar. Apply a thin layer of epoxy to the area where the terminal or pigtail was fastened and onto the adjacent grid line.

(7) Apply a thin layer of conductive epoxy to the terminal or bare wire end of the pigtail and place in the desired location. To prevent the terminal or pigtail from moving while the epoxy is curing, it must be wedged or clamped.

(8) Carefully remove the masking tape or template.

CAUTION: Do not allow the glass surface to exceed 204°C (400°F) or the glass may fracture.

(9) Allow the epoxy to cure 24 hours at room temperature, or use a heat gun with a 260°-371°C (500°-700°F) range for 15 minutes. Hold the heat gun approximately 254 mm (10 in.) from the repair.

(10) After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail. Do not attach the connectors until the curing process is complete.

(11) Check the operation of the rear window defogger.

REMOVAL AND INSTALLATION

DEFOGGER SWITCH

(1) Disconnect the battery negative cable.

(2) Remove the instrument cluster bezel. Refer to Group 8E - Instrument Panel Systems for the procedures.

(3) Remove the left instrument panel switch module.

(4) Unplug the defogger switch wiring connector.

(5) Slightly depress the switch mounting tabs and remove the switch.

(6) Reverse the removal procedures to install.

DEFOGGER RELAY/TIMER

The defogger relay/timer is located in the relay center. The relay center is located on the lower instrument panel reinforcement, under the instrument panel and just inboard from the steering column.

(1) Disconnect the battery negative cable.

(2) Pull the defogger relay/timer (red) from the relay center (Fig. 4).

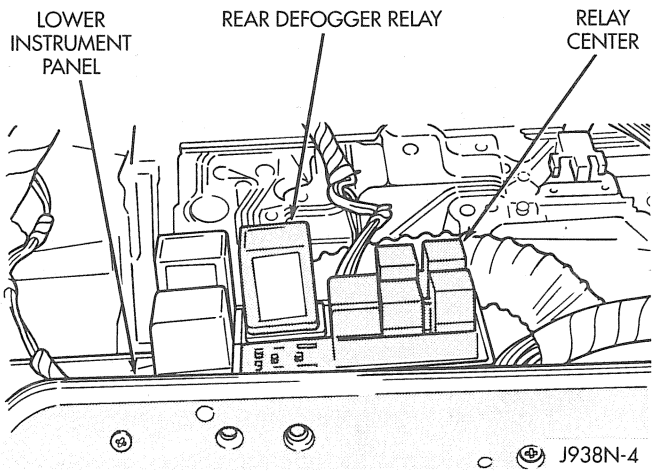


Fig. 4 Defogger Relay/Timer

(3) To install the defogger relay/timer, align the terminals with the cavities in the relay center and push the defogger relay/timer firmly into place.

(4) Connect the battery negative cable.

(5) Test the defogger relay/timer operation.

POWER LOCK SYSTEMS

CONTENTS

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
POWER LOCK MOTOR 1
POWER LOCK SWITCH 1
POWER LOCK/UNLOCK RELAYS 1
REMOTE KEYLESS ENTRY MODULE 2
REMOTE KEYLESS ENTRY TRANSMITTER 2
DIAGNOSIS AND TESTING
POWER LOCK MOTOR 8
POWER LOCK SWITCH 2
POWER LOCK/REMOTE KEYLESS ENTRY SYSTEM 2
POWER LOCK/UNLOCK RELAYS 7
REMOTE KEYLESS ENTRY MODULE 8
REMOTE KEYLESS ENTRY TRANSMITTER 8
SERVICE PROCEDURES
KEYLESS ENTRY TRANSMITTER PROGRAMMING 9
REMOTE KEYLESS ENTRY TRANSMITTER BATTERY REPLACEMENT 9
REMOVAL AND INSTALLATION
POWER LOCK MOTOR 10
POWER LOCK SWITCH 9
POWER LOCK/UNLOCK RELAYS 10
REMOTE KEYLESS ENTRY MODULE 12

AUTHENTIC RESTORATION PRODUCT

GENERAL INFORMATION

INTRODUCTION

Power locks are optional factory-installed equipment on these models. The remote keyless entry and power window systems are included on vehicles equipped with the power lock option. All doors and the liftgate can be locked and unlocked electrically by operating the switch on either front door panel, or by operating the Lock and Unlock buttons of the remote keyless entry transmitter.

The power lock and remote keyless entry systems operate with battery power supplied independent of the ignition switch.

Following are general descriptions of the major components in the power lock system. Refer to 8W-61 - Power Door Locks in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams. Refer to the owner's manual for more information on the features and use of these systems.

DESCRIPTION AND OPERATION

POWER LOCK SWITCH

The power locks are controlled by a two-way switch mounted on the trim panel of each front door. The switch controls battery feed to the lock and unlock relays. The power lock switches cannot be repaired. If faulty, the entire switch must be replaced.

POWER LOCK/UNLOCK RELAYS

The power lock and unlock relays are International Standards Organization (ISO) micro-relays. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The power lock and unlock relays are electro-mechanical devices that switch battery and ground feeds to the power door lock motors. The relays respond to inputs from the power lock switches, and the remote keyless entry module. See the Diagnosis and Testing section of this group for more information on the operation of the power lock and unlock relays.

The power lock and unlock relays are located in the relay center. The relay center is located on the lower instrument panel reinforcement, behind the lower instrument panel and just inboard of the steering column. The power lock and unlock relays cannot be repaired. If faulty, they must be replaced.

POWER LOCK MOTOR

In the power lock system, the locks are actuated by a reversible motor mounted within each door. The motor direction is controlled by the battery and ground feeds from the power lock and unlock relays. The motor cannot be repaired. If faulty, the entire motor must be replaced.

DESCRIPTION AND OPERATION (Continued)

REMOTE KEYLESS ENTRY TRANSMITTER

The remote keyless entry system transmitter is equipped with two buttons, labeled Lock and Unlock. It is also equipped with a key ring and is designed to serve as a key fob. Each transmitter has a different vehicle access code, which must be programmed into the memory of the receiver in the vehicle in order to operate the remote keyless entry system. The operating range of the infrared transmitter signal is up to 4.75 meters (15 feet) from the receiver.

The transmitter operates on two CR1616 3-volt (or equivalent) batteries. Typical battery life is from one to two years.

REMOTE KEYLESS ENTRY MODULE

The remote keyless entry module is mounted in a housing on the headliner near the windshield and between the sunvisors, or inside and towards the rear of the optional overhead console. This module contains the remote keyless entry receiver and the program logic for the remote keyless entry system.

The remote keyless entry module has a memory function to retain the vehicle access code of at least one, but no more than four, transmitters. The receiver is designed to retain the transmitter codes in memory, even if the battery is disconnected.

The module receives input from the remote keyless entry transmitter. In response to that input, it is programmed to control outputs to the power lock and unlock relays, and to the courtesy lamp circuit. The remote keyless entry module cannot be repaired and, if faulty, it must be replaced.

DIAGNOSIS AND TESTING

POWER LOCK/REMOTE KEYLESS ENTRY SYSTEM

As a preliminary power lock/remote keyless entry system diagnosis, note the system operation while you actuate both the Lock and Unlock functions with the power lock switches and the remote keyless entry transmitter. Then, proceed as follows:

- If the system fails to function with either the switches or the transmitter, see Power Lock/Unlock Relays diagnosis.
- If the system functions with both switches, but not with the transmitter, see the Remote Keyless Entry Transmitter diagnosis.
- If system functions with transmitter, but not with one or both switches, see the Power Lock Switch diagnosis.
- If one lock fails to operate with the switches or transmitter, see the Power Lock Motor diagnosis.

POWER LOCK SWITCH

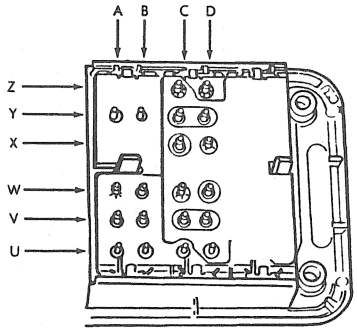
For circuit descriptions and diagrams, refer to 8W-61 - Power Door Locks in Group 8W - Wiring Diagrams.

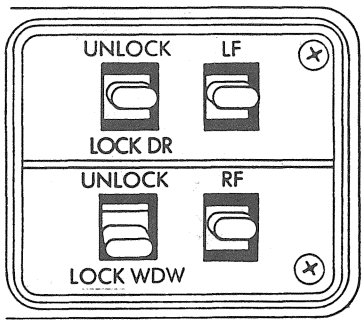
(1) Remove the switch from the trim panel as described in this group. Carefully separate the multiple terminal block on the wiring harness from the switch body.

(2) Check for battery voltage at the door lock relay control circuit cavity of the switch connector. If OK, go to Step 3. If not OK, repair the open circuit to the fuse in the fuseblock module.

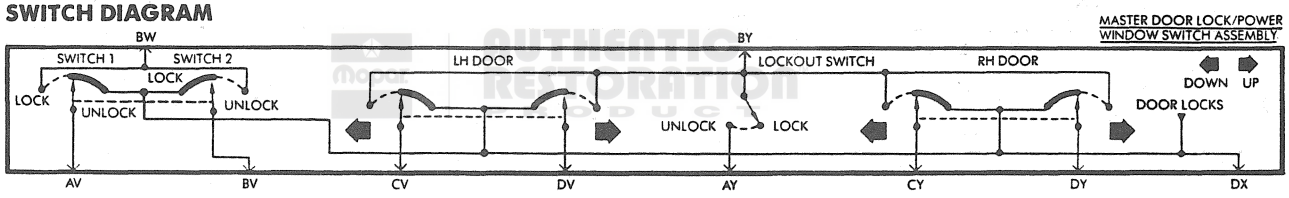
(3) Test the switch continuity. See the appropriate Switch Continuity chart to see if the continuity is correct in the Off, Lock, and Unlock switch positions. If OK, see the diagnosis for Power Lock/Unlock Relays in this group. If not OK, replace the faulty switch.

DIAGNOSIS AND TESTING (Continued)





SWITCH DIAGRAM



SWITCH TEST
Switch Grounds

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	DX and: AV, BV, CV DV, CY, DY	Yes
	BW and DX	No
	BY and DX	No

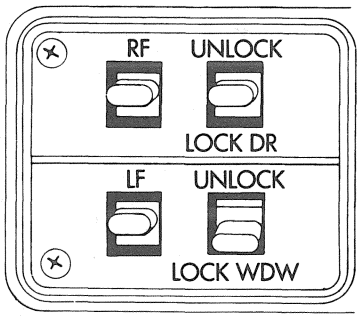
SWITCH TEST

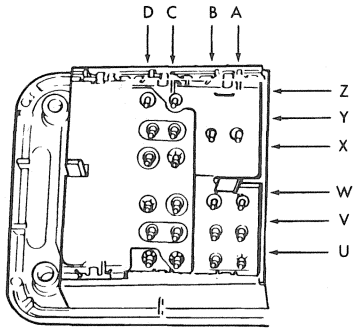
SWITCH POSITION	TERMINALS	ZERO OHMS
Unlock	BW and BV	Yes
Lock	BW and AV	Yes

J948P-4

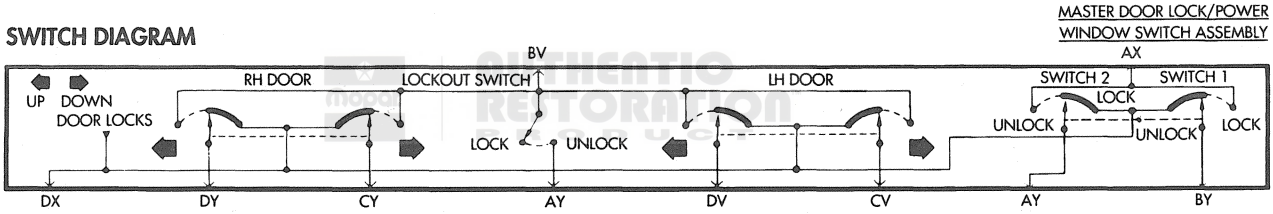
Driver's Power Lock Switch Continuity - 2-Door (LHD)

DIAGNOSIS AND TESTING (Continued)





SWITCH DIAGRAM



SWITCH TEST
Switch Grounds

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	DX and: AV, BV, CV DV, CY, DY	Yes
	BW and DX	No
	BY and DX	No

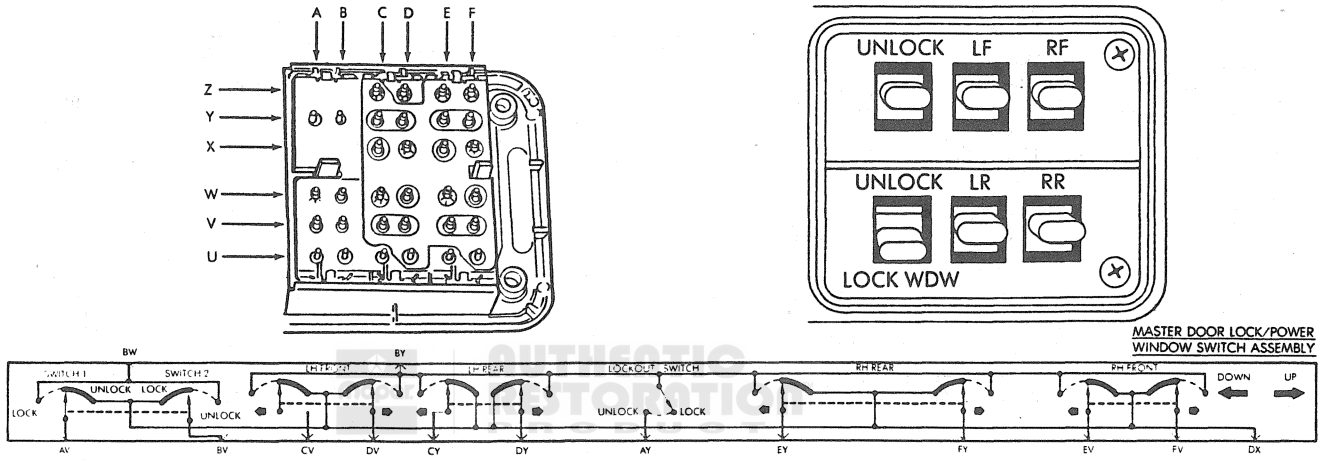
SWITCH TEST

SWITCH POSITION	TERMINALS	ZERO OHMS
Unlock	AX and AY	Yes
Lock	AX and BY	Yes

J948P-7

Driver's Power Lock Switch Continuity - 2-Door (RHD)

DIAGNOSIS AND TESTING (Continued)



SWITCH TEST
Switch Grounds

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	DX and: AV, BV, CV, DV, CY, DY, EY, FY, EV, FV	Yes
	BW and DX	No
	BY and DX	No

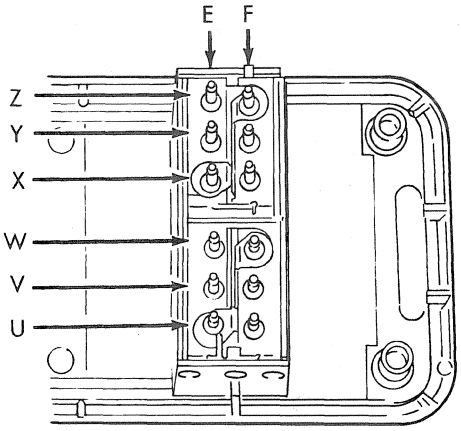
SWITCH TEST

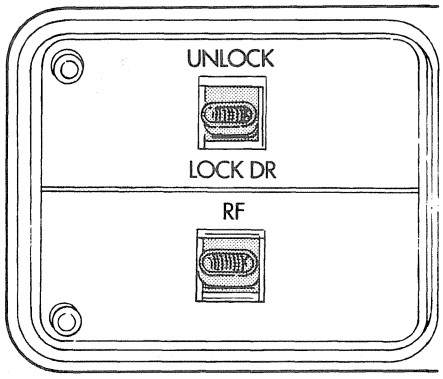
SWITCH POSITION	TERMINALS	ZERO OHMS
Unlock	BW and BV	Yes
Lock	BW and AV	Yes

J948P-5

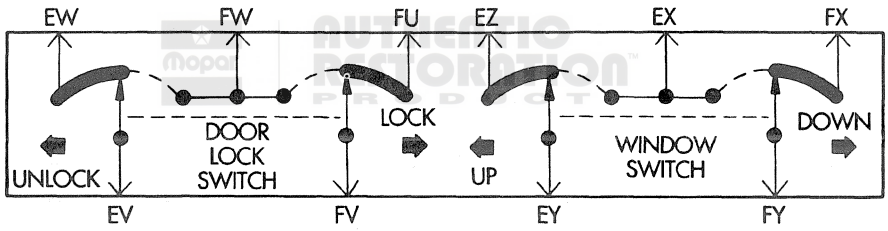
Driver's Power Lock Switch Continuity - 4-Door

DIAGNOSIS AND TESTING (Continued)





SWITCH DIAGRAM



SWITCH TEST
Lock Switch

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	EW and EV	Yes
	FU and FV	Yes
	All Others	No
Unlock	EW and EV	Yes
	FW and FV	Yes
	All Others	No
Lock	FU and FV	Yes
	FW and EV	Yes
	All Others	No

J948P-6

Passenger's Power Lock Switch Continuity

DIAGNOSIS AND TESTING (Continued)

POWER LOCK/UNLOCK RELAYS

The power lock and unlock relays are in the relay center. The relay center is located on the lower instrument panel reinforcement, under the instrument panel and just inboard of the steering column (Fig. 1). For circuit descriptions and diagrams, refer to 8W-61 - Power Door Locks in Group 8W - Wiring Diagrams.

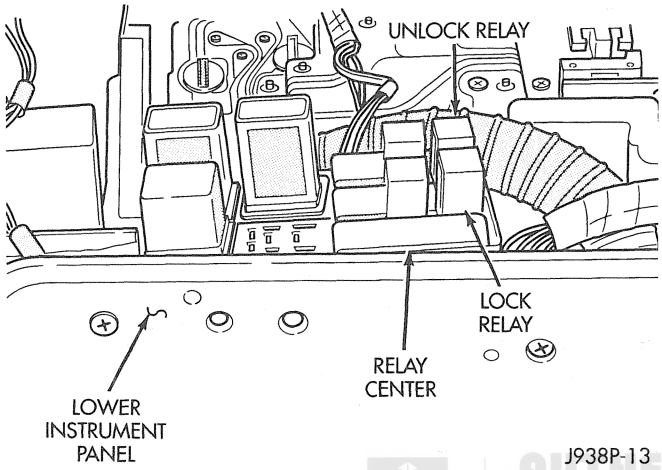


Fig. 1 Power Lock/Unlock Relays

RELAY TEST

Remove the power lock and/or unlock relays from the relay center to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

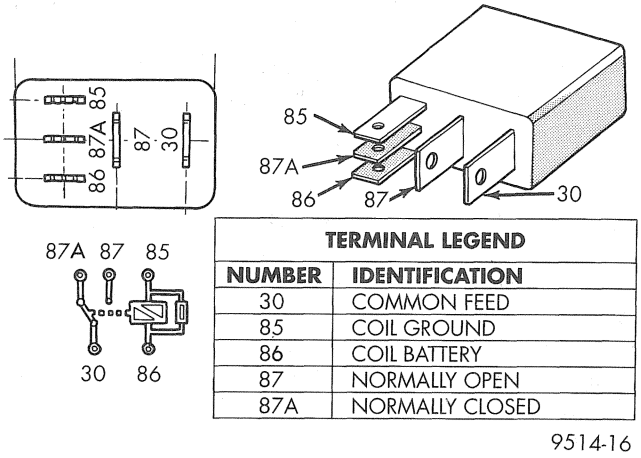
(2) Resistance between terminals 85 and 86 (electromagnet) should be 75±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the appropriate Relay Circuit Test in this group. If not OK, replace the faulty relay.

LOCK RELAY CIRCUIT TEST

(1) The lock relay common feed terminal (30) is connected to the door lock relay output circuit cavity in the relay center. With both the lock and unlock relays removed from the relay center, check for continuity between the door lock output circuit cavity of the relay center and a good ground. There should be no continuity. If OK, go to Step 2. If not OK, see the diagnosis for Power Lock Motor.

(2) The lock relay normally closed terminal (87A) is connected to the lock relay common feed terminal (30) in the de-energized position. The relay center cavity for the lock relay terminal 87A is connected to the ground circuit. Check this cavity for continuity to a good ground. If OK, go to Step 3. If not OK, repair the circuit to ground as required.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Power Lock/Unlock Relay

(3) The lock relay normally open terminal (87) is connected to the lock relay common feed terminal (30) in the energized position. The relay center cavity for the lock relay terminal 87 is connected to the fused B(+) circuit. There should be battery voltage at this cavity at all times. If OK, go to Step 4. If not OK, repair the open circuit to the fuseblock module as required.

(4) The lock relay coil ground terminal (85) is connected to one side of the electromagnet in the lock relay. The relay center cavity for lock relay terminal 85 is connected to the ground circuit. Check this cavity for continuity to ground. If OK, go to Step 5. If not OK, repair the circuit to ground as required.

(5) The lock relay coil battery terminal (86) is connected to the other side of the electromagnet in the lock relay. The relay center cavity for lock relay terminal 86 is connected to the door lock switch output (lock) circuit. This circuit is activated by a power lock switch or the remote keyless entry module. Check for battery voltage at the relay center cavity for lock relay terminal 86 while actuating the Lock function of a power door lock switch or the remote keyless entry transmitter. If not OK, repair the open circuit to the door lock switch and/or remote keyless entry module as required.

UNLOCK RELAY CIRCUIT TEST

(1) The unlock relay common feed terminal (30) is connected to the door unlock relay output circuit cavity in the relay center. With both the lock and unlock relays removed from the relay center, check for continuity between the door unlock output circuit cavity of the relay center and a good ground. There should be no continuity. If OK, go to Step 2. If not OK, see the diagnosis for Power Lock Motor.

DIAGNOSIS AND TESTING (Continued)

(2) The unlock relay normally closed terminal (87A) is connected to the unlock relay common feed terminal (30) in the de-energized position. The relay center cavity for the unlock relay terminal 87A is connected to the ground circuit. Check this cavity for continuity to a good ground. If OK, go to Step 3. If not OK, repair the circuit to ground as required.

(3) The unlock relay normally open terminal (87) is connected to the unlock relay common feed terminal (30) in the energized position. The relay center cavity for the unlock relay terminal 87 is connected to the fused B(+) circuit. There should be battery voltage at this cavity at all times. If OK, go to Step 4. If not OK, repair the open circuit to the fuseblock module as required.

(4) The unlock relay coil ground terminal (85) is connected to one side of the electromagnet in the relay. The relay center cavity for the unlock relay terminal 85 is connected to the ground circuit. Check this cavity for continuity to ground. If OK, go to Step 5. If not OK, repair the circuit to ground as required.

(5) The unlock relay coil battery terminal (86) is connected to the other side of the electromagnet in the relay. The relay center cavity for the unlock relay terminal 86 is connected to the door lock switch output (unlock) circuit. This circuit is activated by a power lock switch or the remote keyless entry module. Check for battery voltage at the relay center cavity for relay terminal 86 while actuating the Unlock function of a power door lock switch or the remote keyless entry transmitter. If not OK, repair the open circuit to the door lock switch and/or remote keyless entry module as required.

POWER LOCK MOTOR

For circuit descriptions and diagrams, refer to 8W-61 - Power Door Locks in Group 8W - Wiring Diagrams.

(1) If only one lock motor is inoperative, go to Step 2. If all lock motors are inoperative, the problem may be caused by one shorted motor. Disconnecting a shorted motor will allow the good motors to operate. Disconnect each motor connector, one at a time, and re-check both the lock and unlock functions by operating the door lock switch. If disconnecting one motor causes the other motors to become functional, go to Step 2 to test the disconnected motor.

(2) Once it is determined which lock motor is inoperative, that motor can be tested as follows. Disconnect the wire connector at the inoperative motor. Apply 12 volts to the motor terminals to check its operation in one direction. Reverse the polarity to check the operation in the other direction. If OK, repair the circuits to the power lock/unlock relays as required. If not OK, replace the faulty motor.

REMOTE KEYLESS ENTRY TRANSMITTER

(1) Depress either transmitter button and note whether the red Light-Emitting Diode (LED) on the transmitter case lights. If OK, go to Step 2. If not OK, replace the transmitter batteries as described in this group. Test the transmitter operation. If OK, discard the faulty batteries. If not OK, go to Step 2.

(2) Perform the transmitter program procedure, as described in this group, with the suspect transmitter and another known good transmitter.

(3) Test the remote keyless entry system operation with both transmitters. If both transmitters fail to operate the power locks, see the diagnosis for Remote Keyless Entry Module. If the known good transmitter operates the power locks and the suspect transmitter does not, replace the faulty transmitter.

NOTE: Be certain to perform the transmitter program procedure again when replacing faulty transmitter, and to erase the access code of the test transmitter from the remote keyless entry module.

REMOTE KEYLESS ENTRY MODULE

For circuit descriptions and diagrams, refer to 8W-61 - Power Door Locks in Group 8W - Wiring Diagrams.

(1) Check the fuse in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Check for battery voltage at the fuse in the fuseblock module. If OK, go to Step 3. If not OK, repair the open circuit from the power distribution center as required.

(3) Access the remote keyless entry module connector as described in this group.

(4) Unplug the module connector from the module. Check the connector and the receptacle in the module for loose, corroded, or damaged terminals and pins. If OK, go to Step 5. If not OK, repair the connections as required.

(5) Check for battery voltage at the fused B(+) circuit cavity of the module connector. If OK, go to Step 6. If not OK, repair the open circuit to the fuseblock module as required.

(6) Install a jumper wire between the fused B(+) circuit and the door lock switch output (lock) circuit cavities of the module connector. The doors should lock. If OK, go to Step 8. If not OK, go to Step 7.

(7) Remove the jumper wire and check for continuity between the door lock switch output (lock) circuit cavities for the module connector and the lock relay in the relay center. There should be continuity. If OK, go to Step 8. If not OK, repair the open circuit as required.

(8) Install a jumper wire between the fused B(+) circuit and the door lock switch output (unlock) circuit cavities of the module connector. The doors

DIAGNOSIS AND TESTING (Continued)

should unlock. If OK, go to Step 10. If not OK, go to Step 9.

(9) Remove the jumper wire and check for continuity between the door lock switch output (unlock) circuit cavities for the module connector and the unlock relay in the relay center. There should be continuity. If OK, go to Step 10. If not OK, repair the open circuit as required.

(10) Check for continuity between the ground circuit cavity of the module connector and a good ground. There should be continuity. If OK, go to Step 11. If not OK, repair the ground circuit as required.

(11) With the ignition switch in the On position, check for battery voltage at the fused ignition switch output circuit cavity of the module connector. If OK, go to Step 12. If not OK, repair the open circuit to the fuseblock module as required.

(12) Turn the ignition switch to the Off position. Install the module connector. Back-probe the courtesy lamp switch driver circuit cavity of the module connector. Check for battery voltage as the remote keyless entry transmitter Unlock button is depressed. If not OK, replace the faulty module.

SERVICE PROCEDURES

REMOTE KEYLESS ENTRY TRANSMITTER BATTERY REPLACEMENT

To replace the remote keyless entry system transmitter batteries, separate transmitter case halves by prying gently with a trim stick, or other suitable wide flat-bladed tool, at the center seam (Fig. 2). The case snaps open and shut. Replace the batteries with new CR1616 3-volt batteries, or their equivalent (Fig. 3).

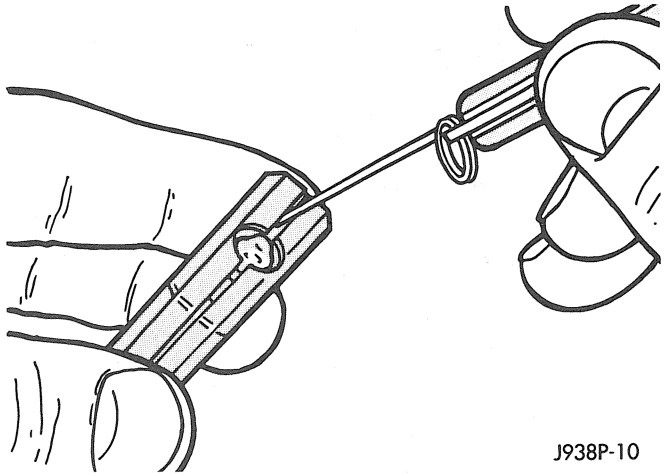


Fig. 2 Separate Transmitter Halves

KEYLESS ENTRY TRANSMITTER PROGRAMMING

(1) Open the driver's door of the vehicle, and leave it open throughout the programming procedure.

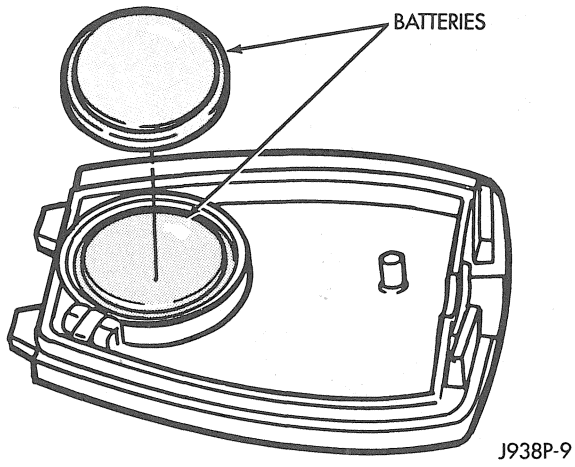


Fig. 3 Batteries Remove/Install

(2) Move the mechanical door lock lever to the Lock position.

(3) Turn the ignition switch to the On position.

(4) Within 20 seconds of turning the ignition switch on, aim a transmitter at the remote keyless entry module receiver dome and depress the Lock button for at least five seconds. Once the module accepts the programming code, the driver's door will unlock as feedback.

(5) After the first transmitter has been programmed, additional transmitters (no more than four total) may be programmed into the module. Within 20 seconds of the first transmitter programming, move the mechanical door lock lever to the Lock position. Aim another transmitter at the receiver dome and depress the Lock button for at least five seconds. The driver's door will unlock again, to indicate programming code acceptance.

(6) Repeat Step 5 for each additional transmitter.

(7) To lock the programmed codes into the module, the ignition switch must be turned to the Off position, and back to the On position within 20 seconds after programming the last transmitter's code. At that time, all previous codes are erased from the module.

REMOVAL AND INSTALLATION

POWER LOCK SWITCH

(1) Disconnect the battery negative cable.

(2) Remove the inside remote door latch release assembly and control panel retaining screws (Fig. 4).

(3) Disconnect the latch control linkage and the control panel wire harness retainer clip and connector.

(4) Remove the latch release and control panel assembly.

(5) The switch is retained to the control panel with clips (Fig. 5). Push in on the retainer part of the clip and pry the clips.

REMOVAL AND INSTALLATION (Continued)

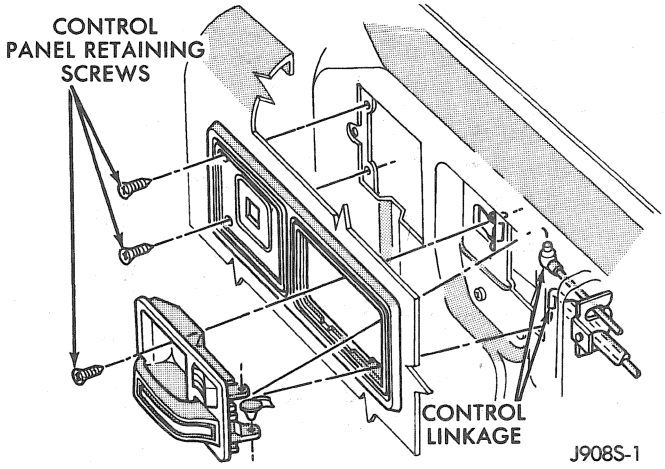


Fig. 4 Power Window/Lock Control Panel Remove/ Install

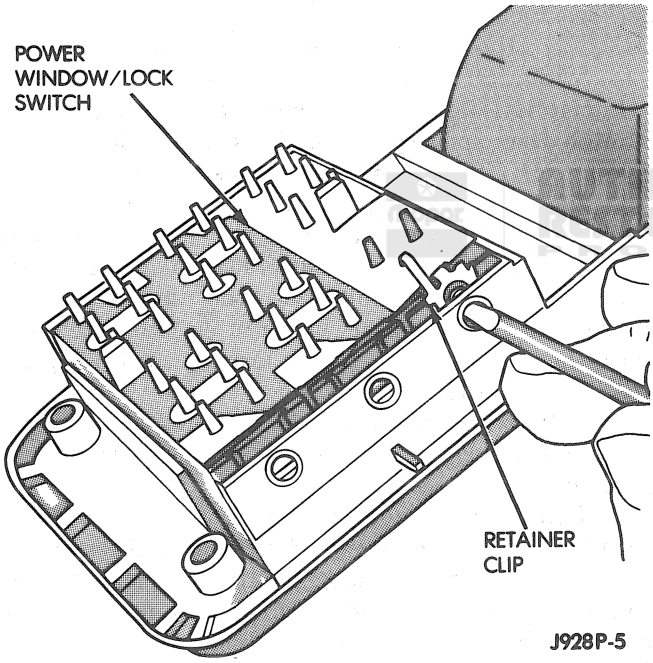


Fig. 5 Power Lock Switch Remove/Install

(6) To install the switch, position the switch on the control panel and press in on the retainer clips until they snap into position. Reverse the remaining removal procedures to complete the installation.

POWER LOCK/UNLOCK RELAYS

The power lock/unlock relays are located in the relay center. The relay center is located on the lower instrument panel reinforcement, under the instrument panel and just inboard of the steering column (Fig. 6).

(1) Disconnect the battery negative cable.

(2) Remove the lock and/or unlock relay from the relay center by pulling the relay straight out from the relay center.

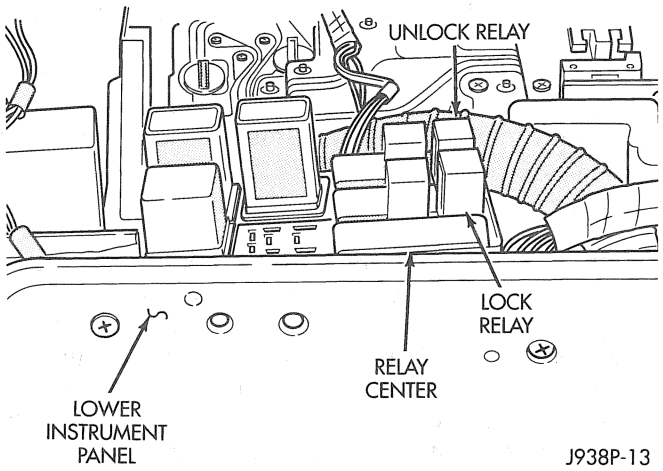


Fig. 6 Power Lock/Unlock Relays

(3) To install the relay, align the relay terminals with the cavities in the relay center and push the relay firmly into place.

(4) Connect the battery negative cable.

(5) Test the relay operation.

POWER LOCK MOTOR

DOORS

(1) Disconnect the battery negative cable.

(2) Remove the remote inside door latch release assembly and control panel as described under Power Lock Switch in this group.

(3) Remove the armrest lower retaining screws.

(4) Swing the armrest downward to a vertical position. This is necessary to release the armrest from the upper retainer clip (Fig. 7).

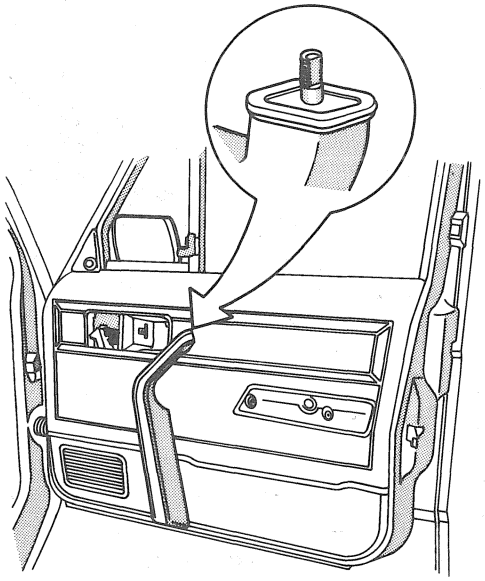


Fig. 7 Armrest Upper Retainer Clip

(5) Pull the armrest straight out from the door trim panel.

REMOVAL AND INSTALLATION (Continued)

(6) Remove the trim panel by prying with a wide flat-bladed tool around the perimeter of the door (Fig. 8). **To ease the removal of the trim panel, start at the bottom of the panel.**

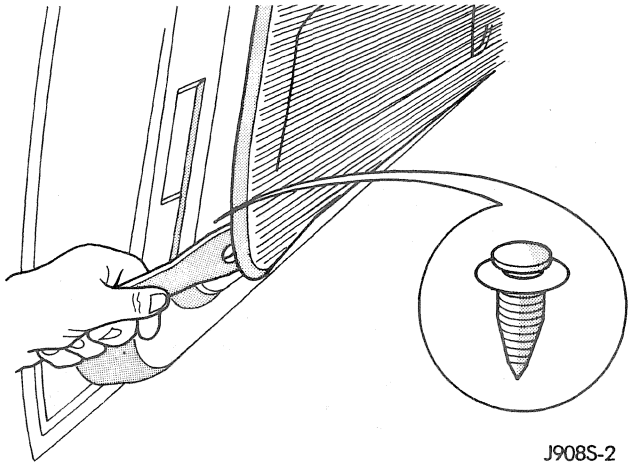


Fig. 8 Door Trim Panel Remove/Install

(7) Remove the plastic water shield from the inner door panel.

(8) Remove the door latch retaining screws (Fig. 9).

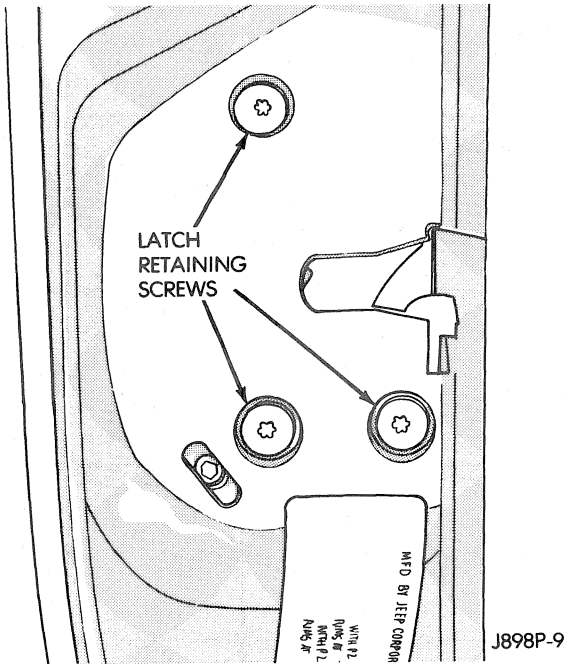


Fig. 9 Door Latch Remove/Install

(9) Grind off, or drill out, the lock motor rivets. Remove the lock motor with the door latch and remote control rods as an assembly (Fig. 10).

(10) Use new rivets, or nuts and screws, to install the motor. Tighten the latch screws to 9 N·m (7 ft. lbs.).

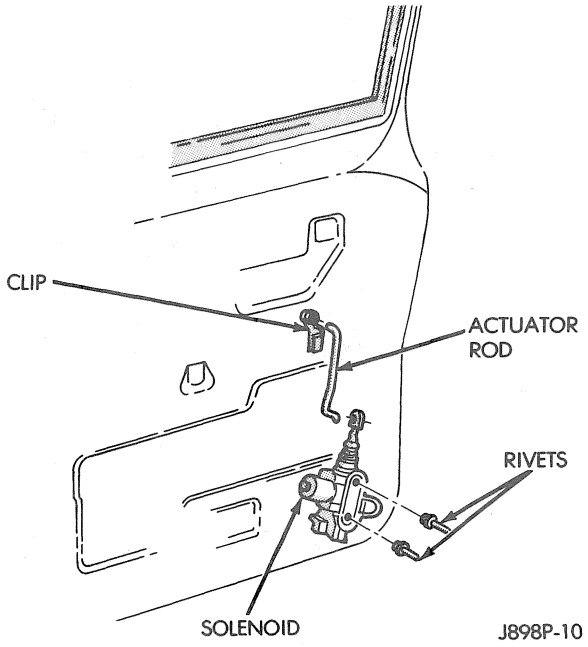


Fig. 10 Power Lock Motor Remove/Install

(11) Use an adhesive/sealant to re-install the water shield to the inner door panel.

(12) Reverse the remaining removal procedures to complete the installation.

LIFTGATE

(1) Disconnect the battery negative cable.

(2) Remove the two screws at the top outer edges of the liftgate trim panel.

(3) Remove the trim panel by prying with a wide flat-bladed tool around the perimeter of the liftgate (Fig. 11). **To ease the removal of the trim panel, start at the bottom of the liftgate.**

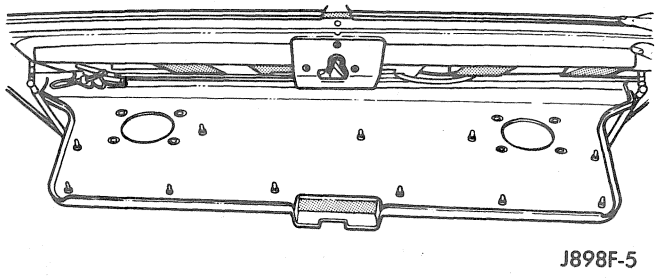


Fig. 11 Liftgate Trim Panel Remove/Install

(4) Disconnect the lock actuator linkage clip (Fig. 12).

(5) Remove the three latch retaining screws (Fig. 13).

(6) Remove the latch.

(7) Grind off, or drill out, the two rivets securing the lock motor. Remove the motor from the liftgate.

REMOVAL AND INSTALLATION (Continued)

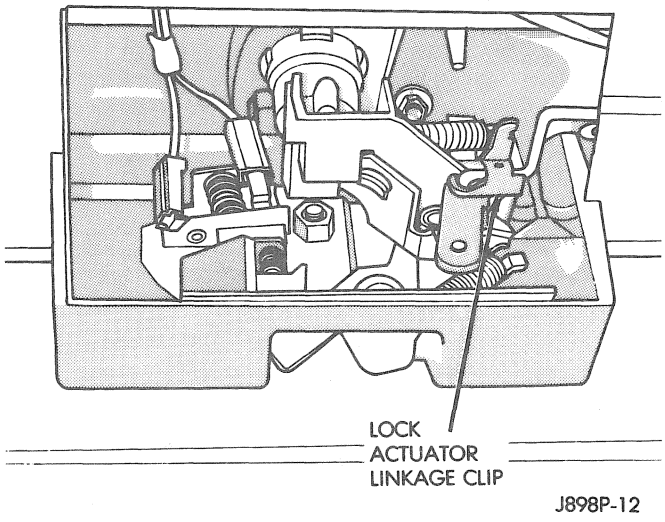


Fig. 12 Lock Actuator Linkage Clip

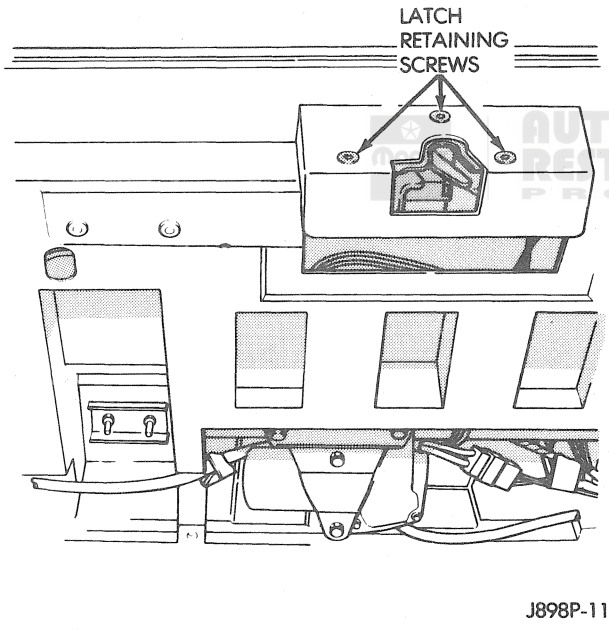


Fig. 13 Liftgate Latch Remove/Install

(8) Use new rivets, or nuts and screws, to install the motor. Tighten the latch screws to 9 N·m (7 ft. lbs.).

(9) Reverse the remaining removal procedures to complete the installation.

REMOTE KEYLESS ENTRY MODULE

WITHOUT OVERHEAD CONSOLE

(1) Disconnect the battery negative cable.

(2) Remove the two screws attaching the remote keyless entry module housing to the roof bow (Fig. 14).

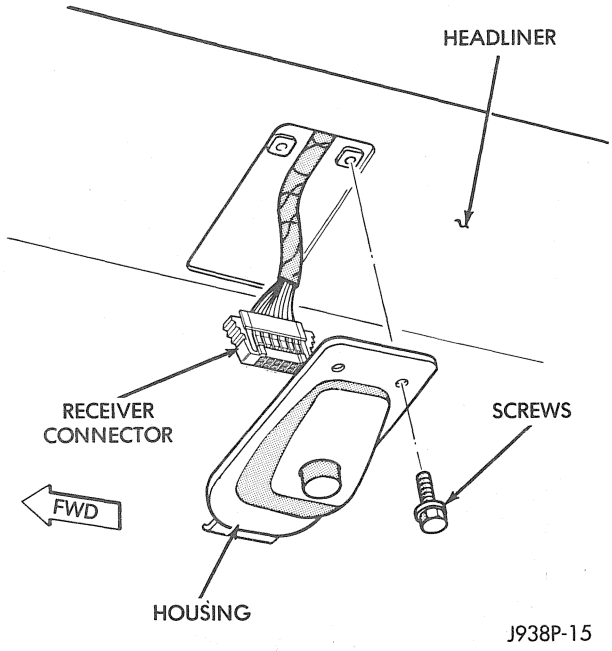


Fig. 14 Remote Keyless Entry Module Remove/Install

(3) Pull the module towards the rear of the vehicle to disengage the front mounting tab from the headliner.

(4) Disconnect the module wiring harness connector.

(5) Remove the remote keyless entry circuit board from the module housing.

(6) Reverse the removal procedures to install.

WITH OVERHEAD CONSOLE

(1) Disconnect the battery negative cable.

(2) Remove the mounting screw, forward of compass unit (Fig. 15).

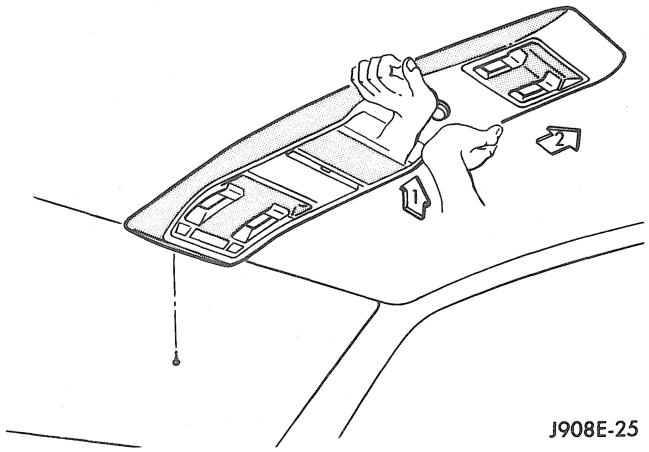


Fig. 15 Overhead Console Remove/Install

REMOVAL AND INSTALLATION (Continued)

(3) Flex the console housing outward, while pressing upward to disengage the housing from the rear mounting bracket. See Arrow 1 in (Fig. 15).

(4) Slide the console rearward, until the console detaches from the front mounting bracket. See Arrow 2 in (Fig. 15).

(5) See Arrow 1 (Fig. 16). While pressing up on the rear of the console, slide the console forward holding the front away from the headliner. See Arrow 2 in (Fig. 16). Move the console forward until the rear detaches from the headliner, and becomes free.

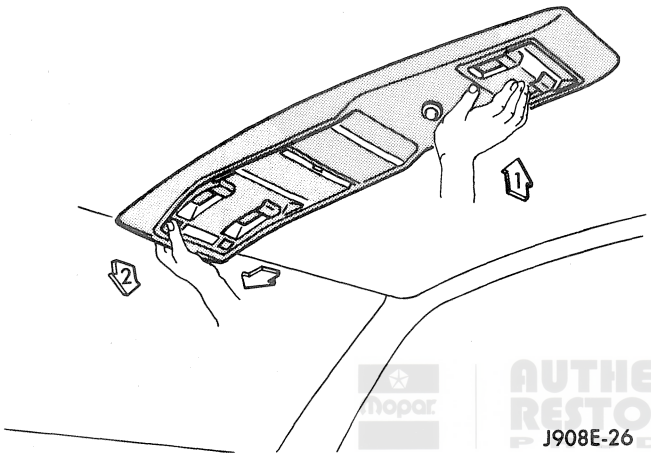


Fig. 16 Overhead Console Remove/Install

(6) Disconnect the wire harness connectors from the remote keyless entry and compass modules (Fig. 17) and (Fig. 18).

(7) Pinch the forward area of the receiver cover to release the retaining clips. Slide the end of the cover out from under the rib (Fig. 19).

(8) Remove the receiver mounting screw and remove the receiver.

(9) Reverse the removal procedures to install. Be sure to flex the console housing outward near the remote keyless entry module until the console snaps onto the rear mounting bracket.

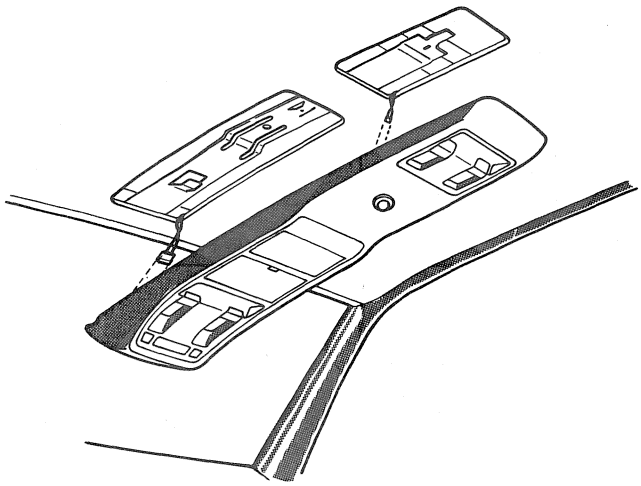


Fig. 17 Overhead Console Wire Harnesses

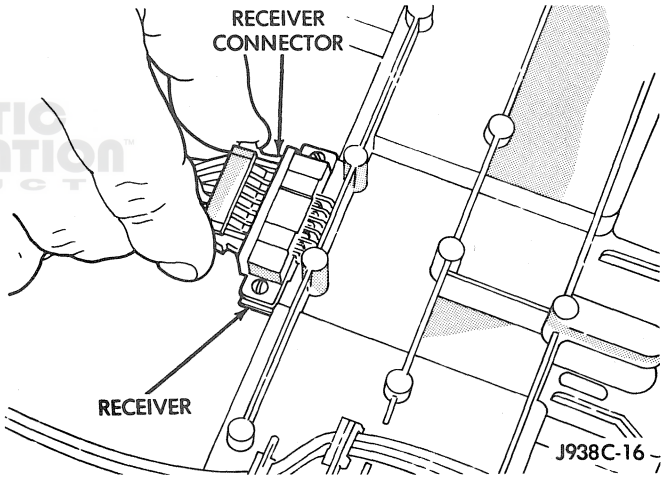


Fig. 18 Remote Keyless Entry Harness Connector

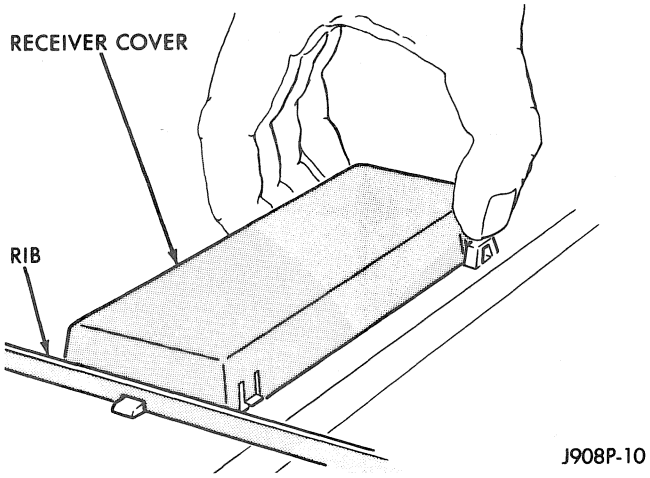


Fig. 19 Remote Keyless Entry Receiver Cover Remove/Install

POWER SEAT SYSTEMS

CONTENTS

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
CIRCUIT BREAKER 1
POWER SEAT ADJUSTER/MOTORS 1
POWER SEAT SWITCH 1
DIAGNOSIS AND TESTING
CIRCUIT BREAKER 2
POWER SEAT ADJUSTER/MOTORS 2
POWER SEAT SWITCH 2
POWER SEAT SYSTEM 1
REMOVAL AND INSTALLATION
POWER SEAT ADJUSTER/MOTORS 3
POWER SEAT SWITCH 3

GENERAL INFORMATION

INTRODUCTION

A six-way driver's side power seat is an available factory-installed option for this model. The power seat system receives battery feed through a fuse in the power distribution center and a circuit breaker in the fuseblock module at all times.

Following are general descriptions of the major components in the power seat system. Refer to 8W-63 - Power Seat in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

POWER SEAT SWITCH

The power seat can be adjusted in six different ways using the power seat switch. The switch is located on the lower outboard side of the seat cushion frame. Refer to the owner's manual for more information on power seat switch functions and seat adjusting procedures. The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

POWER SEAT ADJUSTER/MOTORS

There are three reversible motors that operate the power seat adjuster. The motors are connected to worm-drive gearboxes that move the seat adjuster through a combination of drive cables and screw-type drive units.

The front and rear of a seat are operated by different motors. They can be raised or lowered independently of each other. When the center seat switch is pushed to the Up or Down position, both the front and rear motors operate in unison, moving the entire seat up or down. The forward-rearward motor is operated by pushing the center seat switch to the Forward or Rearward position.

When a switch is actuated, battery feed and a ground path are applied through the switch contacts to the motor(s). The motor(s) operate to move the seat in the selected direction until the switch is released, or until the travel limit of the power seat adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor(s) are reversed through the switch contacts. This causes the motor to run in the opposite direction.

Each motor contains a self-resetting circuit breaker to protect it from overload. Consecutive or frequent resetting of the circuit breakers must not be allowed to continue, or the motors may be damaged. Make the necessary repairs.

The power seat adjuster and motors cannot be repaired, and are serviced only as a complete unit. If any component in this unit should fail, the entire assembly must be replaced.

CIRCUIT BREAKER

An automatic resetting circuit breaker in the fuseblock module is used to protect the power seat system circuit. The circuit breaker can protect the system from a short circuit, or from an overload condition caused by an obstructed or stuck seat adjuster. The circuit breaker cannot be repaired. If faulty, it must be replaced.

DIAGNOSIS AND TESTING

POWER SEAT SYSTEM

For circuit descriptions and diagrams, refer to 8W-63 - Power Seat in Group 8W - Wiring Diagrams.

Before any testing is attempted, the battery should be fully-charged and all connections and pins cleaned

DIAGNOSIS AND TESTING (Continued)

SWITCH POSITION	CONTINUITY BETWEEN
OFF	B-N, B-J, B-M, B-E, B-L, B-K
VERTICAL UP	A-E, A-M, B-N, B-J
VERTICAL DOWN	A-J, A-N, B-M, B-E
HORIZONTAL FORWARD	A-L, B-K
HORIZONTAL AFT	A-K, B-L
FRONT TILT UP	A-M, B-N
FRONT TILT DOWN	A-N, B-M
REAR TILT UP	A-E, B-J
REAR TILT DOWN	A-J, B-E

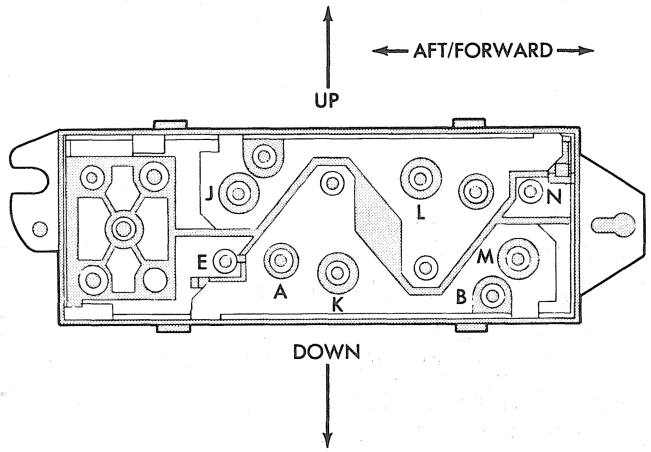


Fig. 1 Power Seat Switch Continuity

and tightened to ensure proper continuity and grounds.

With the dome lamp on, apply the switch in the direction of the failure. If the dome lamp dims, the seat may be jamming. Check under the seat for binding or obstructions. If the dome lamp does not dim, proceed with the following component tests.

CIRCUIT BREAKER

For circuit descriptions and diagrams, refer to 8W-63 - Power Seat in Group 8W - Wiring Diagrams.

(1) Locate the correct circuit breaker in the fuseblock module. Pull out the circuit breaker slightly, but be sure that the terminals still contact the terminals in the fuseblock module.

(2) Connect the negative lead of a 12-volt DC voltmeter to a good ground.

(3) With the voltmeter positive lead, check both terminals of the circuit breaker for battery voltage.

If only one terminal has battery voltage, the circuit breaker is faulty and must be replaced. If neither terminal has battery voltage, repair the open circuit from the power distribution center as required.

POWER SEAT ADJUSTER/MOTORS

For circuit descriptions and diagrams, refer to 8W-63 - Power Seat in Group 8W - Wiring Diagrams.

Operate the power seat switch to move all three seat motors. The seat should move in all directions. If one or more of the motors operate, see the diagnosis for the Power Seat Switch in this group. If no motors operate, proceed as follows:

(1) Check the circuit breaker in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty circuit breaker.

(2) Remove the switch as described in this group, and check for battery voltage at the fused B(+) circuit cavity of the switch connector. If OK, go to Step 3. If not OK, repair the open circuit to the fuseblock module as required.

(3) Check for continuity between the ground circuit cavity of the switch connector and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open circuit to ground as required.

(4) Test the power seat switch as described in this group. If the switch tests OK, replace the faulty power seat adjuster/motors assembly.

POWER SEAT SWITCH

For circuit descriptions and diagrams, refer to 8W-63 - Power Seat in Group 8W - Wiring Diagrams. To check the power seat switch:

(1) Remove the power seat switch as described in this group.

(2) Use an ohmmeter to test the continuity of the switches in each position. See the Power Seat Switch Continuity chart (Fig. 1). If OK, see the Power Seat Adjuster/Motors diagnosis. If not OK, replace the faulty switch module.

REMOVAL AND INSTALLATION

POWER SEAT SWITCH

(1) Disconnect the battery negative cable.

(2) Reach under the seat and release the switch and bezel retainer snap clips, while pulling gently outward on switch and bezel assembly (Fig. 2).

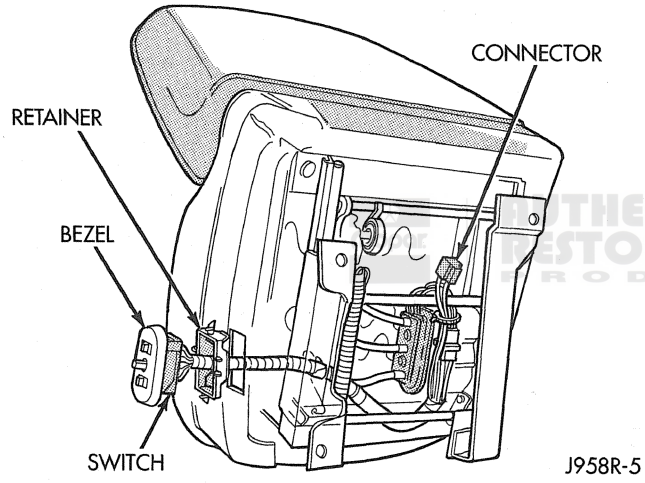


Fig. 2 Power Seat Switch Remove/Install

(3) Pull the switch, bezel, and retainer out from the seat frame far enough to access the multiple terminal block. Carefully release the retainer locking tabs and separate the switch retainer and the switch bezel from the switch body.

(4) Carefully release the locking tabs securing the multiple terminal block to the switch and remove the switch.

(5) Reverse the removal procedures to install.

POWER SEAT ADJUSTER/MOTORS

(1) Disconnect the battery negative cable.

(2) Remove the four bolts securing the seat adjuster to the floor panel (Fig. 3).

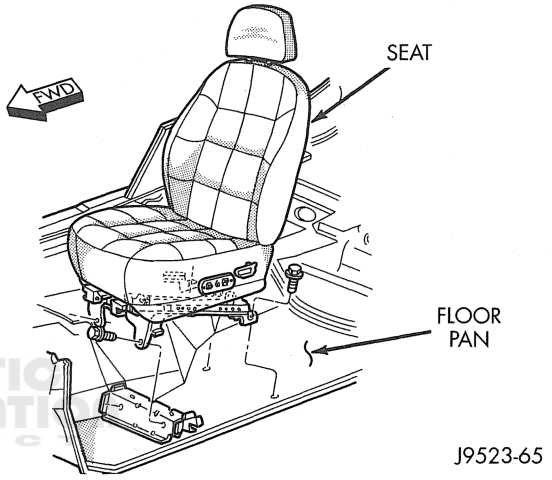


Fig. 3 Power Seat Adjuster Remove/Install

(3) Disconnect the power seat feed wiring connector from the body wiring harness connector.

(4) Remove the four bolts securing the power seat adjuster/motor assembly to the seat cushion frame.

(5) Disconnect the wiring from the power seat switch to the power seat motors and remove the power seat adjuster/motor assembly.

(6) Reverse the removal procedures to install. Tighten the seat mounting hardware to 34 N·m (25 ft. lbs.).

POWER WINDOW SYSTEMS

CONTENTS

	page
GENERAL INFORMATION	
INTRODUCTION	1
DESCRIPTION AND OPERATION	
CIRCUIT BREAKER	1
POWER WINDOW MOTOR	1
POWER WINDOW SWITCH	1
DIAGNOSIS AND TESTING	
CIRCUIT BREAKER	2
POWER WINDOW MOTOR	7
POWER WINDOW SWITCH	2
POWER WINDOW SYSTEM	1
REMOVAL AND INSTALLATION	
POWER WINDOW MOTOR	7
POWER WINDOW SWITCH	7

GENERAL INFORMATION

INTRODUCTION

Power windows are available as factory-installed optional equipment on these models. The power windows operate only with the ignition switch in the On position. This group covers diagnosis and service of only the electrical components in the power window system. For service of mechanical components, such as the regulator, lift plate or window tracks, refer to Group 23 - Body Components.

Following are general descriptions of the major components in the power window system. Refer to 8W-60 - Power Windows in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

POWER WINDOW SWITCH

Both the front and the rear door (four-door models) windows can be raised or lowered electrically by operating the two-way switches on the driver's door trim panel. A single two-way switch on each passenger's door trim panel operates only the window on that passenger's door. The power window switches cannot be repaired and, if faulty, must be replaced.

POWER WINDOW MOTOR

A permanent magnet reversible motor moves the window regulator through a cable and drum operating mechanism. A positive and negative battery connection to the two motor terminals will cause the motor to rotate in one direction. Reversing current through these same two connections will cause the motor to rotate in the opposite direction. In addition, each power window motor is equipped with an integral self-resetting circuit breaker to protect the motor from overloads. The power window motor and regulator assembly cannot be repaired. If faulty, the entire motor assembly must be replaced.

CIRCUIT BREAKER

An automatic resetting circuit breaker in the fuseblock module is used to protect the power window system circuit. The circuit breaker can protect the system from a short circuit, or from an overload condition caused by an obstructed or stuck window glass or regulator. The circuit breaker cannot be repaired. If faulty, it must be replaced.

DIAGNOSIS AND TESTING

POWER WINDOW SYSTEM

For circuit descriptions and diagrams, refer to 8W-60 - Power Windows in Group 8W - Wiring Diagrams.

ALL WINDOWS INOPERATIVE

(1) Check the circuit breaker in the fuseblock module, as described in this group. If OK, go to Step 2. If not OK, replace the faulty circuit breaker.

(2) Remove the driver's door power window switch. Check for continuity between the ground circuit cavity of the switch connector and a good ground. If OK, go to Step 3. If not OK, repair the circuit to ground as required.

(3) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavity of the switch connector. If OK, see the diagnosis for Power Window Switch in this group. If not OK, repair the open circuit to the fuseblock module as required.

ONE WINDOW INOPERATIVE

The window glass must be free to slide up and down for the power window motor to function prop-

DIAGNOSIS AND TESTING (Continued)

erly. If the glass is not free to move up and down, the motor will overload and trip the circuit breaker. To determine if the glass is free, disconnect the regulator plate from the glass. Then slide the window up and down by hand.

There is an alternate method to check if the glass is free. Position the glass between the up and down stops. Then, shake the glass in the door. Check that the glass can be moved slightly from side to side, front to rear, and up and down. Then check that the glass is not bound tight in the tracks. If the glass is free, proceed with the diagnosis that follows. If the glass is not free, refer to Group 23 - Body Components for window glass service and adjustment procedures.

(1) Check the switch continuity as described in the Power Window Switch diagnosis. If OK and the driver's door window is inoperative, see the diagnosis for the Power Window Motor. If OK and the inoperative window is other than the driver's door, go to Step 2. If not OK, replace the faulty switch.

(2) With the ignition switch in the On position, check for battery voltage at the fused ignition switch output circuit cavity of the switch connector. If OK, go to Step 3. If not OK, repair the open circuit to the fuseblock module as required.

(3) Refer to the circuit diagram on 8W-60 - Power Windows in Group 8W - Wiring Diagrams. Check the continuity in each circuit between the inoperative power window switch connector cavities and the corresponding driver's door power window switch connector cavities. If OK, see the diagnosis for the Power Window Motor. If not OK, repair the open circuit(s) as required.

NOTE: All individual power window switches receive their battery and ground feeds through the driver's door power window master switch and connector.

CIRCUIT BREAKER

For circuit descriptions and diagrams, refer to 8W-60 - Power Windows in Group 8W - Wiring Diagrams.

(1) Locate the correct circuit breaker in the fuseblock module. Pull out the circuit breaker slightly, but be sure that the terminals still contact the terminals in the fuseblock module.

(2) Connect the negative lead of a 12-volt DC voltmeter to a good ground.

(3) With the voltmeter positive lead, check both terminals of the circuit breaker for battery voltage.

If only one terminal has battery voltage, the circuit breaker is faulty and must be replaced. If neither terminal has battery voltage, repair the open circuit from the power distribution center as required.

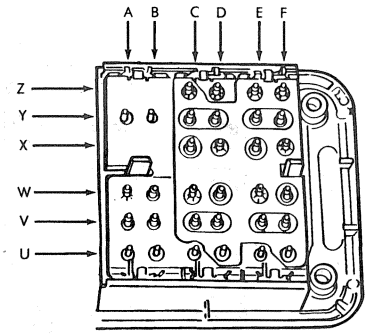
POWER WINDOW SWITCH

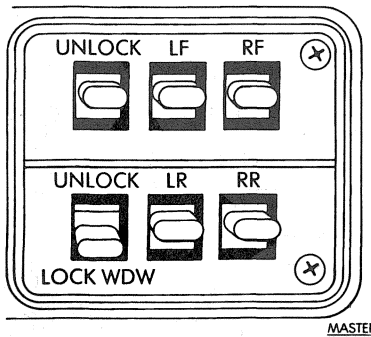
For circuit descriptions and diagrams, refer to 8W-60 - Power Windows in Group 8W - Wiring diagrams. Before you proceed with this diagnosis, confirm proper circuit breaker operation. See the Circuit Breaker diagnosis in this group.

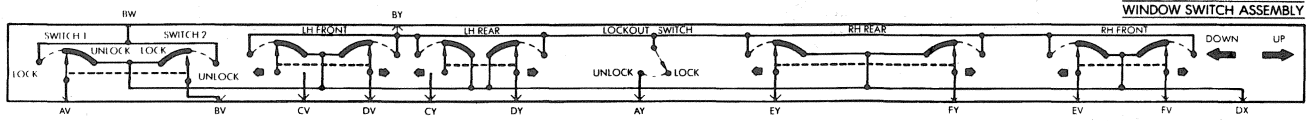
(1) Remove the switch from the door trim panel as described in this group. Carefully separate the multiple terminal block on the wiring harness from the switch body.

(2) Check the switch continuity in each position, as shown in the Switch Continuity charts. If OK, see the diagnosis for Power Window Motor in this group. If not OK, replace the faulty switch.

DIAGNOSIS AND TESTING (Continued)







SWITCH TEST
Switch Grounds

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	DX and: AV, BV, CV, DV, CY, DY, EY, FY, EV, FV	Yes
	BW and DX	No
	BY and DX	No

SWITCH TEST
LH Front

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BY and DV	Yes
Down	BY and CV	Yes

SWITCH TEST
LH Rear

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BY and DY	Yes
Down	BY and CY	Yes

SWITCH TEST
Lockout Switch

SWITCH POSITION	TERMINALS	ZERO OHMS
Up (Unlock)	AY and BY	Yes
Down (Lock)	AY and BY	No

SWITCH TEST
RH Rear

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BY and FY	Yes
Down	BY and EY	Yes

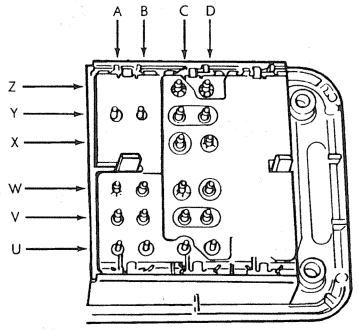
SWITCH TEST
RH Front

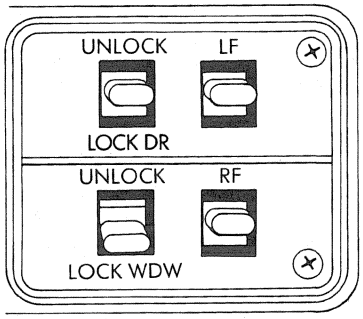
SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BY and FV	Yes
Down	BY and EV	Yes

J928S-3

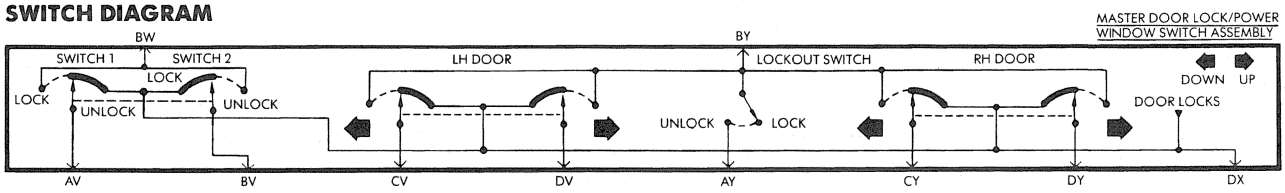
Driver's Door Power Window Switch Continuity - 4-Door

DIAGNOSIS AND TESTING (Continued)





SWITCH DIAGRAM



SWITCH TEST
Switch Grounds

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	DX and: AV, BV, CV DV, CY, DY	Yes
	BW and DX	No
	BY and DX	No

SWITCH TEST
LH Door

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BY and DV	Yes
Down	BY and CV	Yes

SWITCH TEST
RH Door

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BY and DY	Yes
Down	BY and CY	Yes

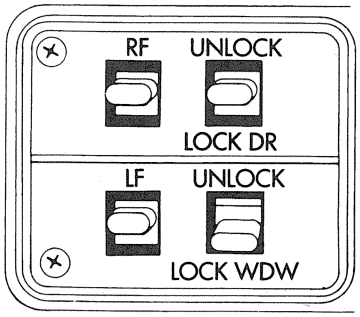
SWITCH TEST
Lockout Switch

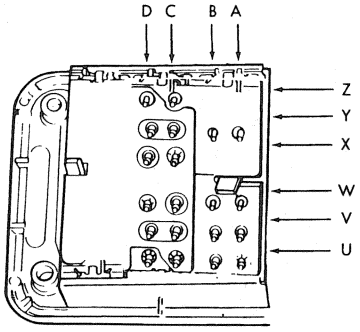
SWITCH POSITION	TERMINALS	ZERO OHMS
Up (Unlock)	AY and BY	Yes
Down (Lock)	AY and BY	No

J938S-9

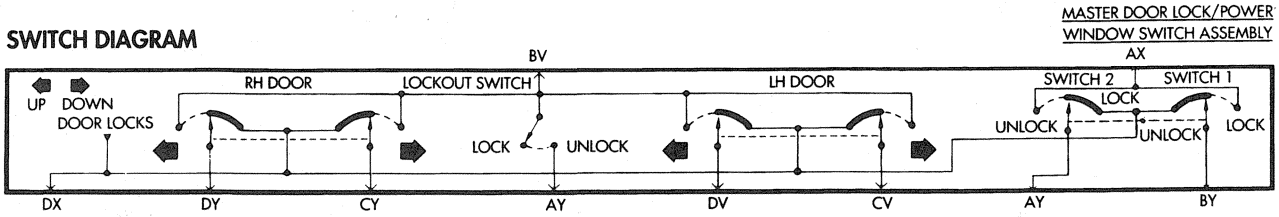
Driver's Door Power Window Switch Continuity - 2-Door (LHD)

DIAGNOSIS AND TESTING (Continued)





SWITCH DIAGRAM



SWITCH TEST
Switch Grounds

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	DX and: BY, AY, CV DV, CY, DY	Yes
	AX and DX	No
	BV and DX	No

SWITCH TEST
LH Door

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BV and DV	Yes
Down	BV and CV	Yes

SWITCH TEST
RH Door

SWITCH POSITION	TERMINALS	ZERO OHMS
Up	BV and DY	Yes
Down	BV and CY	Yes

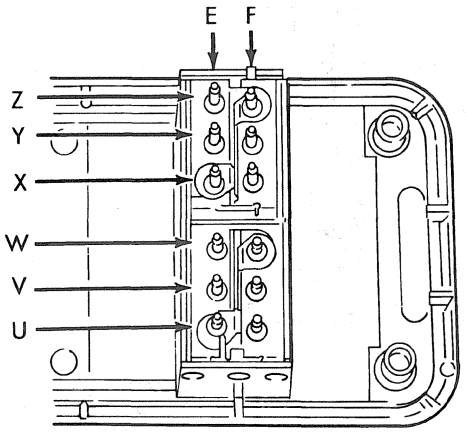
SWITCH TEST
Lockout Switch

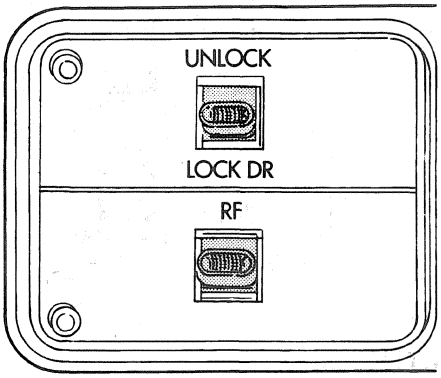
SWITCH POSITION	TERMINALS	ZERO OHMS
Up (Unlock)	AV and BV	Yes
Down (Lock)	AV and BV	No

J948S-11

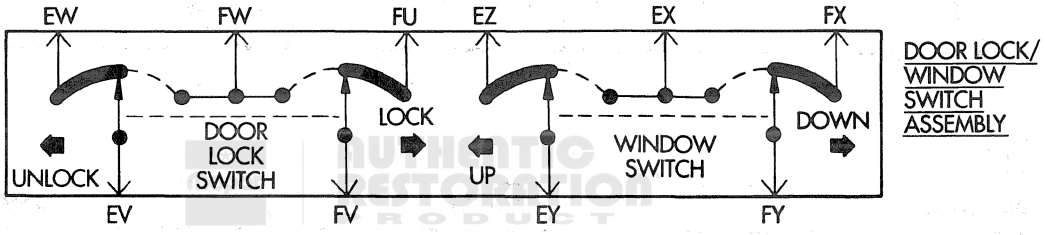
Driver's Door Power Window Switch Continuity - 2-Door (RHD)

DIAGNOSIS AND TESTING (Continued)





SWITCH DIAGRAM



SWITCH TEST
Window Switch

SWITCH POSITION	TERMINALS	ZERO OHMS
Off (Normal)	EY and EZ	Yes
	FY and FX	Yes
	All Others	No
Up	EY and EZ	Yes
	EX and FY	Yes
	All Others	No
Down	EX and EY	Yes
	FX and FY	Yes
	All Others	No

J948S-13

Passenger's Door Power Window Switch Continuity

DIAGNOSIS AND TESTING (Continued)

POWER WINDOW MOTOR

For circuit descriptions and diagrams, refer to 8W-60 - Power Windows in Group 8W - Wiring Diagrams. Before you proceed with this diagnosis, confirm proper switch operation. See the Power Window Switch diagnosis in this group.

(1) Remove the door trim panel as described in this group.

(2) Disconnect the power window motor connector. Apply 12 volts across the motor terminals to check its operation in one direction. Reverse the connections across the motor terminals to check the operation in the other direction. Remember, if the window is in the full up or full down position, the motor will not operate in that direction by design. If OK, repair the circuits from the motor to the switch as required. If not OK, replace the faulty motor.

(3) If the motor operates in both directions, check the window's operation through its complete up and down travel. If not OK, refer to Group 23 - Body Components to check the window glass, tracks, and regulator for sticking, binding or improper adjustment.

REMOVAL AND INSTALLATION

POWER WINDOW SWITCH

(1) Disconnect the battery negative cable.

(2) Remove the inside remote door latch release assembly and control panel retaining screws (Fig. 1).

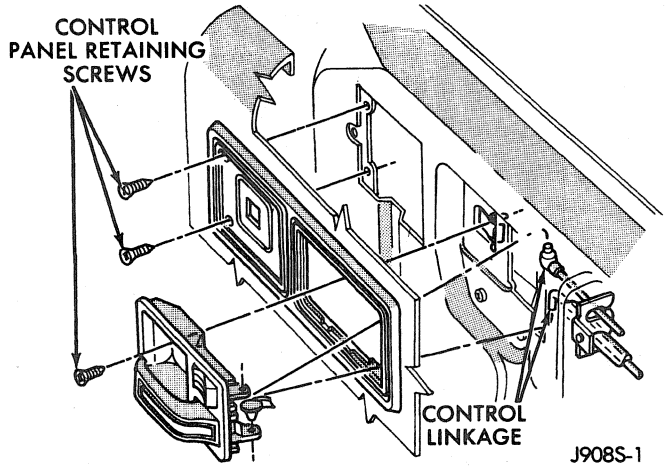


Fig. 1 Power Window/Lock Control Panel Remove/Install

(3) Disconnect the latch control linkage and the control panel wire harness retainer clip and connector.

(4) Remove the latch release and control panel assembly.

(5) The switch is retained to the control panel with clips (Fig. 2). Push in on the retainer part of the clip and pry the clips.

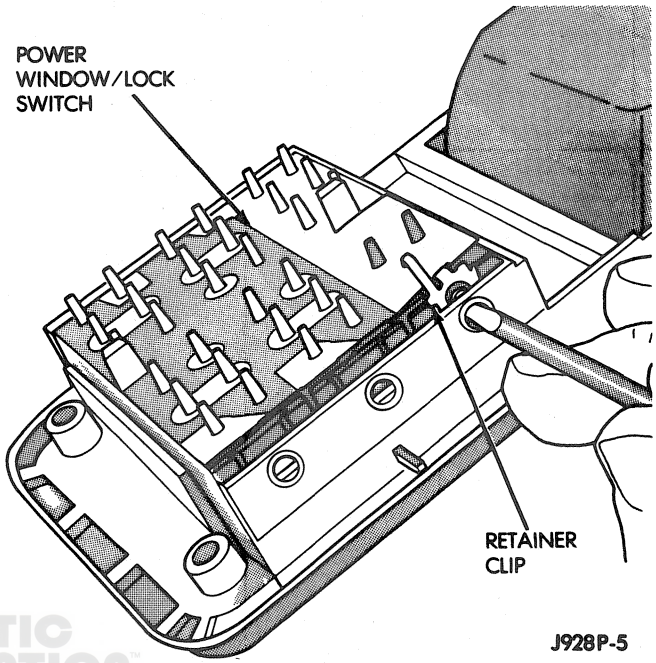


Fig. 2 Power Window Switch Remove/Install

(6) To install the switch, position the switch on the control panel and press in on the retainer clips until they snap into position. Reverse the remaining removal procedures to complete the installation.

POWER WINDOW MOTOR

(1) Disconnect the battery negative cable.

(2) Remove the remote inside door latch release assembly and control panel as described under Power Window Switch in this group.

(3) Remove the armrest lower retaining screws.

(4) Swing the armrest downward to a vertical position. This is necessary to release the armrest from the upper retainer clip (Fig. 3).

(5) Pull the armrest straight out from the door trim panel.

(6) Remove the trim panel by prying with a wide flat-bladed tool around the perimeter of the door (Fig. 4). **To ease the removal of the trim panel, start at the bottom of the panel.**

(7) Remove the plastic water shield from the inner door panel.

(8) Grind off, or drill out, the two rivets holding the reinforcement to the inner door panel (Fig. 5).

(9) Adjust the window regulator to allow access to the torx-head glass attaching screw (Fig. 6).

(10) Remove the two screws holding the bottom of the regulator to the door.

(11) Remove the torx-head glass attaching screw.

REMOVAL AND INSTALLATION (Continued)

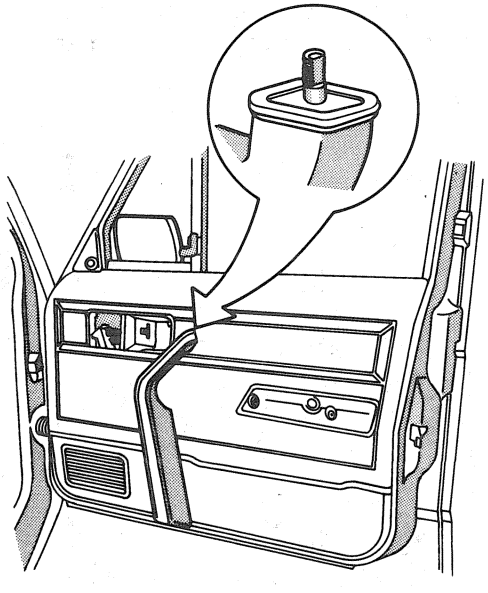


Fig. 3 Armrest Upper Retainer Clip

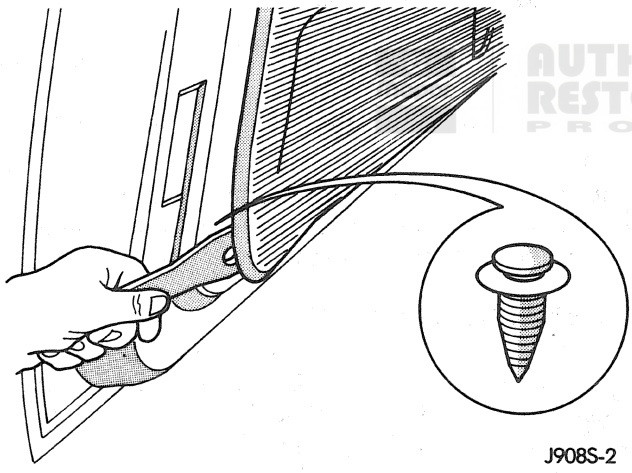


Fig. 4 Door Trim Panel Remove/Install

(12) Pull the glass to the full up position and tape the glass to the upper door glass frame.

(13) Disconnect the wire harness connector from the power window motor.

(14) Remove the remaining window regulator attaching screws.

(15) Remove the window regulator.

(16) To install, place the regulator inside the door.

(17) Attach the regulator to the door using screws and nuts, or the hardware kit supplied with a new regulator. Do not install the two screws that hold the bottom of the regulator, at this time.

(18) Connect the wire harness connector to the power window motor.

(19) Attach the door glass to the regulator with the torx-head screw. Tighten the door glass screw to 3.3 N·m (30 in. lbs.).

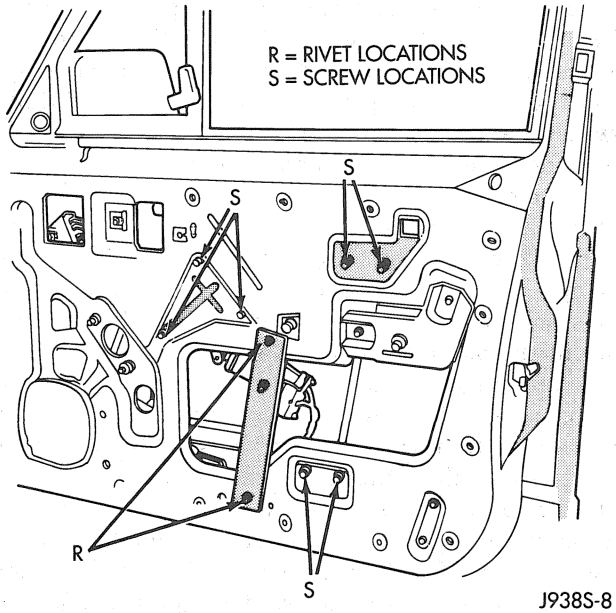


Fig. 5 Window Regulator Remove/Install

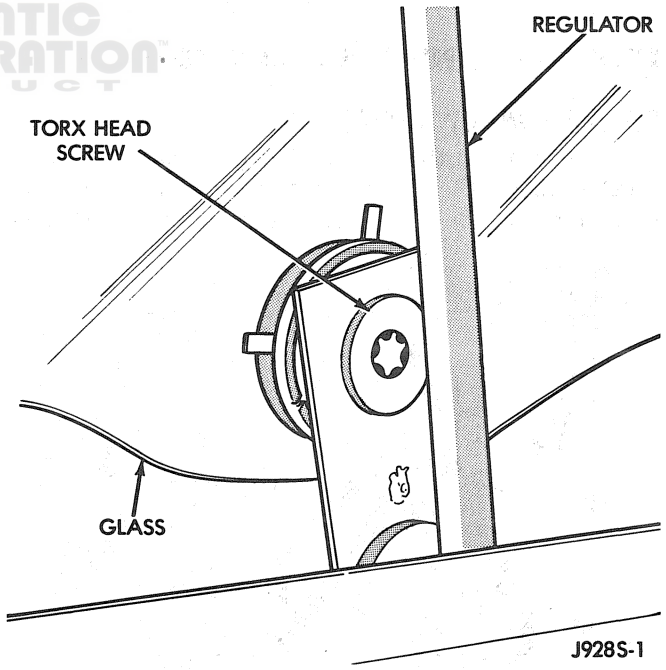


Fig. 6 Glass Attaching Screw Remove/Install

(20) Install the two screws that hold the bottom of the regulator.

(21) Use an adhesive/sealant to re-install the water shield to the inner door panel.

(22) Reverse the remaining removal procedures to complete the installation.

POWER MIRROR SYSTEMS

CONTENTS

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
POWER MIRROR SWITCH 1
POWER MIRROR 1

page

DIAGNOSIS AND TESTING
POWER MIRROR SYSTEM 1
REMOVAL AND INSTALLATION
POWER MIRROR SWITCH 4
POWER MIRROR 4

GENERAL INFORMATION

INTRODUCTION

Power outside rear view mirrors are an available factory-installed option on these models. Following are general descriptions of the major components in the power mirror system. Refer to 8W-62 - Power Mirrors in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

POWER MIRROR

The power mirrors are connected to battery feed at all times. Each mirror head contains two electric motors, two drive mechanisms and the mirror glass. One motor and drive controls mirror up-and-down movement, and the other controls right-and-left movement.

The mirror glass is the only serviced replacement part for the power mirror assembly. If any other component of the mirror unit is faulty or damaged, the entire assembly must be replaced.

POWER MIRROR SWITCH

Both the right and left power mirrors are controlled by a single multi-function switch located on the front of the center console storage compartment, directly below the armrest. A selector switch is moved right (right mirror control), left (left mirror control), or center to turn the power mirrors off. Then one of four directional control buttons is depressed to control movement of the selected mirror up, down, right, or left. The power mirror switch cannot be repaired and, if faulty, must be replaced as a complete unit.

DIAGNOSIS AND TESTING

POWER MIRROR SYSTEM

For circuit descriptions and diagrams, refer to 8W-62 - Power Mirrors in Group 8W - Wiring Diagrams.

(1) Check the fuses in the fuseblock module and the Power Distribution Center (PDC). If OK, go to Step 2. If not OK, replace the faulty fuse(s).

(2) Check for battery voltage at the fuse in the fuseblock module. If OK, go to Step 3. If not OK, repair the open circuit to the PDC as required.

(3) Remove the power mirror switch from the center console as described in this group.

(4) Disconnect the wiring harness connector from the switch. Check for battery voltage at the fused B(+) circuit cavity of the switch connector. If OK, go to Step 5. If not OK, repair the open circuit to the fuseblock module as required.

(5) Check for continuity between the ground circuit (black wire) cavity of the switch harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the circuit to ground as required.

(6) Check the switch continuity as shown in the Mirror Switch Continuity charts. If OK, go to Step 7. If not OK, replace the faulty switch.

(7) Use two jumper wires, and see the Power Mirror Switch illustration (Fig. 1). Connect one jumper wire between the mirror switch connector cavities for pin E and pin F. Now connect the other jumper wire from the mirror switch connector cavity for pin G to each of the following pin cavities: A, B, C, and then D. In each case, the selected mirror head should move. If OK, replace the faulty switch. If not OK, go to Step 8.

DIAGNOSIS AND TESTING (Continued)

SWITCH POSITION	TERMINALS	ZERO OHMS
Push Down (D)	A and G	Yes
	E and F	Yes
	All Others	No
Push Up (U)	A and F	Yes
	E and G	Yes
	All Others	No
Off (Normal)	All Others	No
Push Left (L)	B and G	Yes
	E and F	Yes
	All Others	No
Push Right (R)	B and F	Yes
	E and G	Yes
	All Others	No

J918T-1

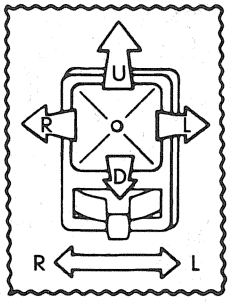
Power Mirror Switch Continuity (Left Position)

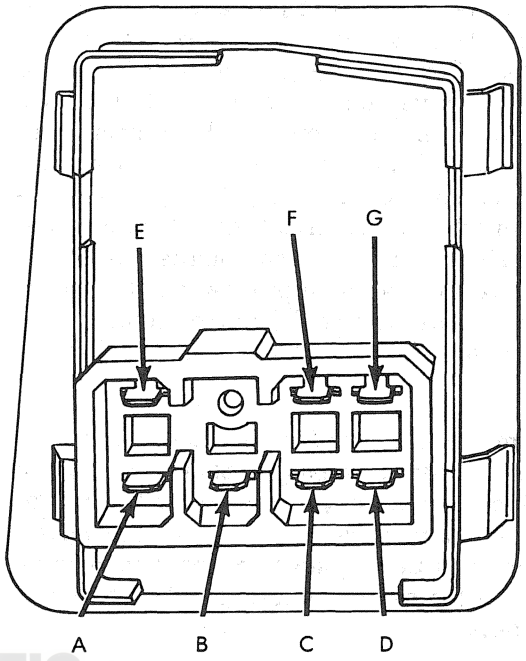
SWITCH POSITION	TERMINALS	ZERO OHMS
Push Down (D)	D and G	Yes
	E and F	Yes
	All Others	No
Push Up (U)	D and F	Yes
	E and G	Yes
	All Others	No
Off (Normal)	All Others	No
Push Left (L)	C and G	Yes
	E and F	Yes
	All Others	No
Push Right (R)	C and F	Yes
	E and G	Yes
	All Others	No

J918T-2

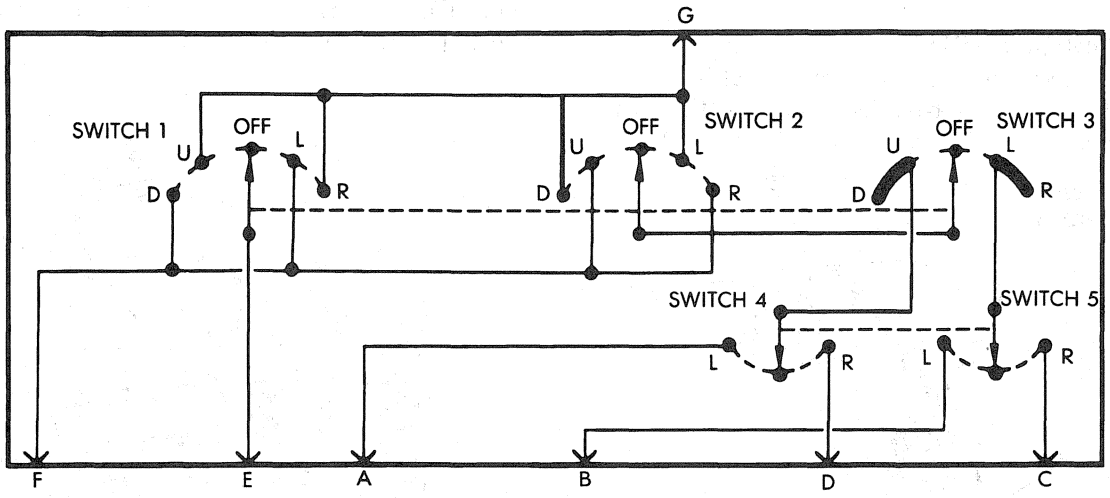
Power Mirror Switch Continuity (Right Position)

DIAGNOSIS AND TESTING (Continued)





Mopar AUTHENTIC RESTORATION PRODUCT



J928T-1

Fig. 1 Power Mirror Switch

DIAGNOSIS AND TESTING (Continued)

(8) Remove the front door trim panel as described in this group. Unplug the power mirror connector inside the door. Connect one jumper wire to a good ground, and the other jumper wire to a 12-volt battery feed. Connect the other ends of the jumper wires to the mirror half of the connector in the door (refer to 8W-62 - Power Mirrors in Group 8W - Wiring Diagrams for connector cavity circuit identification). The mirror head should move in each of the four directions. If OK, repair the circuits between the mirror switch and the body half of the mirror connector in the door as required. If not OK, replace the faulty mirror.

NOTE: The mirror connector cavity called out as a "ground" circuit (dark blue/light blue wire) in the Connector Pin Outs, is only a ground for two mirror directions. This circuit is switched by the power mirror switch to a battery feed in order to reverse the direction of the mirror motors, for the other two mirror directions.

REMOVAL AND INSTALLATION

POWER MIRROR SWITCH

(1) Disconnect the battery negative cable.

(2) Using a wide flat-bladed tool, pry the switch housing away from the center console (Fig. 2).

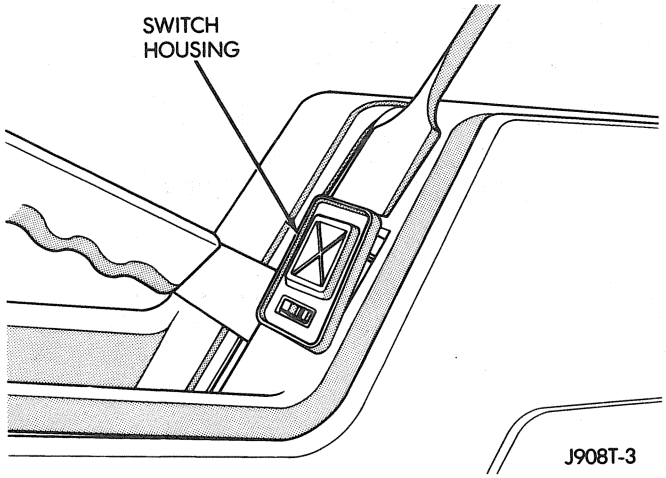


Fig. 2 Power Mirror Switch Remove/Install

(3) Disconnect the switch connector and remove the switch.

(4) Reverse the removal procedures to install.

POWER MIRROR

(1) Disconnect the battery negative cable.

(2) Remove the inside remote door latch release assembly and control panel retaining screws (Fig. 3).

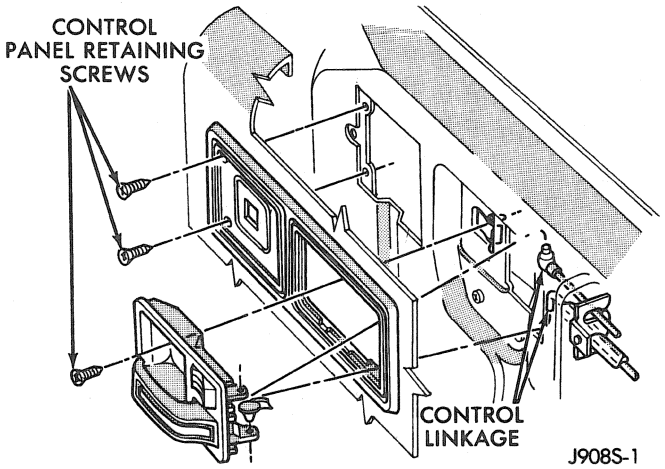


Fig. 3 Door Control Panel Remove/Install

(3) Disconnect the latch control linkage and the control panel wire harness retainer clip and connector.

(4) Remove the latch release and control panel assembly.

(5) Remove the armrest lower retaining screws.

(6) Swing the armrest downward to a vertical position. This is necessary to release the armrest from the upper retainer clip (Fig. 4).

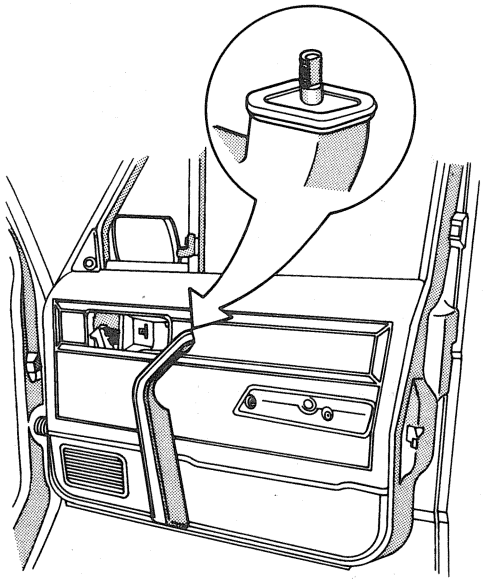


Fig. 4 Armrest Upper Retainer Clip

(7) Pull the armrest straight out from the door trim panel.

(8) Remove the trim panel by prying with a wide flat-bladed tool around the perimeter of the door (Fig. 5). **To ease the removal of the trim panel, start at the bottom of the panel.**

(9) Remove the screw holding the mirror trim cover (Fig. 6).

REMOVAL AND INSTALLATION (Continued)

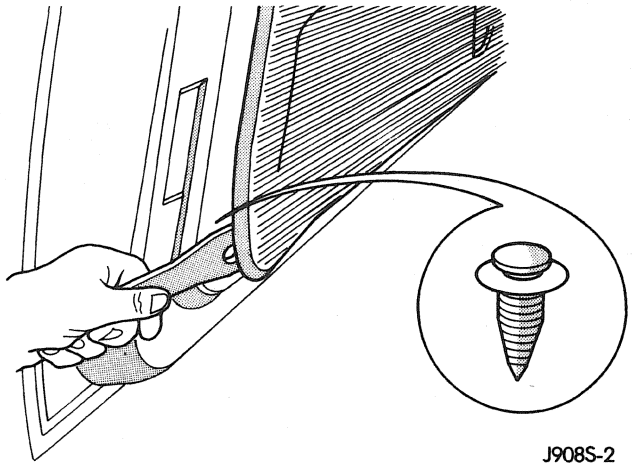


Fig. 5 Door Trim Panel Remove/Install

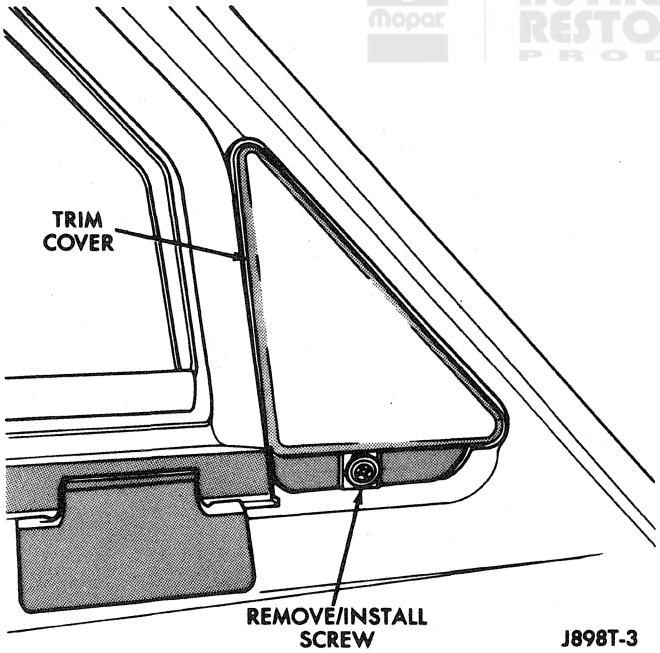


Fig. 6 Power Mirror Trim Cover Remove/Install

(10) Disconnect the power mirror wire harness at the connector inside the door.

(11) Pull the harness up through the door.

(12) Remove the three screws holding the mirror to the door, and remove the mirror (Fig. 7).

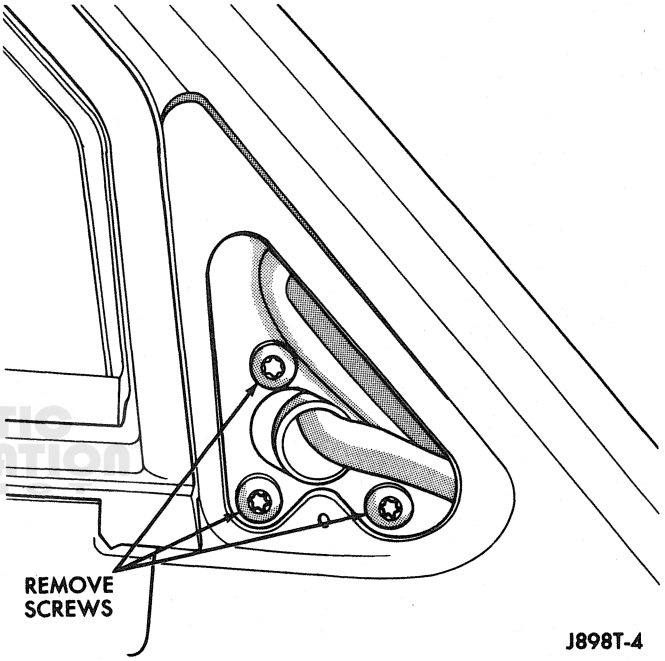


Fig. 7 Power Mirror Remove/Install

(13) Reverse the removal procedures to install.

CHIME/BUZZER WARNING SYSTEMS

CONTENTS

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
BUZZER MODULE 1
DRIVER'S DOOR JAMB SWITCH 1
DRIVER'S SEAT BELT SWITCH 2
HEADLAMP SWITCH 1
IGNITION KEY-IN SWITCH 1
DIAGNOSIS AND TESTING
BUZZER MODULE 2
DRIVER'S DOOR JAMB SWITCH 2
DRIVER'S SEAT BELT SWITCH 3
HEADLAMP SWITCH 3
IGNITION KEY-IN SWITCH 2
REMOVAL AND INSTALLATION
BUZZER MODULE 3
CHIME/BUZZER WARNING SYSTEM SWITCHES 3

GENERAL INFORMATION

INTRODUCTION

This group covers the buzzer warning system, which is standard factory-installed equipment on this model. The system provides an audible warning to the driver when it monitors the following conditions:

- The key is in the ignition switch with the driver's door open.
- The head or park lamps are on with the driver's door open.
- The driver's seat belt is not buckled with the ignition switch in the On position.

Following are general descriptions of the major components in the buzzer warning system. Refer to 8W-44 - Interior Lighting in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

BUZZER MODULE

The buzzer module receives battery voltage at all times from a fuse in the fuseblock module. It also receives a second battery feed through a fuse in the fuseblock module when the ignition switch is in the On or Start position.

Other inputs to the module include the driver's door jamb switch, the driver's seat belt switch, the ignition key-in switch, and the headlamp switch. The only output of the module is a timed four to eight second feed to the seat belt reminder lamp on the instrument panel. The timer function begins after the ignition switch is turned to the On position.

The buzzer module cannot be repaired. If faulty, it must be replaced.

DRIVER'S DOOR JAMB SWITCH

The driver's door jamb switch is mounted to the driver's door hinge pillar. The switch closes a path to ground for the buzzer module through the key-in switch or the headlamp switch when the driver's door is opened, and opens when the driver's door is closed. This switch cannot be repaired and, if faulty, must be replaced. Refer to Group 8L - Lamps for the service procedures.

IGNITION KEY-IN SWITCH

The ignition key-in switch is integral to the ignition switch, which is mounted on the right side of the steering column. It closes a path to ground for the buzzer module when the ignition key is inserted in the ignition lock cylinder and the driver's door jamb switch is closed (door open). The switch opens when the key is removed from the ignition lock cylinder. This switch cannot be repaired and, if faulty, the entire ignition switch must be replaced. Refer to Group 8D - Ignition Systems for the service procedures.

HEADLAMP SWITCH

The headlamp switch is located in the instrument panel. It closes a path to ground for the buzzer module when the park or head lamps are on and the driver's door jamb switch is closed (door open). The switch opens the ground path when the park and head lamps are turned off. The headlamp switch cannot be repaired and, if faulty, must be replaced. Refer to Group 8E - Instrument Panel Systems for the service procedures.

DESCRIPTION AND OPERATION (Continued)

DRIVER'S SEAT BELT SWITCH

The driver's seat belt switch is integral to the driver's seat belt buckle-half assembly. The switch is normally closed, providing a ground path to the buzzer module. When the tip-half of the seat belt is inserted into the seat belt buckle, the switch opens the buzzer ground path. The seat belt switch cannot be repaired. If faulty, the entire driver's seat belt buckle-half unit must be replaced. Refer to Group 23 - Body Components for the service procedures.

DIAGNOSIS AND TESTING

BUZZER MODULE

For circuit descriptions and diagrams, refer to 8W-44 - Interior Lighting in Group 8W - Wiring Diagrams.

(1) Check the fuse(s) in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse(s).

(2) Check for battery voltage at the hot at all times fuse in the fuseblock module. If OK, go to Step 3. If not OK, repair the open circuit from the power distribution center as required.

(3) Turn the ignition switch to the On position. Check for battery voltage at the hot in run and start fuse in the fuseblock module. If OK, go to Step 4. If not OK, repair the open circuit from the ignition switch as required.

(4) Turn the ignition switch to the Off position. Replace the buzzer module with a known good unit and test its operation. If OK, discard the faulty buzzer module. If not OK, remove the buzzer module and go to Step 5.

(5) Check for battery voltage at the fused B(+) circuit cavity of the buzzer module connector. If OK, go to Step 6. If not OK, repair the open circuit to the fuseblock module as required.

(6) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavity of the buzzer module connector. If OK, go to Step 7. If not OK, repair the open circuit to the fuseblock module as required.

(7) Turn the ignition switch to the Off position. Check for continuity between the ground circuit cavity of the buzzer module connector and a good ground. There should be continuity. If OK, go to the diagnosis for the switch that is related to the buzzer malfunction. If not OK, repair the circuit to ground as required.

DRIVER'S DOOR JAMB SWITCH

For circuit descriptions and diagrams, refer to 8W-44 - Interior Lighting in Group 8W - Wiring Diagrams.

(1) Open the driver's door and note whether the interior lamps light. They should light. If OK, see the diagnosis for the Ignition Key-In Switch or the Headlamp Switch in this group. If not OK, go to Step 2.

(2) Check for continuity between the ground circuit cavity of the driver's door jamb switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the circuit to ground as required.

(3) Check for continuity between the ground circuit terminal and each of the two courtesy lamps driver terminals of the door jamb switch. There should be continuity with the switch plunger released, and no continuity with the switch plunger depressed. If not OK, replace the faulty switch.

IGNITION KEY-IN SWITCH

For circuit descriptions and diagrams, refer to 8W-44 - Interior Lighting in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL OR STEERING COLUMN COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the steering column shrouds. Refer to Group 8D - Ignition Systems for the procedures. Unplug the ignition key-in switch connector from the ignition switch (Fig. 1).

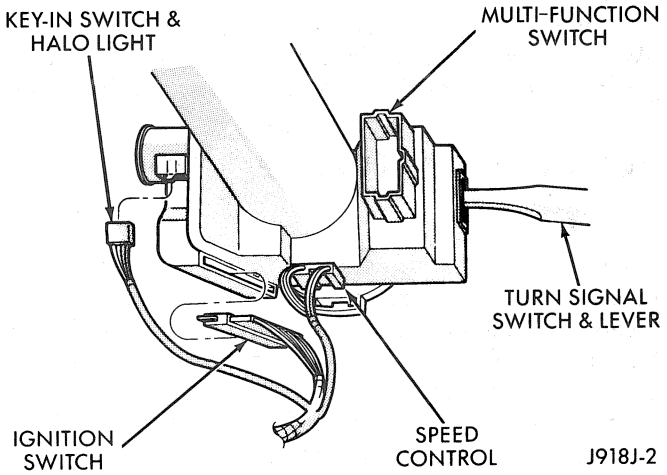


Fig. 1 Key-In Switch Connector

(2) Open the driver's door. Check for continuity between the key-in ignition switch sense circuit cavity of the key-in switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not

DIAGNOSIS AND TESTING (Continued)

OK, repair the open circuit to the driver's door jamb switch as required.

(3) Insert the ignition key in the ignition lock cylinder. Check for continuity between the key-in switch sense circuit and the courtesy lamp switch output circuit terminals of the key-in switch. There should be continuity until the key is removed. If OK, go to Step 4. If not OK, replace the faulty ignition switch.

(4) Check for continuity between the courtesy lamp switch output circuit cavities of the key-in switch connector and the buzzer module connector. There should be continuity. If not OK, repair the open circuit to the buzzer module as required.

HEADLAMP SWITCH

For circuit descriptions and diagrams, refer to 8W-44 - Interior Lighting in Group 8W - Wiring Diagrams.

(1) Remove the headlamp switch from the instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures. Unplug the headlamp switch connector. Open the driver's door. Check for continuity between the key-in ignition switch sense circuit cavity of the headlamp switch connector and a good ground. There should be continuity until the driver's door is closed. If OK, go to Step 2. If not OK, repair the circuit to the driver's door jamb switch as required.

(2) Check for continuity between the courtesy lamp switch output circuit cavities of the headlamp switch connector and the buzzer module connector. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit to the buzzer module as required.

(3) Check for continuity between the key-in ignition switch sense circuit and the courtesy lamp switch output circuit terminals of the headlamp switch. There should be no continuity with the switch in the Off position, and there should be continuity with the switch in the park or head lamps On position. If not OK, replace the faulty headlamp switch.

DRIVER'S SEAT BELT SWITCH

For circuit descriptions and diagrams, refer to 8W-44 - Interior Lighting in Group 8W - Wiring Diagrams.

(1) Unplug the seat belt switch connector on the floor under the driver's seat near the seat belt buckle-half anchor. Check for continuity between the seat belt switch sense circuit and the ground circuit cavities of the seat belt half of the connector. There should be continuity with the seat belt unbuckled, and no continuity with the seat belt buckled. If OK, go to Step 2. If not OK, replace the faulty seat belt buckle-half assembly.

(2) Check for continuity between the ground circuit cavity in the harness half of the seat belt switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the circuit to ground as required.

(3) Check for continuity between the seat belt switch sense circuit cavities in the harness half of the seat belt switch connector and the buzzer module connector. There should be continuity. If not OK, repair the open circuit as required.

REMOVAL AND INSTALLATION

BUZZER MODULE

(1) Disconnect the battery negative cable.

(2) Locate the buzzer module in the fuseblock module (LHD), or in a connector near the fuseblock module (RHD), under the driver's end of the instrument panel.

(3) Unplug the buzzer module by pulling it straight back from its fuseblock module or connector cavities.

(4) To install the buzzer module, align its terminals with the cavities in the fuseblock module or connector. Then, push the module firmly into place.

(5) Connect the battery negative cable.

(6) Test the buzzer module operation.

CHIME/BUZZER WARNING SYSTEM SWITCHES

Service procedures for the various switches used in the chime/buzzer warning system can be found in the appropriate group as follows:

- Driver's door jamb switch - refer to Group 8L - Lamps
- Ignition key-in switch - refer to Group 8D - Ignition Systems
- Headlamp switch - refer to Group 8E - Instrument Panel Systems
- Driver's seat belt switch - refer to Group 23 - Body Components.

OVERHEAD CONSOLE SYSTEMS

CONTENTS

	page		page
GENERAL INFORMATION		**SERVICE PROCEDURES**	
INTRODUCTION	1	COMPASS CALIBRATION	4
DESCRIPTION AND OPERATION		COMPASS DEMAGNETIZING	5
COMPASS	1	COMPASS VARIATION ADJUSTMENT	4
GARAGE DOOR OPENER STORAGE BIN	2	**REMOVAL AND INSTALLATION**	
READING/COURTESY LAMPS	2	COMPASS/THERMOMETER/DISPLAY MODULE	6
REMOTE KEYLESS ENTRY MODULE	2	OVERHEAD CONSOLE	6
SUNGLASSES STORAGE BIN	2	READING/COURTESY LAMP BULBS	8
THERMOMETER	1	SUNGLASSES STORAGE BIN	7
DIAGNOSIS AND TESTING		TEMPERATURE SENSOR	7
COMPASS/DISPLAY MODULE	2		
THERMOMETER	3		

GENERAL INFORMATION

INTRODUCTION

An overhead console featuring an electronic compass and thermometer is an available factory-installed option on these models. Following are general descriptions of the major components used in the overhead console. Refer to 8W-49 Overhead Console in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

DESCRIPTION AND OPERATION

COMPASS

The compass will display the direction in which the vehicle is pointed using the eight major compass headings (Examples: north is N, northeast is NE). It does not display the headings in actual degrees. The display is turned on or off using the Comp/Temp button, located to the left of the display module.

The self-calibrating compass unit requires no adjusting in normal use. The only calibration that may prove necessary is to drive the vehicle in three complete circles, on level ground, in not less than 48 seconds. This will reorient the compass unit to its vehicle.

The compass unit also will compensate for magnetism the body of the vehicle may acquire during normal use. However, avoid placing anything magnetic directly on the roof of the vehicle. Magnetic mounts for an antenna, a repair order hat, or a funeral procession flag can exceed the compensating ability of the compass unit if placed on the roof panel. Magnetic bit drivers used on the fasteners that hold the assembly to the roof header can also affect compass operation. If the vehicle roof should become magnetized, the demagnetizing and calibration procedures found in this group may be required to restore proper compass operation.

The compass, thermometer, and display module cannot be repaired, and are only available for service as a unit. If faulty, the complete assembly must be replaced.

THERMOMETER

The thermometer displays the outside ambient temperature. The temperature display can be changed from Fahrenheit to Celsius using the US/Metric button, located to the right of the display module. The displayed temperature is not an instant reading of conditions, but an average temperature. It may take the thermometer display several minutes to respond to a major temperature change, such as driving out of a heated garage into winter temperatures.

When the ignition switch is turned to the Off position, the last displayed temperature reading stays in the thermometer unit memory. When the ignition switch is turned to the On position again, the thermometer will display the memory temperature for one minute; then update the display to the current average temperature reading within five minutes.

The thermometer function is supported by an ambient temperature sensor. The sensor is mounted outside the passenger compartment near the front and center of the vehicle. The ambient temperature sensor is available as a separate service item.

DESCRIPTION AND OPERATION (Continued)

The compass, thermometer, and display module cannot be repaired, and are only available for service as a unit. If the module is faulty, the complete assembly must be replaced.

READING/COURTESY LAMPS

All reading and courtesy lamps located in the overhead console are activated by the door jamb switches. When all of the doors and the liftgate are closed, the lamps can be individually activated by depressing the corresponding lens. When a door and/or the liftgate is open, depressing the lamp lens switches will not turn the lamps off. Refer to Group 8L - Lamps, for diagnosis and service of the reading and courtesy lamps.

REMOTE KEYLESS ENTRY MODULE

Models equipped with the overhead console option have the remote keyless entry module mounted inside and towards the rear of the overhead console. Refer to Group 8P - Power Lock System for diagnosis and service of this component.

GARAGE DOOR OPENER STORAGE BIN

A compartment in the overhead console is designed to hold most garage door opener remote control transmitters. The transmitter is mounted within the compartment with an adhesive-backed hook and loop fastener patch. Then one to three pegs are selected and mounted on a post on the inside of the storage compartment door. The pegs may be stacked, if necessary. The peg(s) selected must be long enough to depress the button of the transmitter, when the garage door opener storage compartment door is depressed.

SUNGLASSES STORAGE BIN

A sunglasses storage bin is included in the overhead console. The interior of the bin is covered with a flocking material to protect the sunglasses from being scratched. This bin features a push/push-type latching mechanism, and a viscous dampening system for a fluid opening action.

DIAGNOSIS AND TESTING

COMPASS/DISPLAY MODULE

If the problem with the compass/display module is an inaccurate or scrambled display, use the Self-Diagnostics procedures. If the problem is a no-display condition, use the following procedures. For circuit descriptions and diagrams, refer to 8W-49 - Overhead Console in Group 8W - Wiring Diagrams.

(1) Check the fuses in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse(s).

(2) Remove the overhead console as described in this group. Check for continuity between each of the two ground circuit cavities of the overhead console connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the circuits to ground as required.

(3) Check for battery voltage at each of the two fused B(+) circuit cavities of the overhead console connector. If OK, go to Step 4. If not OK, repair the open circuit(s) to the fuseblock module as required.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output cavity of the overhead console connector. If OK, go to Step 5. If not OK, repair the open circuit to the fuseblock module as required.

(5) Check for battery voltage at the park lamp switch output circuit cavity of the overhead console connector. There should be zero volts with the headlamp switch in the Off position, and battery voltage with the park or head lamps turned on. If OK, go to Step 6. If not OK, repair the open circuit to the headlamp switch as required.

(6) Check for voltage at the fused panel lamps dimmer switch signal cavity of the overhead console connector. There should be zero volts with the headlamp switch in the Off position. When the park or head lamps are turned on, the voltage should vary as the dimmer switch is rotated. If OK, replace the faulty compass/display module. If not OK, repair the open circuit to the fuseblock module as required.

SELF-DIAGNOSTICS

A self-diagnostic test is used to determine that the compass, and all of the display module segments are operating properly electrically. Initiate the self-diagnostic test as follows:

(1) With the ignition switch in the Off position, simultaneously press and hold the Comp/Temp button and the US/Metric button.

(2) Turn the ignition switch to the On position.

(3) Continue to hold both buttons, until the display module performs a walking segment test. In this test, all of the compass points are displayed, along with various number combinations. These combinations verify that all of the display module segments are functional. If any segment should fail to light during the test, the unit is faulty and must be replaced. To repeat the test, momentarily depress and release the Comp/Temp button one time.

(4) Momentarily depress and release the US/Metric button one time. All of the display segments will light simultaneously for about two seconds. If any segment should fail to light during the test, the unit is faulty and must be replaced. To repeat the test, momentarily depress and release the Comp/Temp button one time.

(5) Momentarily depress and release the US/Metric button one time, or turn the ignition switch to the Off position to exit the self-diagnostic mode and

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OVERHEAD CONSOLE DISPLAY COMPLETELY DARK	1. Display has been switched off. 2. Faulty fuse or headlamp delay module. 3. Faulty wiring. 4. Faulty compass/thermometer display module.	1. Depress COMP/TEMP button to switch unit to compass or thermometer display option. 2. Refer to Group 8L — Lamps, for diagnosis and service of this circuit. 3. Refer to Group 8W — Wiring Diagrams, for circuit diagrams. Check and repair wiring, if required. 4. Replace compass/thermometer display module, if required.
OVERHEAD CONSOLE DISPLAY SEGMENTS MISSING	1. Faulty compass/thermometer display module.	1. See Self-Diagnostic Test, in this group. Replace compass/thermometer display module, if required.
ERRATIC COMPASS OPERATION	1. Magnet or strong magnetic field near compass module. 2. Variance setting incorrect. 3. Calibration incorrect. 4. Faulty compass/thermometer display module.	1. Remove magnet and perform Demagnetizing Procedure, in this group. 2. See Variation Adjustment Procedure in this group. 3. See Calibration Procedure, in this group. 4. Replace compass/thermometer display module, if required.
ERRATIC THERMOMETER OPERATION	1. Faulty sensor wiring. 2. Faulty sensor. 3. Faulty compass/thermometer display module.	1. See Sensor Circuit Test, in this group. Repair wiring, if required. 2. See Sensor Test, in this group. Replace sensor, if required. 3. Replace compass/thermometer display module, if required.

J958C-1

Compass/Thermometer Diagnosis

return the compass and display module to normal operation.

NOTE: If the compass functions, but accuracy is suspect, it may be necessary to perform a variation adjustment. This procedure allows the compass unit to accommodate variations in the earth's magnetic field strength, based on geographic location. See the Compass Variation Adjustment procedures, in this group.

NOTE: If the compass reading has blanked out, and only "CAL" appears in the display module, demagnetizing may be necessary to remove excessive residual magnetic fields from the vehicle. See the Compass Demagnetizing procedure, in this group.

THERMOMETER

The thermometer function is supported by a temperature sensor, a wiring circuit, and a portion of the overhead console display module. The sensor is mounted outside the passenger compartment near the front and center of the vehicle.

If any portion of the temperature sensor circuit fails, the thermometer display will self-diagnose the circuit. An "SC" (short circuit) will appear on the display module in place of the temperature when the sensor is exposed to temperatures above 55°C (131°F), or if the sensor circuit is shorted. An "OC" (open circuit) will appear in place of the temperature when the sensor is exposed too temperatures below -40°C (-40°F), or if the sensor circuit is open.

The temperature sensor circuit can also be diagnosed using the following Sensor Test, and Sensor Circuit Test. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, see the diagnosis for the Compass/Display Module in this group. For circuit descriptions and diagrams, refer to 8W-49 - Overhead Console in Group 8W - Wiring Diagrams.

DIAGNOSIS AND TESTING (Continued)

SENSOR TEST

(1) Turn the ignition switch to the Off position. Unplug the temperature sensor connector.

(2) Measure the resistance of the temperature sensor. At -40°C (-40°F), the sensor resistance is 336K ohms. At 55°C (140°F), the sensor resistance is 2.488K ohms. The sensor resistance should read between these two values. If OK, go to the Sensor Circuit Test. If not OK, replace the faulty sensor.

SENSOR CIRCUIT TEST

(1) Turn the ignition switch to the Off position. Unplug the temperature sensor connector.

(2) Connect a jumper wire between the two terminals in the body half of the sensor connector.

(3) Remove the overhead console as described in this group. Disconnect the overhead console wiring connector.

(4) Check for continuity between the sensor ground circuit and the ambient temperature sensor signal circuit cavities of the overhead console connector. There should be continuity. If OK, go to Step 5. If not OK, repair the open circuit as required.

(5) Remove the jumper wire from the temperature sensor connector. Check for continuity between the sensor ground circuit cavity of the overhead console connector and a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the short circuit as required.

(6) Check for continuity between the ambient temperature sensor signal circuit cavity of the overhead console connector and a good ground. There should be no continuity. If OK, see the diagnosis for the Compass/Display Module in this group. If not OK, repair the short circuit as required.

SERVICE PROCEDURES

COMPASS VARIATION ADJUSTMENT

Variance is the difference between magnetic north and geographic north. In some areas, the difference between magnetic and geographic north is great enough to cause the compass to give false readings. If this problem occurs, the compass variance must be set.

To set the compass variance:

(1) Using the Variance Settings map, find your geographic location and note the zone number (Fig. 1).

(2) Turn the ignition switch to the On position.

(3) Depress both the US/Metric, and the Comp/Temp buttons. Hold the buttons down until "VAR" appears in the display module. This takes about five seconds.

(4) Release both of the buttons. The zone number will appear in the display module.

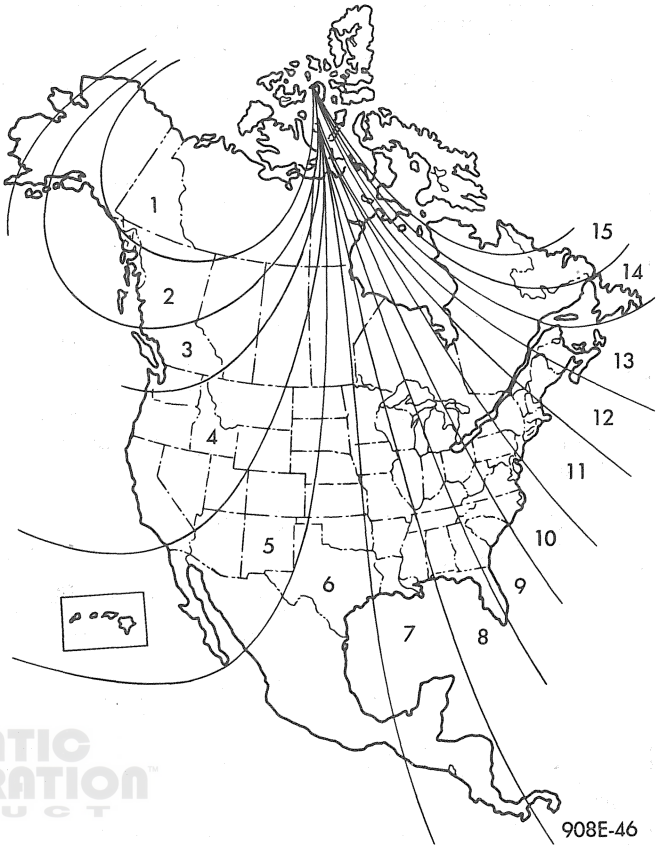


Fig. 1 Variance Settings

(5) Press and release the US/Metric button to step through the zone numbers, until the zone number for your area appears in the display.

(6) Press the Comp/Temp button to enter this zone number into the compass unit memory.

(7) Confirm that the correct directions are now indicated.

COMPASS CALIBRATION

CAUTION: Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not use magnetic tools when servicing the overhead console.

The electronic compass unit features a self-calibrating design, which simplifies the calibration procedure. This feature automatically updates the compass calibration while the vehicle is being driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges.

SERVICE PROCEDURES (Continued)

NOTE: Whenever the compass is calibrated manually, the variation number must also be reset. See the Compass Variation Adjustment procedure, in this group.

Calibrate the compass manually as follows:
(1) Start the engine.
(2) Depress both the US/Metric and Comp/Temp buttons. Hold down both buttons until "CAL" appears in the display module. This takes about ten seconds, and appears about five seconds after "VAR" is displayed.
(3) Release both buttons.
(4) Drive the vehicle on a level surface, away from large metal objects, through three or more complete circles in not less than 48 seconds. The "CAL" message will disappear from the display to indicate that the compass is now calibrated.

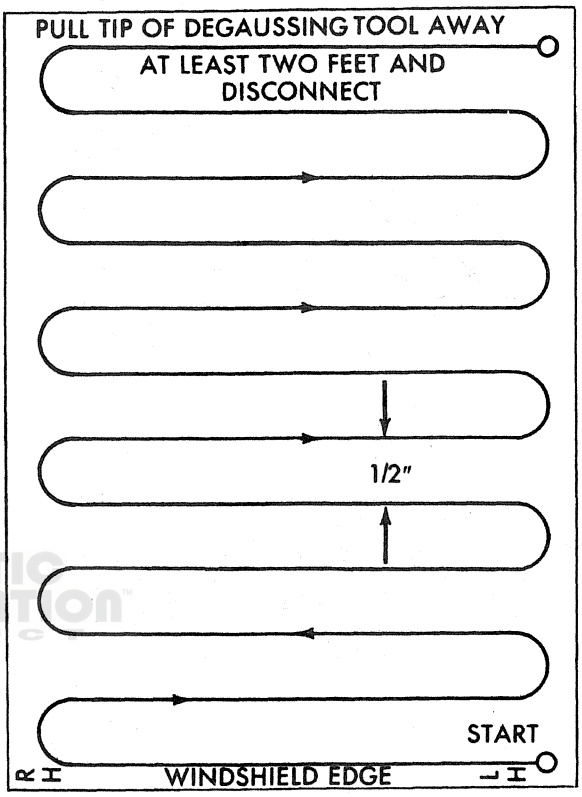
NOTE: If the "CAL" message remains in the display, either there is excessive magnetism near the compass, or the unit is faulty. Repeat the demagnetizing and calibration procedures at least one more time.

NOTE: If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

COMPASS DEMAGNETIZING

A degaussing tool (Special Tool 6029) is used to demagnetize, or degauss, the overhead console front mounting screw and the roof panel. Equivalent units must be rated as continuous duty for 110/115 volts and 60Hz. They must also have a field strength of over 350 gauss at 1/4-inch beyond the tip of the probe.

To demagnetize the roof panel and the console forward mounting screw, proceed as follows:
(1) Be certain the ignition switch is in the Off position, before you begin the demagnetizing procedure.
(2) Plug in the degaussing tool, while keeping the tool at least two feet away from the compass unit.
(3) Slowly approach the head of the overhead console front mounting screw with the plastic coated tip of the degaussing tool. Contact the head of the screw with the tip of the tool for about two seconds.
(4) With the degaussing tool still energized, slowly back it away from the screw. When the tool is at least two feet from the screw head, unplug the tool.
(5) Place an 8-1/2 X 11-inch piece of paper, oriented on the vehicle lengthwise from front to rear, on the center line of the roof at the windshield header (Fig. 2). The purpose of the paper is to protect the roof panel from scratches, and to define the area to be demagnetized.



J908E-27

Fig. 2 Roof Demagnetizing Pattern

(6) Plug in the degaussing tool, while keeping the tool at least two feet away from the compass unit.
(7) Slowly approach the center line of the roof panel at the windshield header, with the degaussing tool plugged in.
(8) Contact the roof panel with the tip of the tool. Be sure the template is in place to avoid scratching the roof panel. Using a slow, back-and-forth sweeping motion, and allowing 1/2-inch between passes, move the tool at least four inches to each side of the roof center line, and eleven inches back from the windshield header.
(9) With the degaussing tool still energized, slowly back it away from the roof panel. When the tip of the tool is at least two feet from the roof panel, unplug the tool.
(10) Calibrate the compass and adjust the compass variance as described in this group.

REMOVAL AND INSTALLATION

OVERHEAD CONSOLE

(1) Disconnect the battery negative cable.

(2) Remove the mounting screw, forward of the compass unit (Fig. 3).

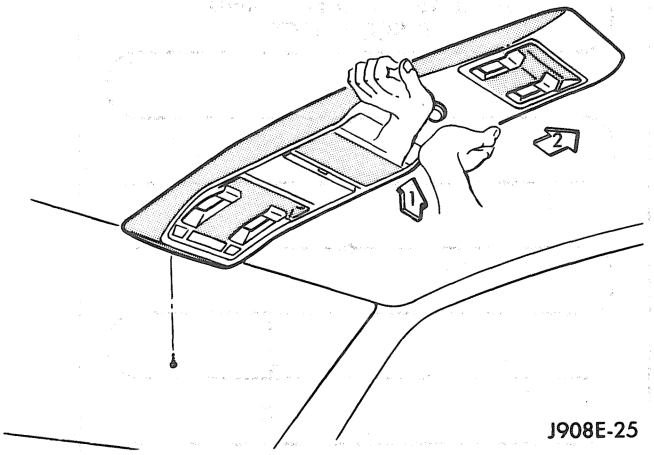


Fig. 3 Overhead Console Remove/Install

(3) Flex the console housing outward, while pressing upward to disengage the housing from the rear mounting bracket. See Arrow 1 in (Fig. 3).

(4) Slide the console rearward, until the console detaches from the front mounting bracket. See Arrow 2 in (Fig. 3).

(5) See Arrow 1 in (Fig. 4). While pressing up on the rear of the console, slide the console forward holding the front away from the headliner. See Arrow 2 in (Fig. 4). Move the console forward until the rear detaches from the headliner, and becomes free.

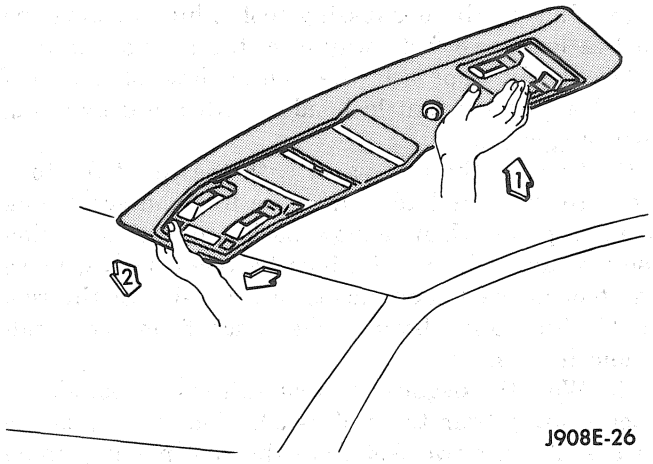


Fig. 4 Overhead Console Remove/Install

(6) Disconnect the wire harness connectors from the remote keyless entry and compass modules (Fig. 5) and (Fig. 6).

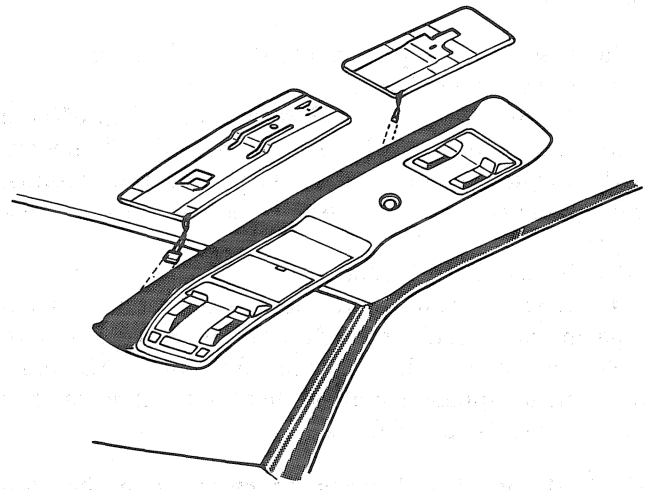


Fig. 5 Overhead Console Wire Harnesses

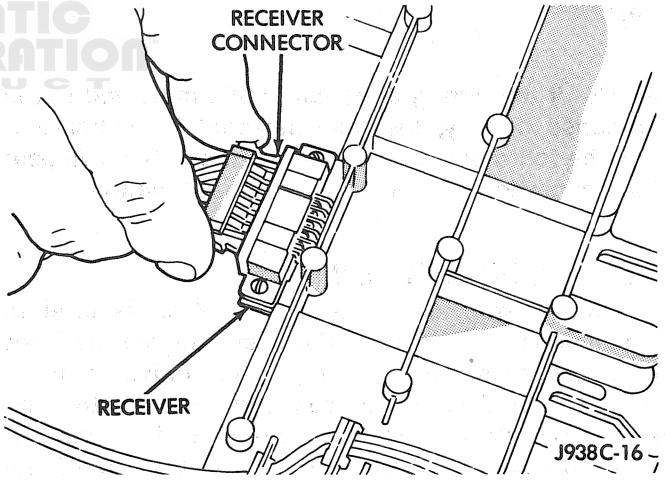


Fig. 6 Remote Keyless Entry Harness Connector

(7) Reverse the removal procedures to install. Be sure to flex the console housing outward near the remote keyless entry module until the console snaps onto the rear mounting bracket.

COMPASS/THERMOMETER/DISPLAY MODULE

(1) Remove the overhead console as described in this group.

(2) Remove the screws securing the compass/thermometer/display module to the overhead console housing.

(3) Unplug the lighting harness connector from the compass/thermometer/display module.

(4) Remove the module from the overhead console housing.

(5) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

TEMPERATURE SENSOR

(1) Disconnect the battery negative cable.

(2) Locate the temperature sensor, below the grille and behind the front bumper (Fig. 7).

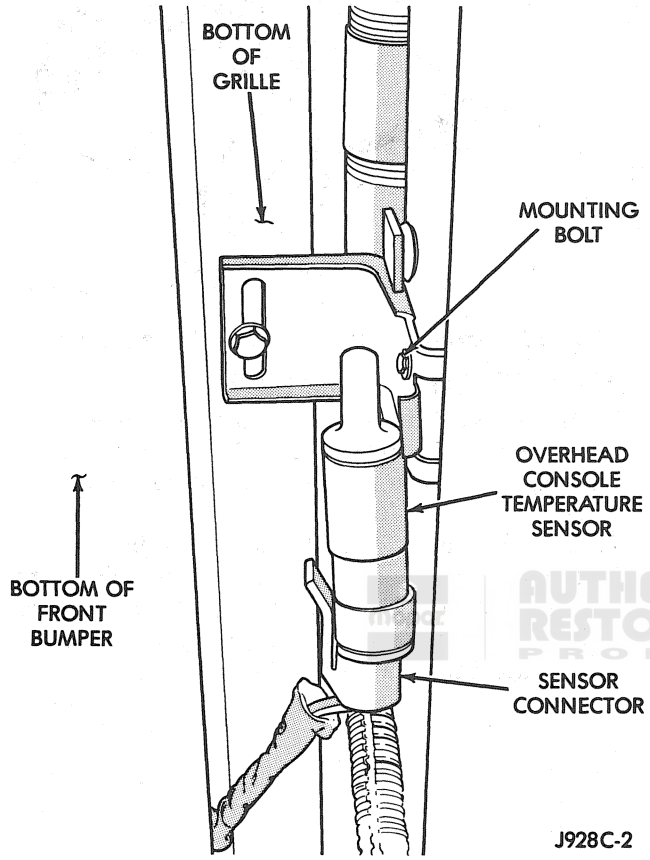


Fig. 7 Temperature Sensor

(3) Unplug the temperature sensor wiring connector.

(4) Remove the temperature sensor mounting bolt and remove the sensor.

(5) Reverse the removal procedures to install.

SUNGLASSES STORAGE BIN

(1) Remove the overhead console as described in this group.

(2) Open the sunglasses storage bin door.

(3) Remove the sunglasses storage bin cover plate (Fig. 8).

(4) Unhook the torque spring from the wall of the console housing, and release the spring to the down position, as shown by the arrow in (Fig. 9).

(5) Remove the sunglasses storage bin door by flexing the center panel. Remove the side of the door that has gear teeth near the pivot rod first (Fig. 10). The gear side of the door has a short pivot rod. Slide the door out of the compartment.

(6) Remove and discard the latch spring.

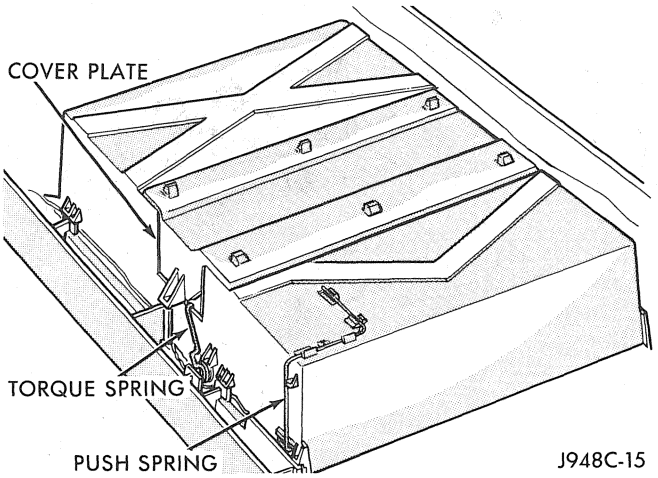


Fig. 8 Sunglasses Storage Bin Cover Plate Remove/Install

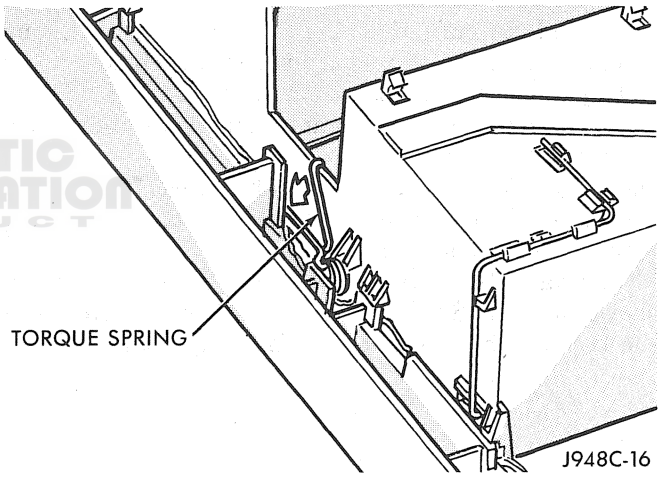


Fig. 9 Release Torque Spring

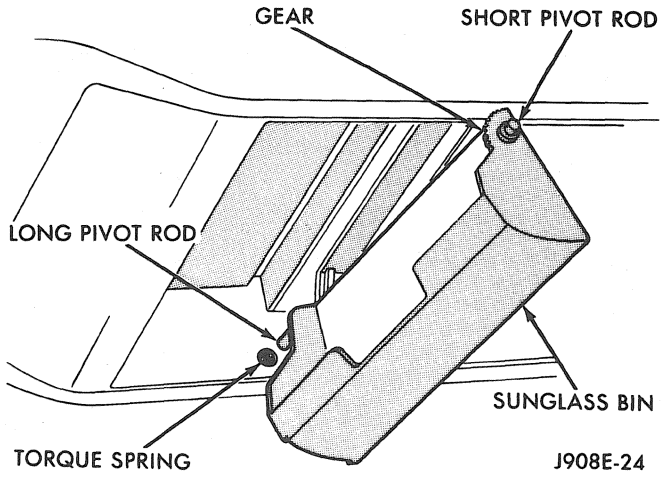


Fig. 10 Sunglasses Storage Bin Remove/Install

(7) Install a new latch spring as shown. This may require flexing the housing in that area for clearance.

REMOVAL AND INSTALLATION (Continued)

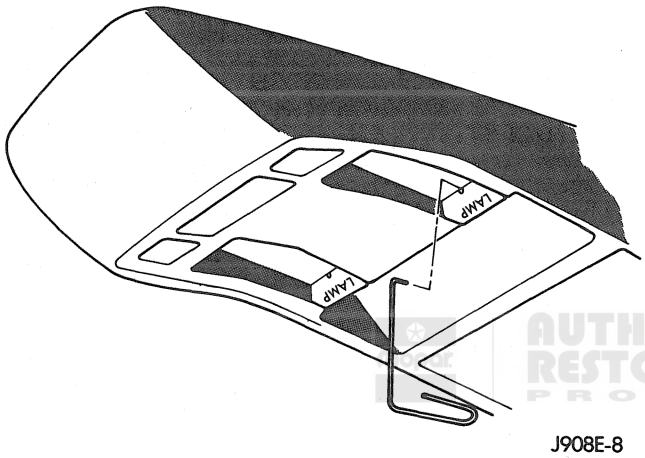


Fig. 11 Reading/Courtesy Lamp Lens Remove

(8) Install the sunglasses storage bin door in the open position as follows:

(a) Make sure that the torque spring lines up with the slot in the long pivot rod, then insert the long pivot rod into the compartment.

(b) Flex the center panel and snap the short pivot rod into place.

(c) Hook the torque spring back over the wall.

(d) Cycle the door several times to ensure that the door functions properly.

(9) Snap the cover plate back into position as shown in (Fig. 8). Some pressure from the inside of the bin may be required to engage all six snaps.

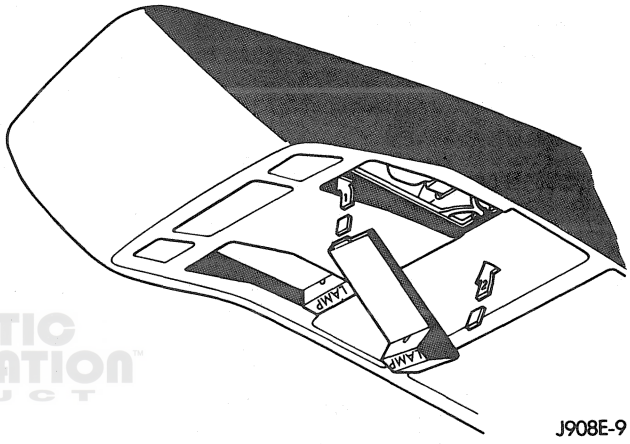


Fig. 12 Reading/Courtesy Lamp Lens Install

READING/COURTESY LAMP BULBS

(1) Make a hook in the end of a large paper clip or wire (approximately 0.06 inches in diameter). Insert the wire into the hole in the lens and pull downward (Fig. 11).

(2) Set the lens aside and replace the bulb.

(3) Replace the lens by inserting the tab on the thin portion of lens into the mating slot on the console. Push upwards on the opposite end of the lens until it snaps into place (Fig. 12).

WIRING DIAGRAMS

CONTENTS

	page		page
8W-01 GENERAL INFORMATION	8W-01-1	8W-47 AUDIO SYSTEM	8W-47-1
8W-02 COMPONENT INDEX	8W-02-1	8W-48 REAR WINDOW DEFOGGER	8W-48-1
8W-10 FUSE/FUSE BLOCK	8W-10-1	8W-49 OVERHEAD CONSOLE	8W-49-1
8W-11 POWER DISTRIBUTION	8W-11-1	8W-50 FRONT LIGHTING	8W-50-1
8W-15 GROUND DISTRIBUTION	8W-15-1	8W-51 REAR LIGHTING	8W-51-1
8W-20 CHARGING SYSTEM	8W-20-1	8W-52 TURN SIGNALS	8W-52-1
8W-21 STARTING SYSTEM	8W-21-1	8W-53 WIPERS	8W-53-1
8W-30 FUEL/IGNITION SYSTEMS	8W-30-1	8W-54 TRAILER TOW	8W-54-1
8W-31 TRANSMISSION CONTROL SYSTEM	8W-31-1	8W-60 POWER WINDOWS	8W-60-1
8W-33 VEHICLE SPEED CONTROL	8W-33-1	8W-61 POWER DOOR LOCKS	8W-61-1
8W-35 ALL-WHEEL ANTI-LOCK BRAKES	8W-35-1	8W-62 POWER MIRRORS	8W-62-1
8W-40 INSTRUMENT CLUSTER	8W-40-1	8W-63 POWER SEAT	8W-63-1
8W-41 HORN/CIGAR LIGHTER	8W-41-1	8W-70 SPLICE INFORMATION	8W-70-1
8W-42 AIR CONDITIONING/HEATER	8W-42-1	8W-80 CONNECTOR PIN-OUTS	8W-80-1
8W-44 INTERIOR LIGHTING	8W-44-1	8W-90 CONNECTOR LOCATIONS	8W-90-1
		8W-95 SPLICE LOCATIONS	8W-95-1

8W-01 GENERAL INFORMATION

INDEX

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
CIRCUIT IDENTIFICATION 3
CONNECTOR/GROUND LOCATIONS 1
CONNECTORS 3
ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES 5
HOW TO USE THIS GROUP 1
NOTES, CAUTIONS, and WARNINGS 2
SECTION IDENTIFICATION 1
SPLICE LOCATIONS 2
SYMBOLS 3
TAKE OUTS 3
WIRE CODE IDENTIFICATION 2
DIAGNOSIS AND TESTING
INTERMITTENT AND POOR CONNECTIONS 5
TROUBLESHOOTING TESTS 6
TROUBLESHOOTING TOOLS 5
TROUBLESHOOTING WIRING PROBLEMS 6
SERVICE PROCEDURES
CONNECTOR AND TERMINAL REPLACEMENT . . 9
CONNECTOR REPLACEMENT 8
DIODE REPLACEMENT 10
TERMINAL REPLACEMENT 9
TERMINAL/CONNECTOR REPAIR-MOLEX CONNECTORS 7
TERMINAL/CONNECTOR REPAIR—THOMAS AND BETTS CONNECTORS 8
WIRING REPAIR 7
SPECIAL TOOLS
WIRING/TERMINAL 11

Mopar AUTHENTIC RESTORATION PRODUCTS

GENERAL INFORMATION

INTRODUCTION

This Group is divided into two stand alone sections; XJ and XJ Right Hand Drive (XJ-RHD). Separate circuit descriptions and wiring diagrams are provided for each vehicle. Each section contains a Contents list for the wiring diagrams and circuit descriptions.

The complete XJ circuit descriptions and wiring diagrams are printed first, followed by those for XJ-RHD. The heading at the top of each page identifies the vehicle covered in the section.

DESCRIPTION AND OPERATION

HOW TO USE THIS GROUP

The purpose of this group is to show the electrical circuits in a clear, simple fashion and to make troubleshooting easier. Components that work together are shown together. All electrical components used in a specific system are shown on one diagram. The feed for a system is shown at the top of the page. All wires, connectors, splices, and components are shown in the flow of current to the bottom of the page. Wiring which is not part of the circuit represented is referenced to another page/section, where the complete circuit is shown. In addition, all switches, components, and modules are shown in the **at rest position with the doors closed and the key removed from the ignition.**

If a component is part of several different circuits, it is shown in the diagram for each. For example, the headlamp switch is the main part of the exterior lighting, but it also affects the interior lighting and the chime warning system. **It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.**

SECTION IDENTIFICATION

Sections in Group 8W are organized by sub-systems. The sections contain circuit operation descriptions, helpful information, and system diagrams. The intention is to organize information by system, consistently from year to year.

CONNECTOR/GROUND LOCATIONS

Section 8W-90 contains connector/ground location illustrations. The illustrations contain the connector/ground number and component identification. Connector/ground location charts in Section 8W-90 reference the illustration number for components and connectors.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the number on the Diagram pages.

DESCRIPTION AND OPERATION (Continued)

SPLICE LOCATIONS

Splice Location charts in Section 8W-70 show the entire splice, and provide references to other sections the splice serves.

Section 8W-95 contains illustrations that show the general location of the splices in each harness. The illustrations show the splice by number, and provide a written location.

NOTES, CAUTIONS, and WARNINGS

Throughout this group additional important information is presented in three ways; Notes, Cautions, and Warnings.

NOTES are used to help describe how switches or components operate to complete a particular circuit. They are also used to indicate different conditions that may appear on the vehicle. For example, an up-to and after condition.

CAUTIONS are used to indicate information that could prevent making an error that may damage the vehicle.

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION.

WARNING: USE SAFETY STANDS ANYTIME A PROCEDURE REQUIRES BEING UNDER A VEHICLE.

WARNING: BE SURE THAT THE IGNITION SWITCH ALWAYS IS IN THE OFF POSITION, UNLESS THE PROCEDURE REQUIRES IT TO BE ON.

WARNING: SET THE PARKING BRAKE WHEN WORKING ON ANY VEHICLE. AN AUTOMATIC TRANSMISSION SHOULD BE IN PARK. A MANUAL TRANSMISSION SHOULD BE IN NEUTRAL.

WARNING: OPERATE THE ENGINE ONLY IN A WELL-VENTILATED AREA.

WARNING: KEEP AWAY FROM MOVING PARTS WHEN THE ENGINE IS RUNNING, ESPECIALLY THE FAN AND BELTS.

WARNING: TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT PARTS SUCH AS THE RADIATOR, EXHAUST MANIFOLD(S), TAIL PIPE, CATALYTIC CONVERTER, AND MUFFLER.

WARNING: DO NOT ALLOW FLAME OR SPARKS NEAR THE BATTERY. GASES ARE ALWAYS PRESENT IN AND AROUND THE BATTERY.

WARNING: ALWAYS REMOVE RINGS, WATCHES, LOOSE HANGING JEWELRY, AND LOOSE CLOTHING.

WIRE CODE IDENTIFICATION

Each wire shown in the diagrams contains a code (Fig. 1) which identifies the main circuit, part of the main circuit, gauge of wire, and color. The color is shown as a two letter code which can be identified by referring to the Wire Color Code Chart (Fig. 2)

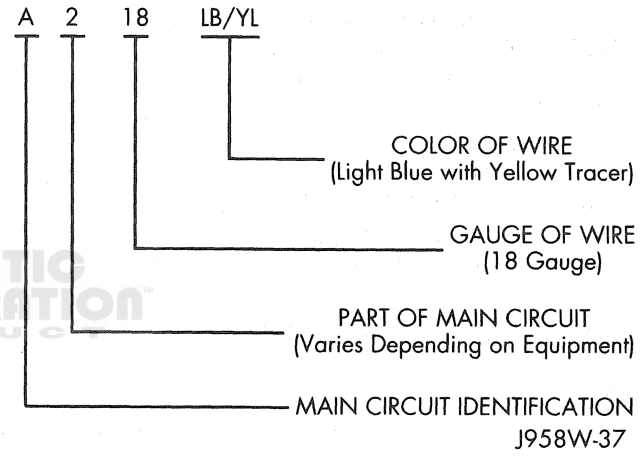


Fig. 1 Wire Code Identification

COLOR CODE	COLOR	STANDARD TRACER COLOR	COLOR CODE	COLOR	STANDARD TRACER CODE
BL	BLUE	WT	OR	ORANGE	BK
BK	BLACK	WT	PK	PINK	BK OR WT
BR	BROWN	WT	RD	RED	WT
DB	DARK BLUE	WT	TN	TAN	WT
DG	DARK GREEN	WT	VT	VIOLET	WT
GY	GRAY	BK	WT	WHITE	BK
LB	LIGHT BLUE	BK	YL	YELLOW	BK
LG	LIGHT GREEN	BK	*	WITH TRACER	

918W-136

Fig. 2 Wire Color Code Chart

DESCRIPTION AND OPERATION (Continued)

CIRCUIT IDENTIFICATION

All circuits in the diagrams use an alpha/numeric code to identify the wire and its function (Fig. 3). To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

CIRCUIT	FUNCTION
A	Battery Feed
B	Brake Controls
C	Climate Controls
D	Diagnostic Circuits
E	Dimming Illumination Circuits
F	Fused Circuits (Secondary Feed)
G	Monitoring Circuits (Gauges)
H	Open
I	Not Used
J	Open
K	Powertrain Control Module
L	Exterior Lighting
M	Interior Lighting
N	ESA Module
O	Not Used
P	Power Option (Battery Feed)
Q	Power Options (Battery Feed)
R	Passive Restraint
S	Suspension/Steering
T	Transmission/Transaxle/Transfer Case
U	Open
V	Speed Control, Washer/Wiper
W	Open
X	Audio Systems
Y	Open
Z	Grounds

948W-190

Fig. 3 Circuit Identification

CONNECTORS

Connectors shown in the diagrams are identified using the international standard arrows for male and female terminals (Fig. 4). A connector identifier is placed next to the arrows to indicate the connector number (Fig. 4).

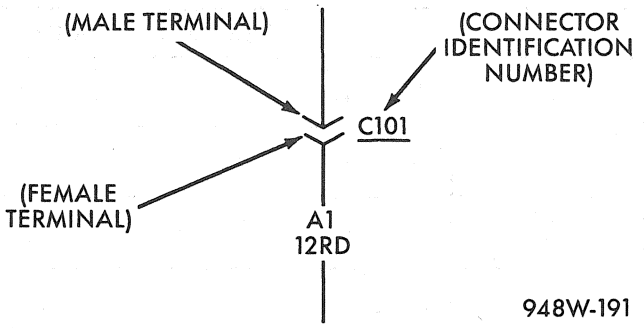


Fig. 4 Connector Identification

For viewing connector pin outs, with two terminals or greater, refer to section 8W-80. This section identifies the connector by number and provides terminal numbering, circuit identification, wire colors, and functions.

All connectors are viewed from the terminal end unless otherwise specified. To find the connector location in the vehicle refer to section 8W-90. This section uses the connector identification number from the wiring diagrams to provide a figure number reference.

TAKE OUTS

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component.

SYMBOLS

Various symbols are used throughout the Wiring Diagrams. These symbols can be identified by referring to the symbol identification chart (Fig. 5).

DESCRIPTION AND OPERATION (Continued)

LEGEND OF SYMBOLS USED ON WIRING DIAGRAMS			
+	POSITIVE		BY-DIRECTIONAL ZENER DIODE
—	NEGATIVE		MOTOR
	GROUND		ARMATURE AND BRUSHES
	FUSE	C100	CONNECTOR IDENTIFICATION
	GANG FUSES WITH BUSS BAR		MALE CONNECTOR
	CIRCUIT BREAKER		FEMALE CONNECTOR
	CAPACITOR		DENOTES WIRE CONTINUES ELSEWHERE
Ω	OHMS		DENOTES WIRE GOES TO ONE OF TWO CIRCUITS
	RESISTOR		SPLICE
	VARIABLE RESISTOR	S100	SPLICE IDENTIFICATION
	SERIES RESISTOR		THERMAL ELEMENT
	COIL	TIMER	TIMER
	STEP UP COIL		MULTIPLE CONNECTOR
	OPEN CONTACT		OPTIONAL WIRING WITH / WIRING WITHOUT
	CLOSED CONTACT		"Y" WINDINGS
	CLOSED SWITCH	88:88	DIGITAL READOUT
	OPEN SWITCH		SINGLE FILAMENT LAMP
	CLOSED GANGED SWITCH		DUAL FILAMENT LAMP
	OPEN GANGED SWITCH		L.E.D. — LIGHT EMITTING DIODE
	TWO POLE SINGLE THROW SWITCH		THERMISTOR
	PRESSURE SWITCH		GAUGE
	SOLENOID SWITCH		SENSOR
	MERCURY SWITCH		FUEL INJECTOR
	DIODE OR RECTIFIER		948W-192

Fig. 5 Symbol Identification

DESCRIPTION AND OPERATION (Continued)

ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are solid state and a symbol (Fig. 6) is used to indicate this. When handling any component with this symbol comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.

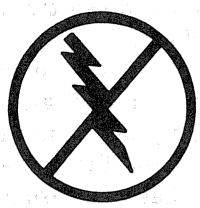
(1) Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.

(2) Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.

(3) When using a voltmeter, be sure to connect the ground lead first.

(4) Do not remove the part from its protective packing until it is time to install the part.

(5) Before removing the part from its package, ground the package to a known good ground on the vehicle.



948W-193

Fig. 6 Electrostatic Discharge Symbol

DIAGNOSIS AND TESTING

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

- Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: NEVER USE A JUMPER WIRE ACROSS A LOAD, SUCH AS A MOTOR, CONNECTED BETWEEN A BATTERY FEED AND GROUND.

- Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicle are solid state. When checking voltages in these circuits use a meter with a 10-megohm or greater impedance.

- Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: - Most of the electrical components used in today's vehicle are Solid State. When checking resistance in these circuits use a meter with a 10-megohm or greater impedance. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle electrical system can cause damage to the equipment and provide false readings.

- Probing Tools - These tools are used for probing terminals in connectors (Fig. 7). Select the proper size tool from Special Tool Package 6807, and insert it into the terminal being tested. Use the other end of the tool to insert the meter probe.

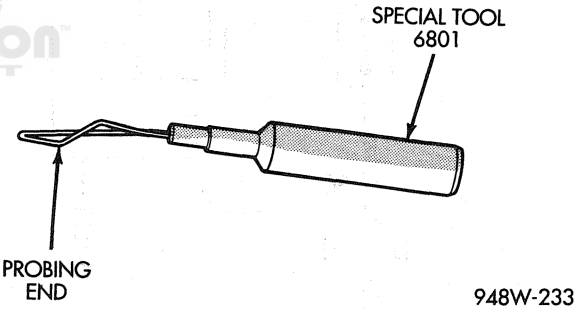


Fig. 7 Probing Tool

INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly check the following items.

- Connectors are fully seated
- Spread terminals, or terminal push out
- Terminals in the wiring assembly are fully seated into the connector/component and locked in position
- Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
- Damaged connector/component casing exposing the item to dirt and moisture
- Wire insulation that has rubbed through causing a short to ground
- Wiring broke inside of the insulation

DIAGNOSIS AND TESTING (Continued)

TROUBLESHOOTING TESTS

Before beginning any tests on a vehicles electrical system use the Wiring Diagrams and study the circuit. Also refer to the Troubleshooting Wiring Problems section in this section.

TESTING FOR VOLTAGE

(1) Connect the ground lead of a voltmeter to a known good ground (Fig. 8).

(2) Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.

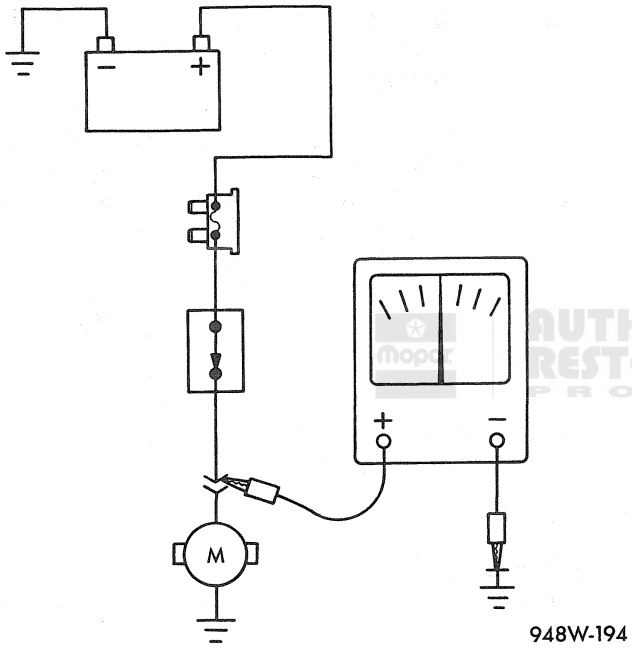


Fig. 8 Testing for Voltage

TESTING FOR CONTINUITY

(1) Remove the fuse for the circuit being checked or, disconnect the battery.

(2) Connect one lead of the ohmmeter to one side of the circuit being tested (Fig. 9).

(3) Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.

TESTING FOR A SHORT TO GROUND

(1) Remove the fuse and disconnect all items involved with the fuse.

(2) Connect a test light or a voltmeter across the terminals of the fuse.

(3) Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.

(4) If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

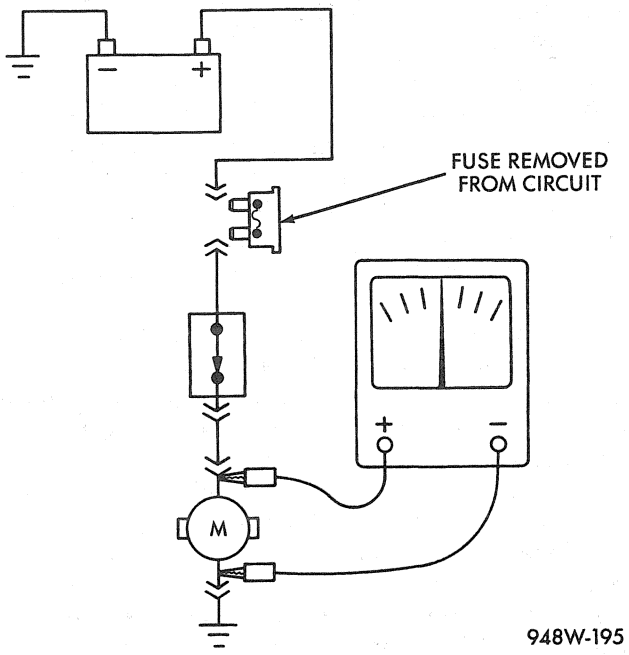


Fig. 9 Testing for Continuity

TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

(1) Refer to the wiring diagrams and disconnect or isolate all items on the fused circuit.

(2) Replace the blown fuse.

(3) Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.

(4) Start connecting the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

TESTING FOR A VOLTAGE DROP

(1) Connect the positive lead of the voltmeter to the side of the circuit closest to the battery (Fig. 10).

(2) Connect the other lead of the voltmeter to the other side of the switch or component.

(3) Operate the item.

(4) The voltmeter will show the difference in voltage between the two points.

TROUBLESHOOTING WIRING PROBLEMS

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

(1) Verify the problem.

(2) Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.

DIAGNOSIS AND TESTING (Continued)

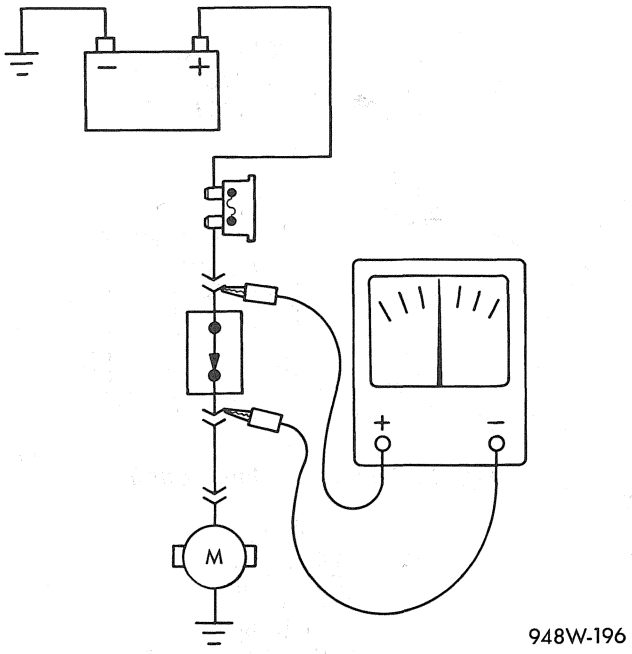


Fig. 10 Testing for Voltage Drop

(3) Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.

(4) Isolate the problem area.

(5) Repair the problem.

(6) Verify proper operation. For this step check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

SERVICE PROCEDURES

WIRING REPAIR

When replacing or repairing a wire, it is important that the correct gauge be used as shown in the wiring diagrams. The wires must also be held securely in place to prevent damage to the insulation.

(1) Disconnect battery negative cable

(2) Remove 1 inch of insulation from each end of the wire.

(3) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(4) Spread the strands of the wire apart on each part of the exposed wire (example 1). (Fig. 11)

(5) Push the two ends of wire together until the strands of wire are close to the insulation (example 2) (Fig. 11)

(6) Twist the wires together (example 3) (Fig. 11)

(7) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(8) Center the heat shrink tubing over the joint, and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

(9) Secure the wire to the existing ones to prevent chafing or damage to the insulation

(10) Connect battery and test all affected systems.

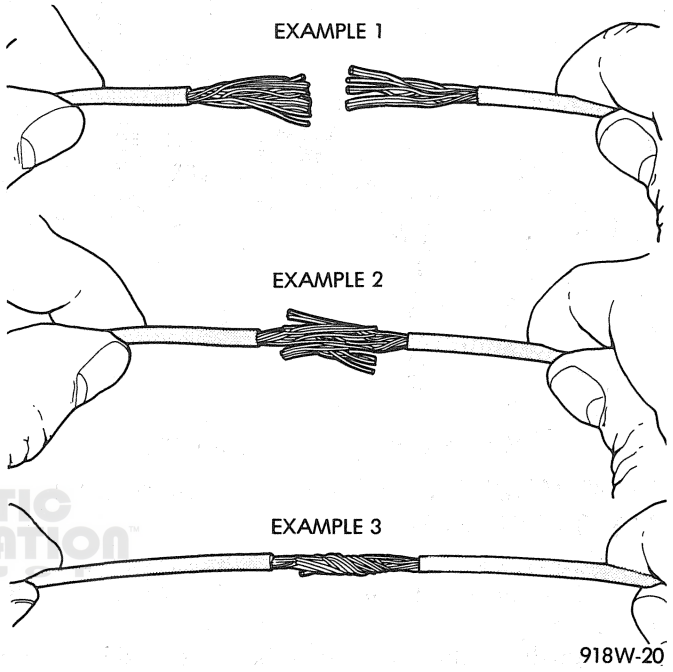


Fig. 11 Wire Repair

TERMINAL/CONNECTOR REPAIR-MOLEX CONNECTORS

(1) Disconnect battery.

(2) Disconnect the connector from its mating half/component.

(3) Insert the terminal releasing special tool 6742 into the terminal end of the connector (Fig. 12).

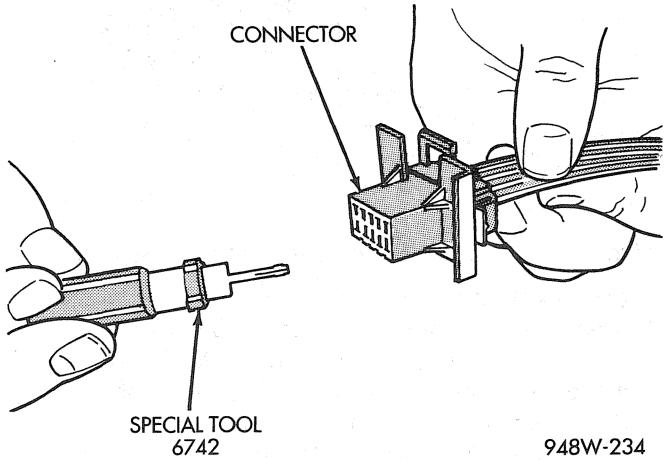


Fig. 12 Molex Connector Repair

SERVICE PROCEDURES (Continued)

(4) Using special tool 6742 release the locking fingers on the terminal (Fig. 13).
(5) Pull on the wire to remove it from the connector.
(6) Repair or replace the connector or terminal, as necessary.

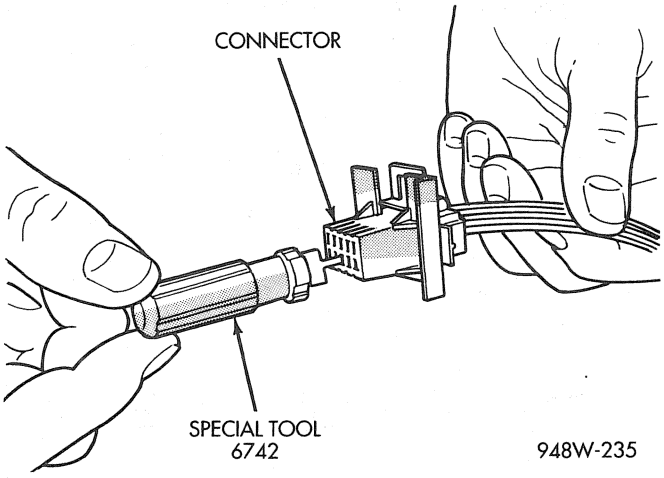


Fig. 13 Using Special Tool 6742

TERMINAL/CONNECTOR REPAIR—THOMAS AND BETTS CONNECTORS

(1) Disconnect battery.
(2) Disconnect the connector from its mating half/component.
(3) Push in the two lock tabs on the side of the connector (Fig. 14).

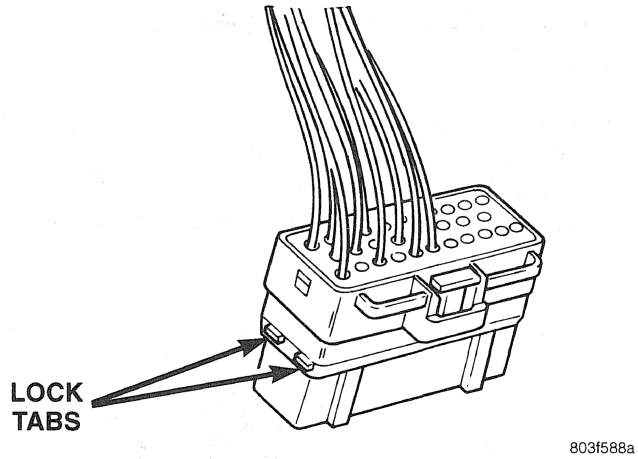


Fig. 14 Thomas and Betts Connector Lock Release Tabs

(4) Insert the probe end of special tool 6934 into the back of the connector cavity (Fig. 15).
(5) Grasp the wire and tool 6934 and slowly remove the wire and terminal from the connector.
(6) Repair or replace the terminal.
(7) Install the wire and terminal in the connector. Fully seat the terminal in the connector.
(8) Push in the single lock tab on the side of the connector (Fig. 16).

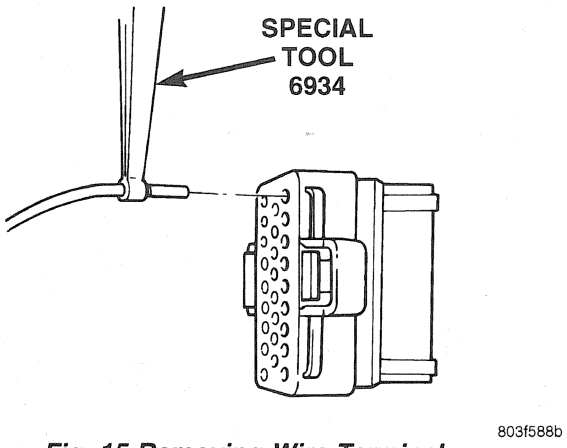


Fig. 15 Removing Wire Terminal

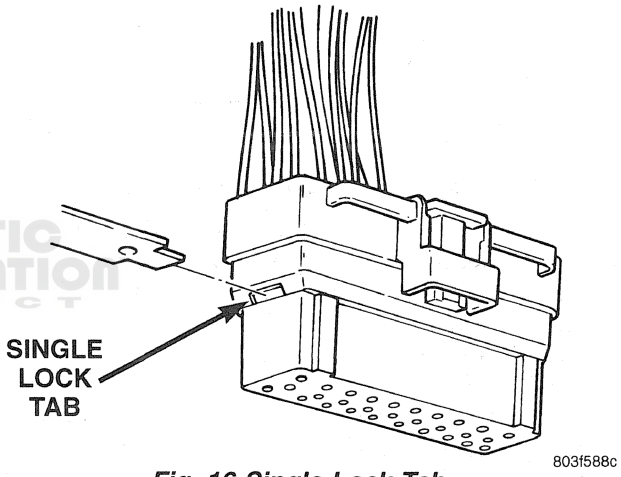


Fig. 16 Single Lock Tab

CONNECTOR REPLACEMENT

(1) Disconnect battery.
(2) Disconnect the connector that is to be repaired from its mating half/component
(3) Remove the connector locking wedge, if required (Fig. 17)

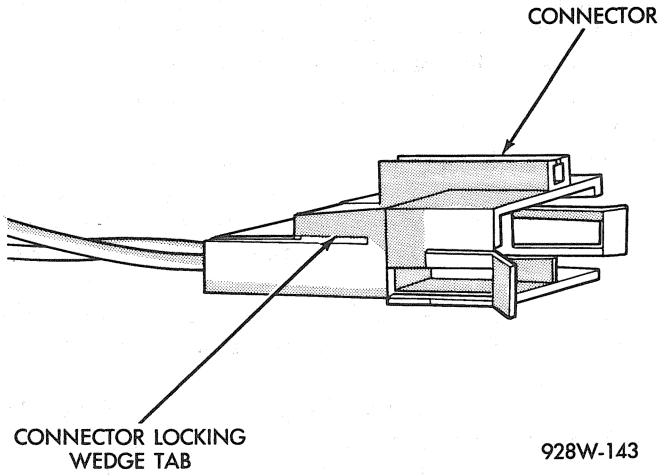


Fig. 17 Connector Locking Wedge

SERVICE PROCEDURES (Continued)

(4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Fig. 18) (Fig. 19).

(5) Reset the terminal locking tang, if it has one.

(6) Insert the removed wire in the same cavity on the repair connector.

(7) Repeat steps four through six for each wire in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.

(8) Insert the connector locking wedge into the repaired connector, if required.

(9) Connect connector to its mating half/component.

(10) Connect battery and test all affected systems.

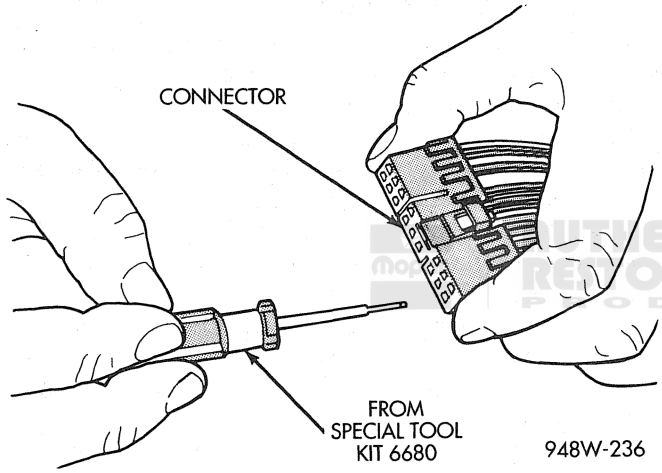


Fig. 18 Terminal Removal

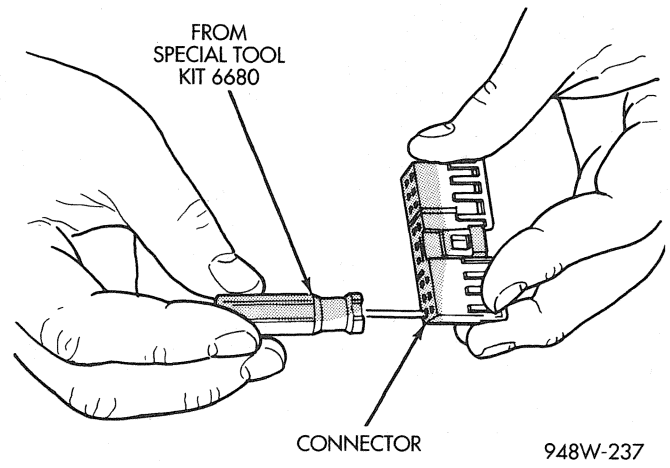


Fig. 19 Terminal Removal Using Special Tool

CONNECTOR AND TERMINAL REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector (that is to be repaired) from its mating half/component.

(3) Cut off the existing wire connector directly behind the insulator. Remove six inches of tape from the harness.

(4) Stagger cut all wires on the harness side at 1/2 inch intervals (Fig. 20).

(5) Remove 1 inch of insulation from each wire on the harness side.

(6) Stagger cut the matching wires on the repair connector assembly in the opposite order as was done on the harness side of the repair. Allow extra length for soldered connections. Check that the overall length is the same as the original (Fig. 20).

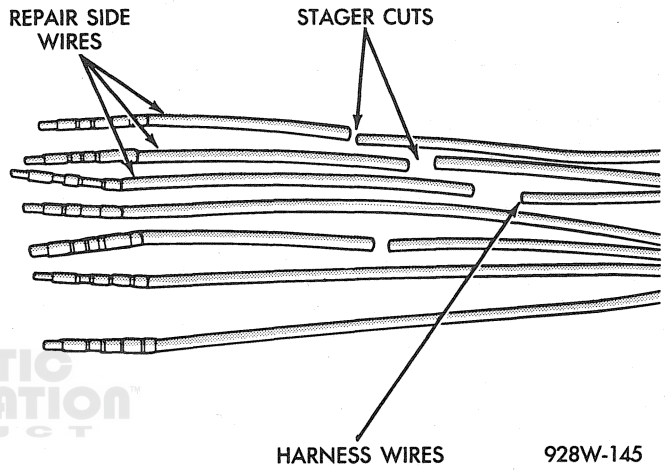


Fig. 20 Stagger Cutting Wires

(7) Remove 1 inch of insulation from each wire.

(8) Place a piece of heat shrink tubing over one side of the wire. Be sure the tubing will be long enough to cover and seal the entire repair area.

(9) Spread the strands of the wire apart on each part of the exposed wires.

(10) Push the two ends of wire together until the strands of wire are close to the insulation.

(11) Twist the wires together.

(12) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(13) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing

(14) Repeat steps 8 through 13 for each wire.

(15) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.

(16) Re-connect the repaired connector.

(17) Connect the battery, and test all affected systems.

TERMINAL REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector being repaired from its mating half. Remove connector locking wedge, if required (Fig. 21).

SERVICE PROCEDURES (Continued)

(3) Remove connector locking wedge, if required (Fig. 21).

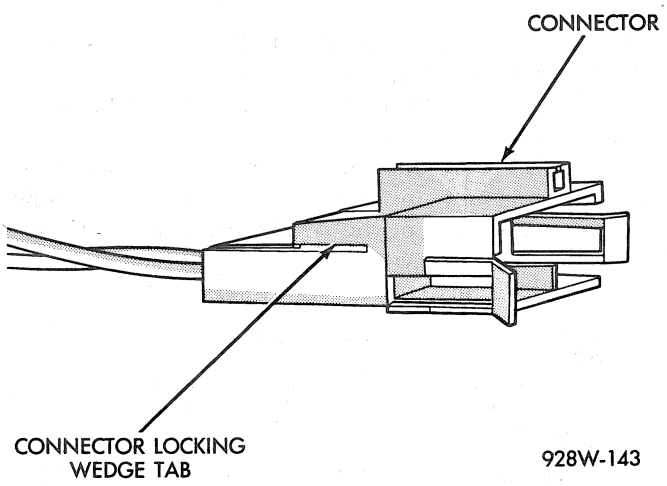


Fig. 21 Connector Locking Wedge Tab (Typical)

(4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Fig. 22) (Fig. 23).

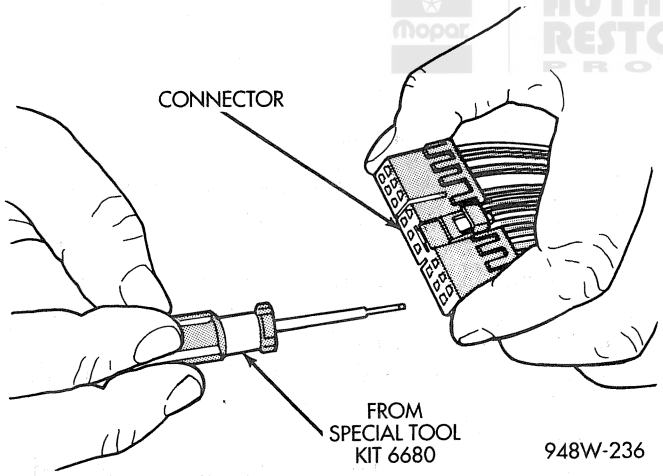


Fig. 22 Terminal Removal

(5) Cut the wire 6 inches from the back of the connector.

(6) Remove 1 inch of insulation from the wire on the harness side.

(7) Select a wire from the terminal repair assembly that best matches the color wire being repaired.

(8) Cut the repair wire to the proper length and remove 1 inch of insulation.

(9) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(10) Spread the strands of the wire apart on each part of the exposed wires.

(11) Spread the strands of the wire apart on each part of the exposed wires.

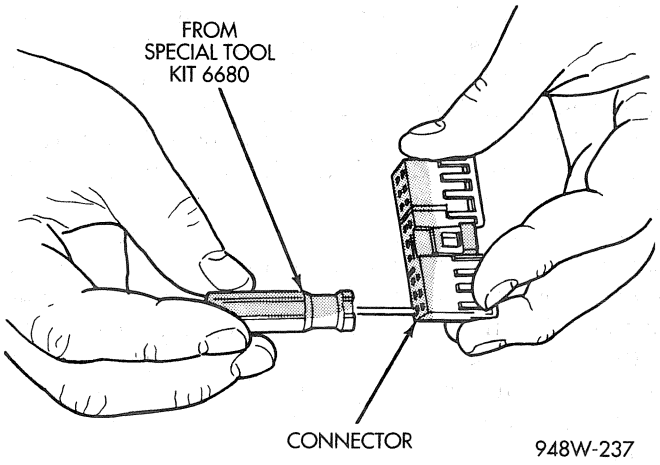


Fig. 23 Terminal Removal Using Special Tool

(12) Push the two ends of wire together until the strands of wire are close to the insulation.

(13) Twist the wires together.

(14) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(15) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

(16) Insert the repaired wire into the connector.

(17) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.

(18) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.

(19) Connect battery, and test all affected systems.

DIODE REPLACEMENT

(1) Disconnect the battery.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 24).

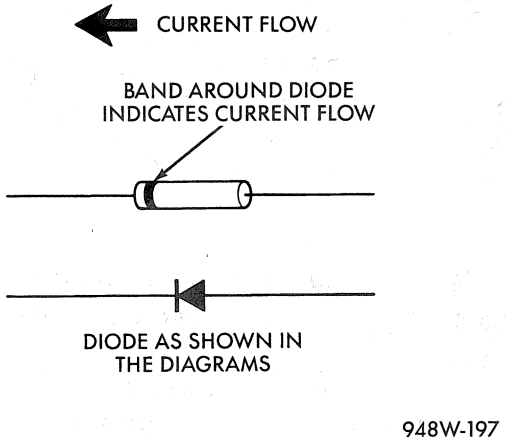


Fig. 24 Diode Identification

SERVICE PROCEDURES (Continued)

(4) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(5) Install the new diode in the harness, making sure current flow is correct. If necessary refer to the appropriate wiring diagram for current flow.

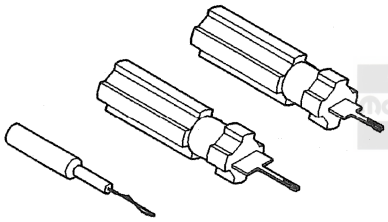
(6) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(7) Tape the diode to the harness using electrical tape making, sure the diode is completely sealed from the elements.

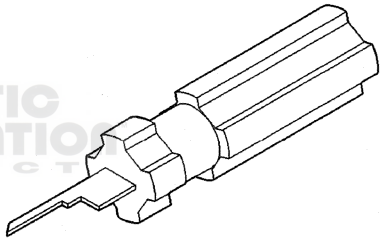
(8) Re-connect the battery, and test affected systems.

SPECIAL TOOLS

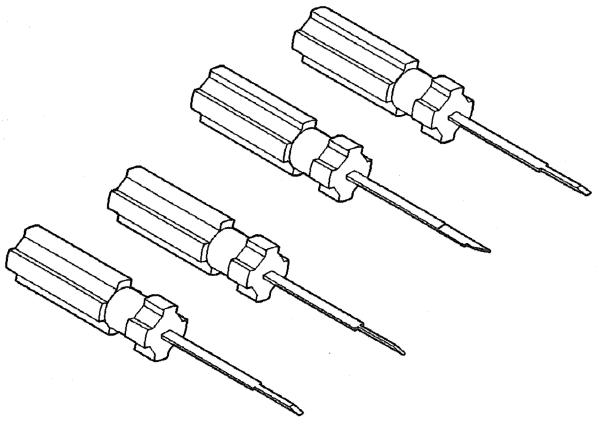
WIRING/TERMINAL



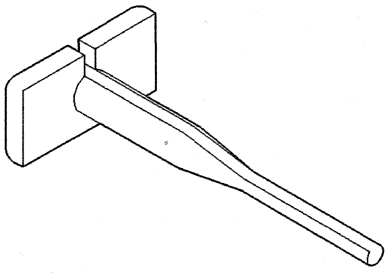
Probing Tool Package 6807



Terminal Removing Tool 6932



Terminal Pick 6680



Terminal Removing Tool 6934

8W-02 COMPONENT INDEX

GENERAL INFORMATION

INTRODUCTION

This section provides an alphabetical listing of all the components covered in group 8W. For information on system operation, refer to the appropriate section of the wiring diagrams.

Mopar | AUTHENTIC RESTORATION PRODUCT

COMPONENT/SECTION INDEX

Component	Section
A/C Compressor	8W-42
ABS Main Relay	8W-35
ABS Pump Motor Relay	8W-35
ABS Warning Lamp	8W-35
Ambient Temperature Sensor	8W-49
Automatic Shut Down (ASD) Relay	8W-30
Back-Up Lamps	8W-51
Battery Temperature Sensor	8W-30
Blower Motor	8W-42
Brake Warning Lamp	8W-40
Buzzer Module	8W-44
Camshaft Position Sensor	8W-30
Cargo Lamp	8W-44
CCD Bus	8W-30, 35
Center High Mounted Stop Lamps (CHMSL)	8W-51
Charging System	8W-20
Cigar Lighter	8W-41
Combination Flasher	8W-52
Controller Anti-Lock Brake	8W-35
Courtesy Lamp	8W-44
Crankshaft Position Sensor	8W-30
Data Link Connector	8W-30
Daytime Running Lamp (DRL) Module	8W-50
Dome Lamp	8W-44
Dome/Reading Lamps	8W-44
Door Lock Relay	8W-61
Door Unlock Relay	8W-61
Engine Coolant Temperature Warning Lamp	8W-40
Engine Coolant Temperature Gauge	8W-40
Engine Coolant Temperature Sensor	8W-30
Engine Starter Motor	8W-21
Evap/Purge Solenoid	8W-30
Extended Idle Switch (Police Package)	8W-30
Fog Lamps	8W-50
Four-Wheel Drive (4WD) Switch	8W-31
Fuel Gauge	8W-40
Fuel Injectors	8W-30
Fuel Pump Module	8W-30
Fuel Pump Relay	8W-30
Fuse/Fuse Block	8W-10
G-Switch	8W-35
Generator	8W-20
Generator Lamp	8W-40
Glove Box Lamp	8W-44
Halo Lamp	8W-44
Hazard Flashers	8W-52
Headlamp Delay Relay	8W-50
Headlamps	8W-50
Heated Oxygen Sensor	8W-30
High Beam Indicator Lamp	8W-40

Component	Section
Horn	8W-41
Hydraulic Control Unit	8W-35
Idle Air Control (IAC) Motor	8W-30
Ignition Coil	8W-30
Ignition Switch	8W-30
Instrument Cluster	8W-40
Instrument Panel Illumination Lamps	8W-44
Intake Air Temperature (IAT) Sensor	8W-30
Intermittent Wipers	8W-53
Left Turn Relay	8W-54
License Lamp	8W-51
Low Washer Fluid Warning Lamp	8W-53
Malfunction Indicator Lamp (MIL)	8W-30, 40
Manifold Absolute Pressure (MAP) Sensor	8W-30
Manual Transmission Up-Shift Lamp	8W-30, 40
Oil Pressure Gauge	8W-40
Oil Pressure Warning Lamp	8W-40
Overhead Console	8W-49
Overhead Console Lamps	8W-49
Park Lamps	8W-50
Park/Neutral Position Switch	8W-31
Power Distribution	8W-11
Power Mirrors	8W-62
Power Seat	8W-63
Power Steering Pressure Switch	8W-30
Powertrain Control Module	8W-30
Radiator Fan Relay	8W-42
Radio	8W-47
Rear Window Defogger	8W-48
Rear Wipers	8W-53
Relay Bank	8W-11
Remote Keyless Entry Module	8W-61
Right Turn Relay	8W-54
Seat Belt Indicator Warning Lamp	8W-40
Speedometer	8W-40
Starting System	8W-21
Stop Lamp Relay	8W-54
Stop Lamps	8W-51
Tachometer	8W-40
Tail Lamps	8W-51
Throttle Position Sensor	8W-30
Torque Converter Clutch Relay	8W-30, 31
Torque Converter Clutch Solenoid	8W-30, 31
Trailer Tow Connector	8W-54
Transmission Control Module	8W-31
Turn Signal Indicator Lamps	8W-40
Underhood Lamp	8W-44
Vehicle Speed Control	8W-33
Vehicle Speed Sensor	8W-30, 33, 40
Visor Vanity Mirror Lamps	8W-44

AUTOMOTIVE RESOURCES

8W-10 FUSE/FUSE BLOCK

DESCRIPTION AND OPERATION

INTRODUCTION

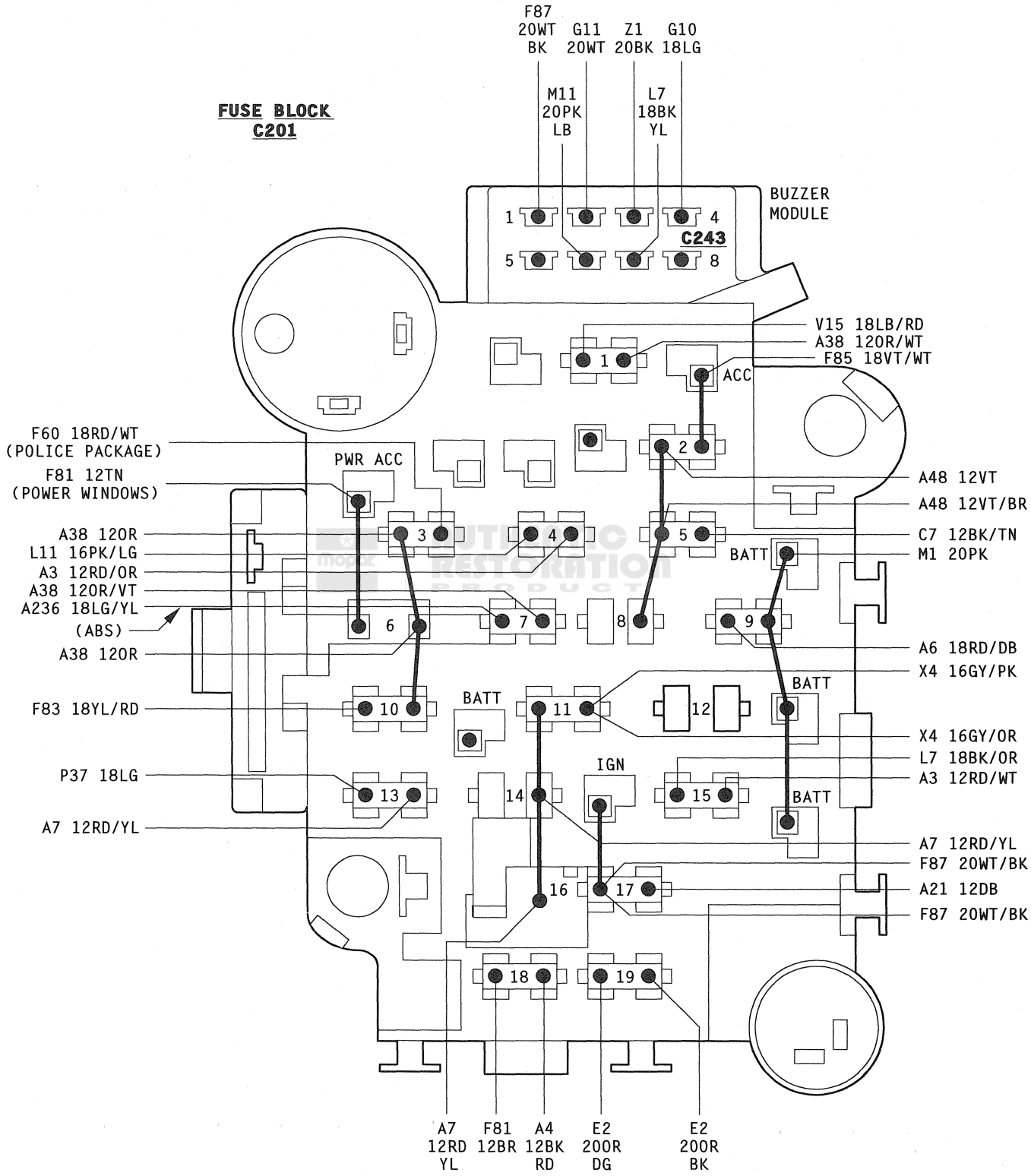
This section covers the Fuse Block and all circuits involved with it. For additional information on system operation, refer to the appropriate section of the wiring diagrams.

Mopar | AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

Component	Page
Circuit Breaker 6	8W-10-3, 8
Circuit Breaker 16	8W-10-11
Fuse Application Chart	8W-10-4
Fuse Block	8W-10-3
Fuse 1	8W-10-3, 8
Fuse 2	8W-10-3, 7
Fuse 3	8W-10-3, 8
Fuse 3 (PDC)	8W-10-5
Fuse 4	8W-10-3, 5
Fuse 4 (PDC)	8W-10-11
Fuse 5	8W-10-3, 7
Fuse 7	8W-10-3, 8
Fuse 8	Not Used
Fuse 8 (PDC)	8W-10-6, 7, 8
Fuse 9	8W-10-3, 9
Fuse 10	8W-10-3, 8
Fuse 11	8W-10-3, 11
Fuse 12	Not Used
Fuse 13	8W-10-3, 11
Fuse 13 (PDC)	8W-10-5
Fuse 14	Not Used
Fuse 15	8W-10-3, 5
Fuse 16	8W-10-3
Fuse 17	8W-10-3, 6
Fuse 18	8W-10-3, 5
Fuse 19	8W-10-3, 10
Fuse 19 (PDC)	8W-10-9
Ignition Switch	8W-10-6, 7, 8
Power Distribution Center	8W-10-5, 6, 7, 8, 9, 11

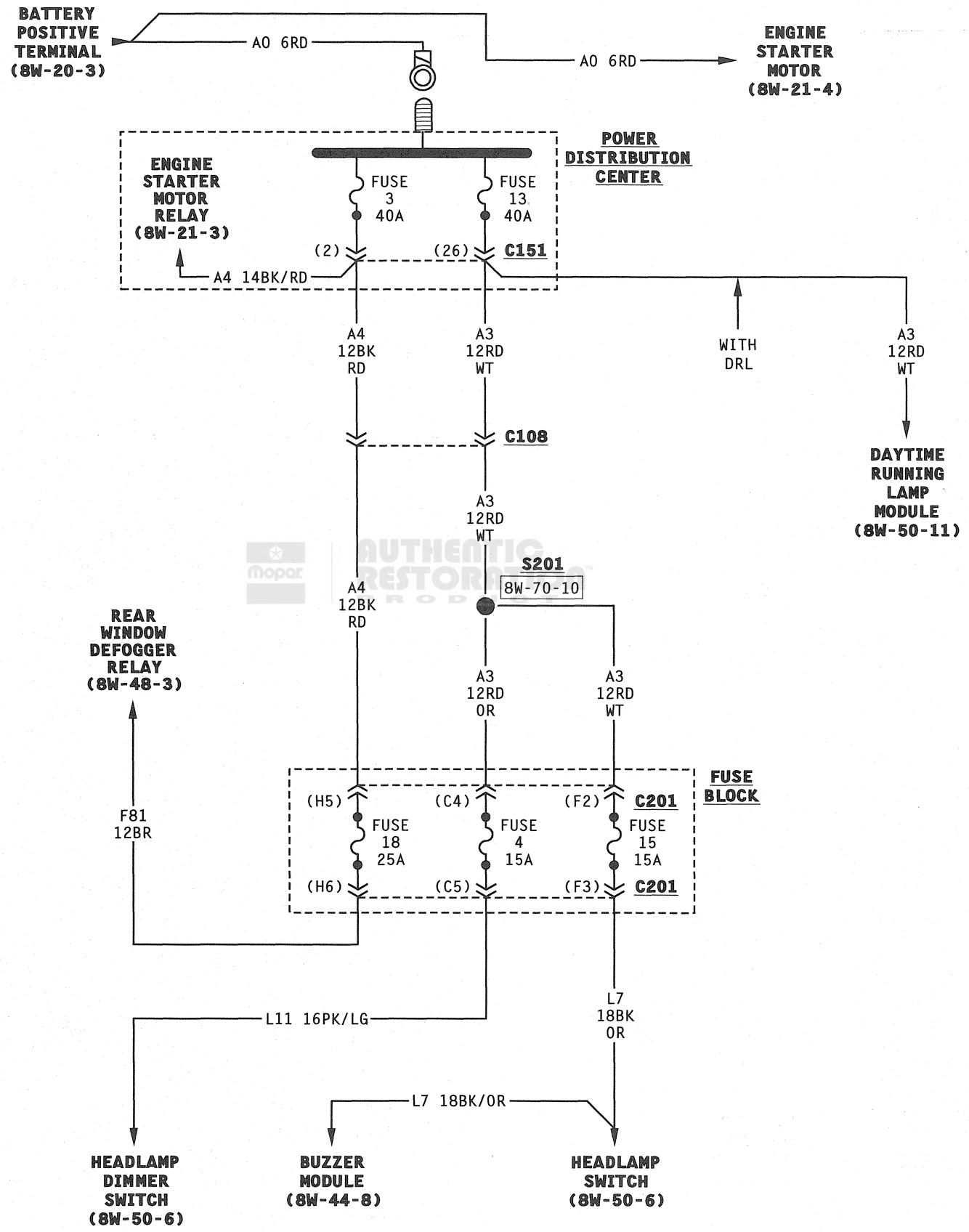
Mopar AUTHENTIC RESTORATION PRODUCT

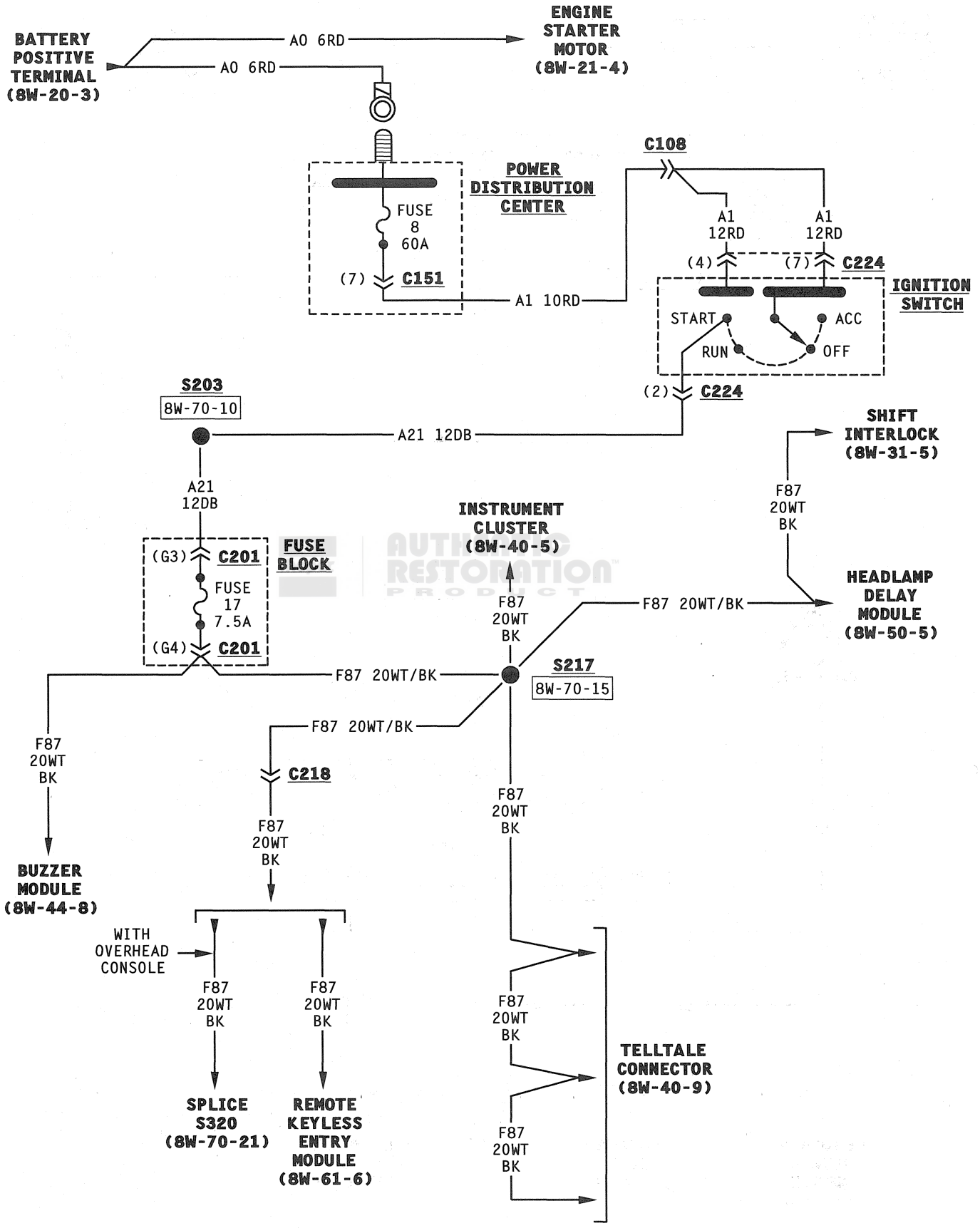

FUSE BLOCK
C201
F87
20WT
BK
G11
20WT
Z1
20BK
G10
18LG
M11
20PK
LB
L7
18BK
YL
BUZZER
MODULE
C243
1
4
5
8
V15 18LB/RD
A38 12OR/WT
F85 18VT/WT
ACC
F60 18RD/WT
(POLICE PACKAGE)
F81 12TN
(POWER WINDOWS)
PWR ACC
A48 12VT
A48 12VT/BR
A38 12OR
L11 16PK/LG
A3 12RD/OR
A38 12OR/VT
A236 18LG/YL
(ABS)
C7 12BK/TN
M1 20PK
BATT
A38 12OR
A6 18RD/DB
X4 16GY/PK
F83 18YL/RD
BATT
BATT
X4 16GY/OR
L7 18BK/OR
A3 12RD/WT
P37 18LG
IGN
BATT
A7 12RD/YL
A7 12RD/YL
F87 20WT/BK
A21 12DB
F87 20WT/BK
A7
12RD
YL
F81
12BR
A4
12BK
RD
E2
200R
DG
E2
200R
BK

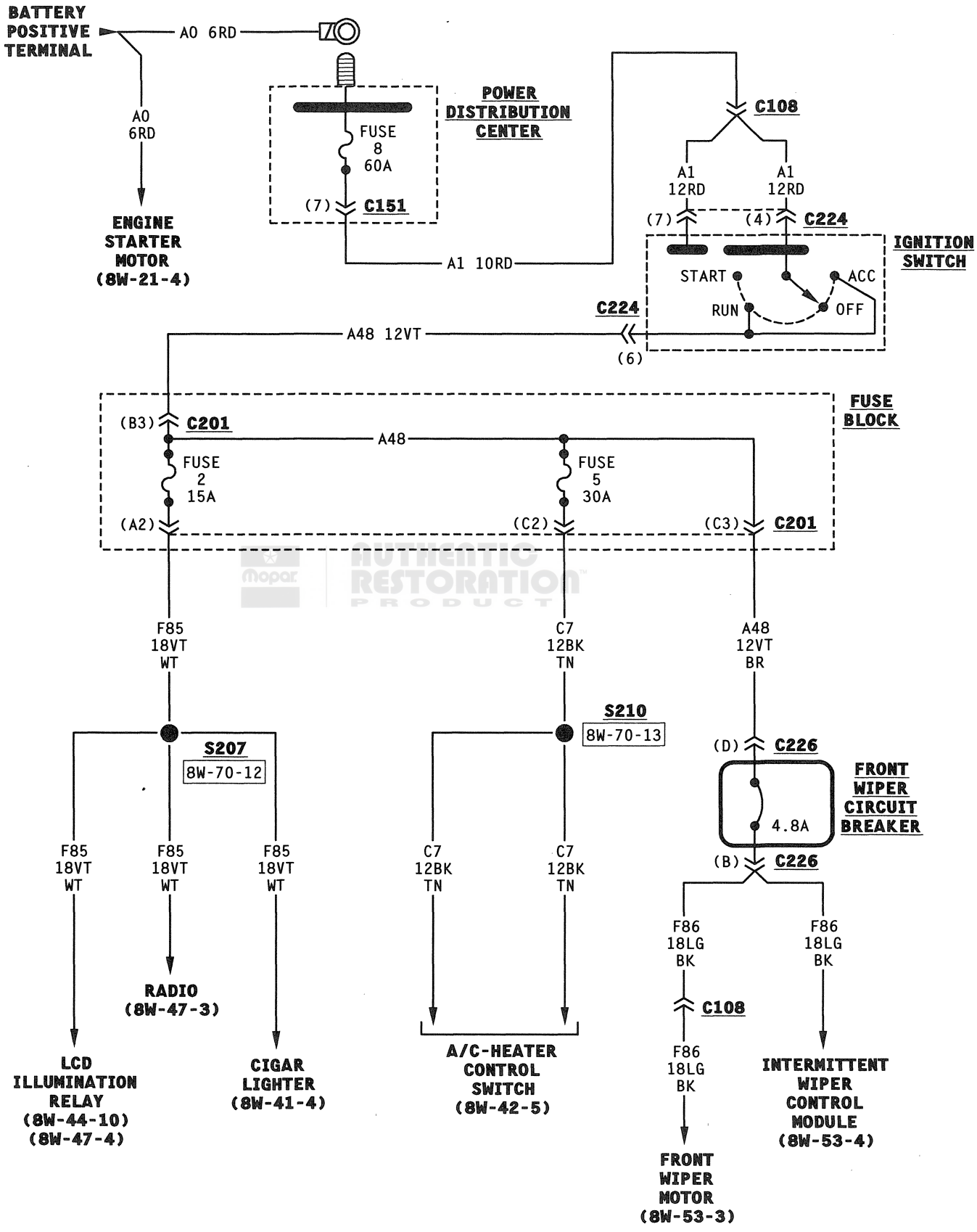
FUSES

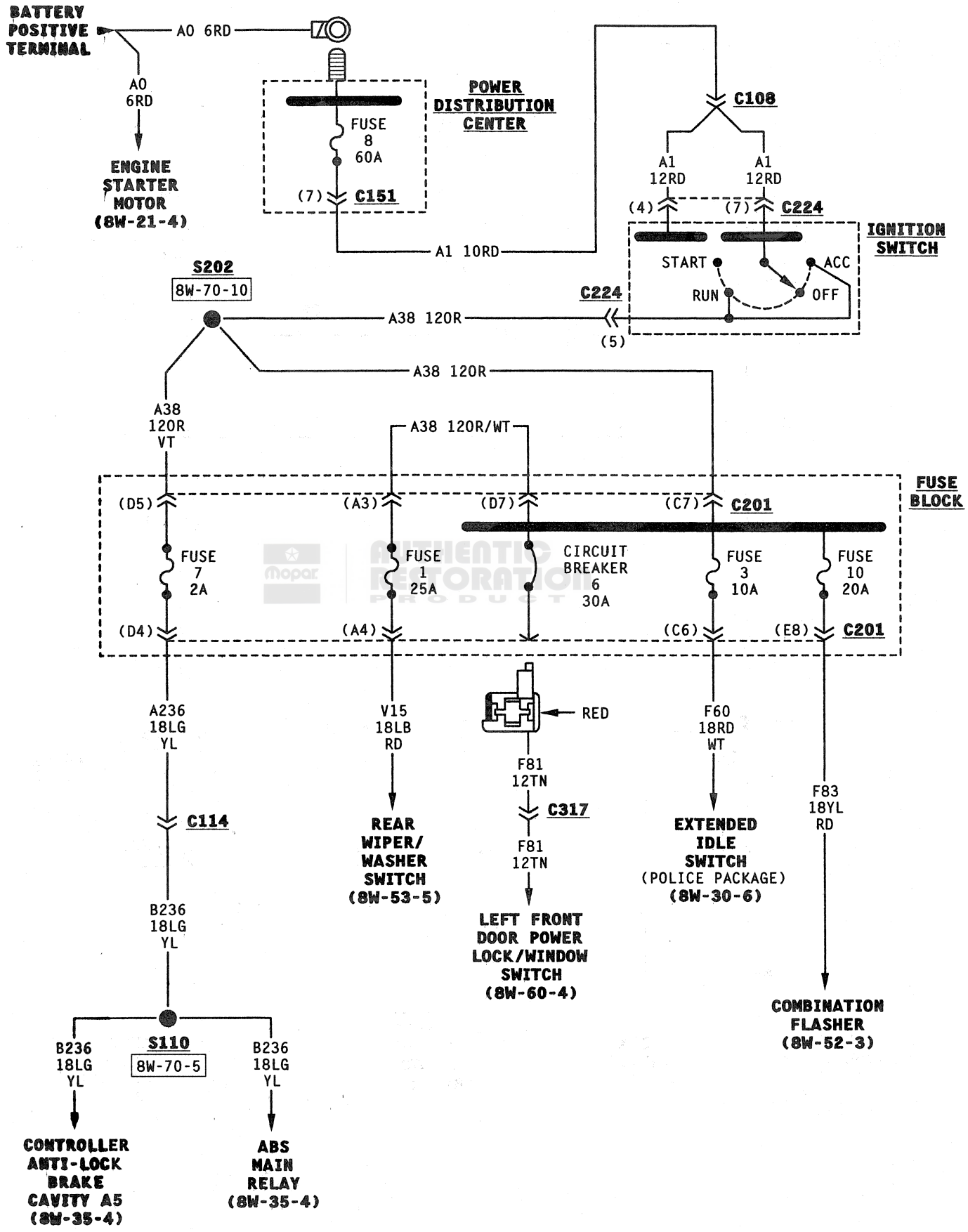
FUSE NO.	AMPS	COLOR	SECTION/PAGE
1	25	WHITE	8W-10-8
2	15	LIGHT BLUE	8W-10-7
3	10	RED	8W-10-8
4	15	LIGHT BLUE	8W-10-5
5	30	GREEN	8W-10-7
6	30	C.B.	8W-10-8
7	2	PINK	8W-10-8
8	–	–	–
9	10	RED	8W-10-9
10	20	YELLOW	8W-10-8
11	25	WHITE	8W-10-11
12	–	–	–
13	20	YELLOW	8W-10-11
14	–	–	–
15	15	LIGHT BLUE	8W-10-7
16	30	C.B.	8W-10-1
17	7.5	BROWN	8W-10-6
18	25	WHITE	8W-10-5
19	5	TAN	8W-10-10

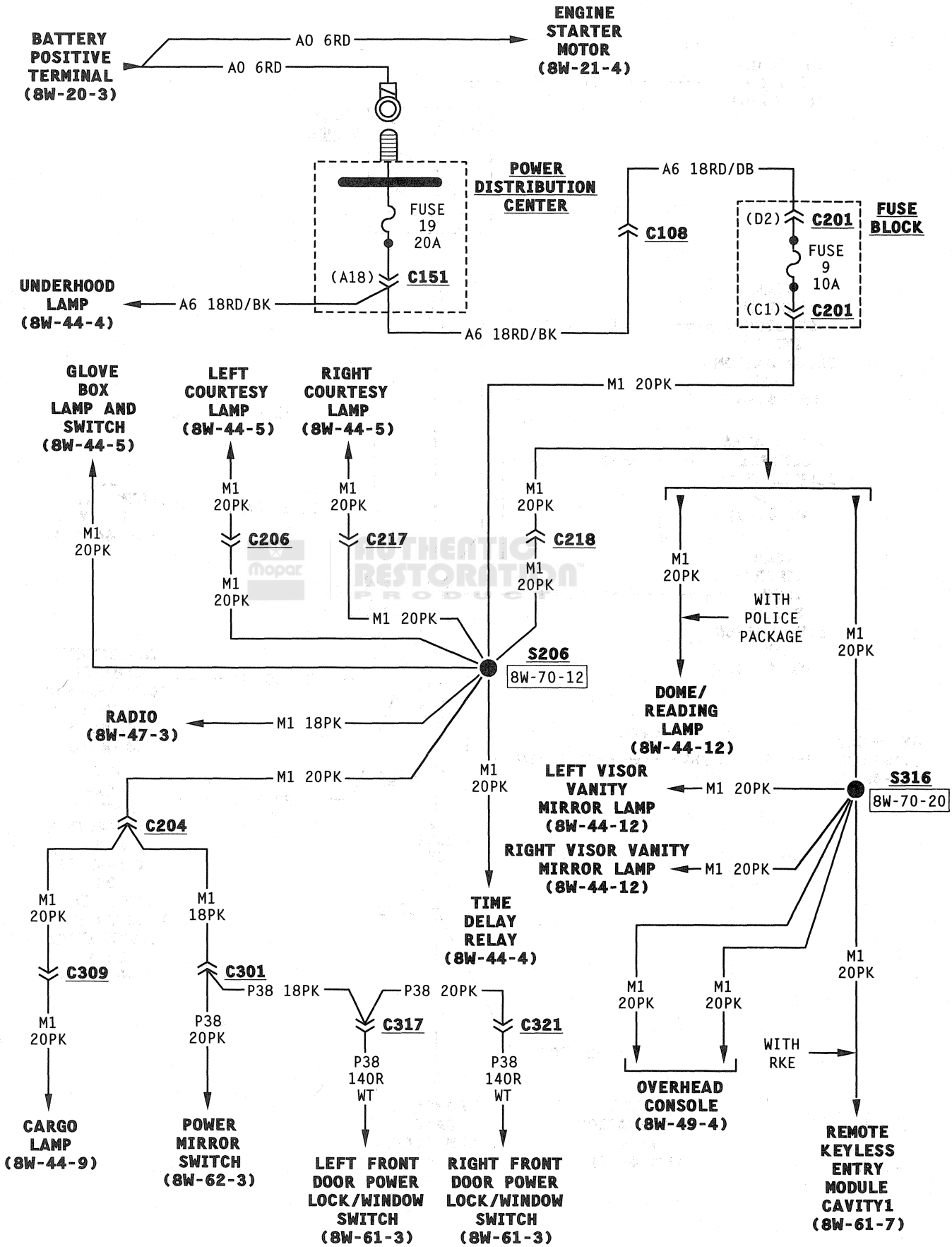
Mopar AUTHENTIC RESTORATION PRODUCT

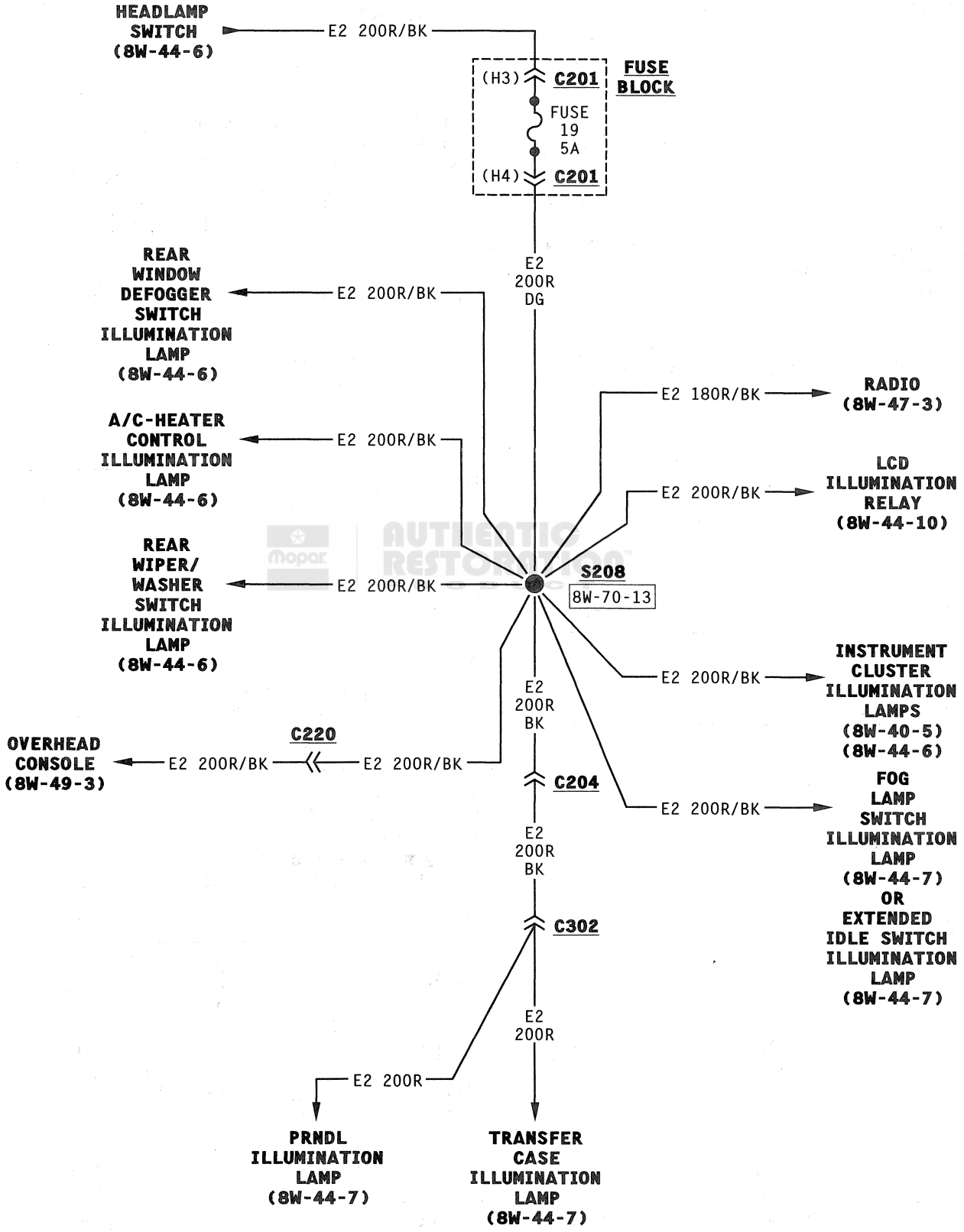

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
ENGINE STARTER MOTOR RELAY (8W-21-3)
FUSE 3 40A
FUSE 13 40A
(2)
(26)
C151
A4 14BK/RD
A4 12BK RD
A3 12RD WT
WITH DRL
A3 12RD WT
DAYTIME RUNNING LAMP MODULE (8W-50-11)
C108
A3 12RD WT
S201
8W-70-10
A4 12BK RD
REAR WINDOW DEFOGGER RELAY (8W-48-3)
A3 12RD OR
A3 12RD WT
FUSE BLOCK
(H5)
(C4)
(F2)
C201
FUSE 18 25A
FUSE 4 15A
FUSE 15 15A
(H6)
(C5)
(F3)
C201
F81 12BR
L11 16PK/LG
L7 18BK OR
L7 18BK/OR
HEADLAMP DIMMER SWITCH (8W-50-6)
BUZZER MODULE (8W-44-8)
HEADLAMP SWITCH (8W-50-6)

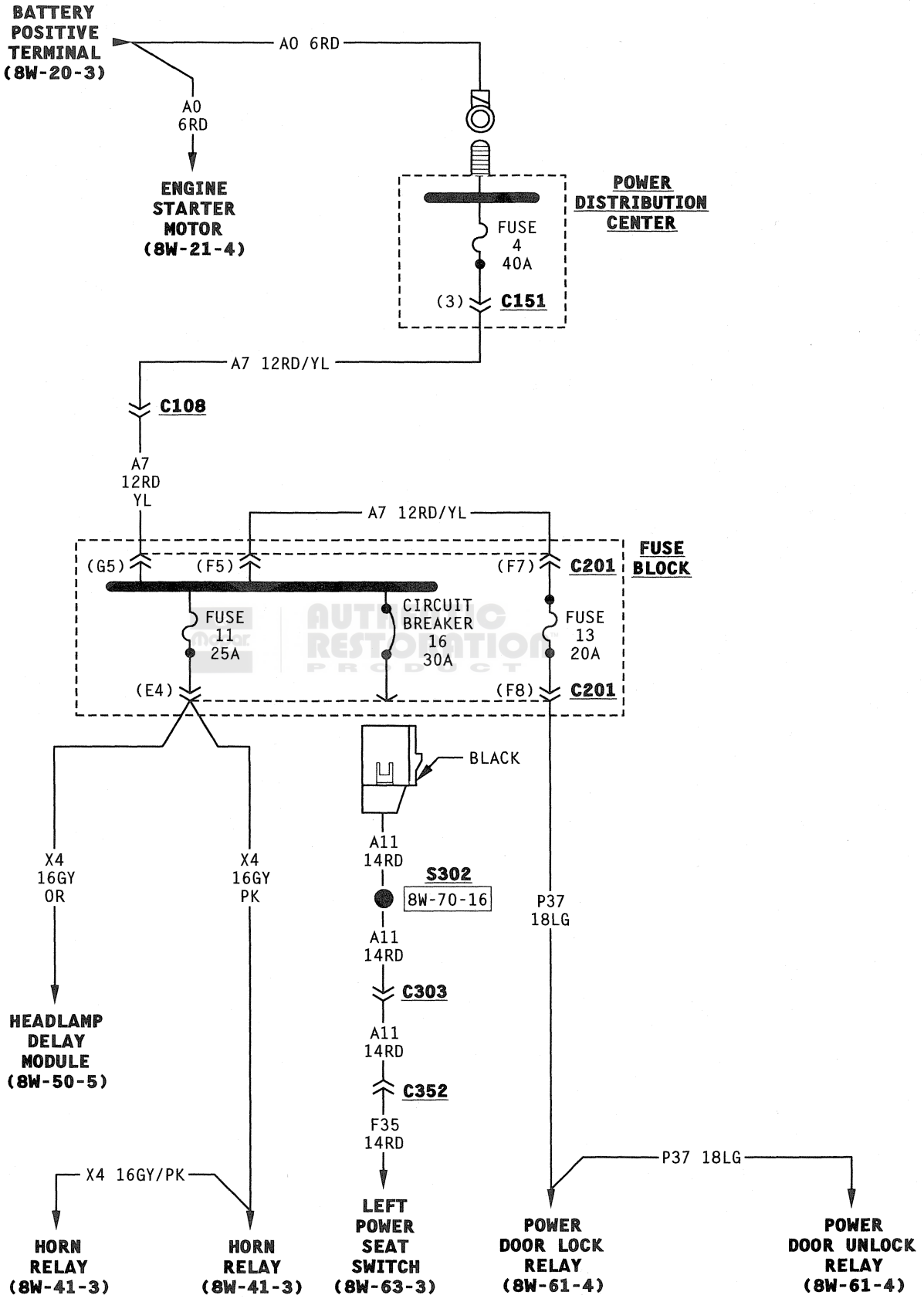

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
A1 10RD
C108
A1 12RD
A1 12RD
(4) (7) C224
IGNITION SWITCH
START
ACC
RUN
OFF
(2) C224
S203
8W-70-10
A21 12DB
A21 12DB
SHIFT INTERLOCK (8W-31-5)
F87 20WT BK
INSTRUMENT CLUSTER (8W-40-5)
FUSE BLOCK
(G3) C201
FUSE 17 7.5A
(G4) C201
F87 20WT/BK
F87 20WT/BK
HEADLAMP DELAY MODULE (8W-50-5)
S217
8W-70-15
F87 20WT/BK
F87 20WT BK
C218
F87 20WT BK
F87 20WT BK
BUZZER MODULE (8W-44-8)
WITH OVERHEAD CONSOLE
F87 20WT BK
F87 20WT BK
F87 20WT BK
F87 20WT BK
F87 20WT BK
TELLTALE CONNECTOR (8W-40-9)
SPLICE S320 (8W-70-21)
REMOTE KEYLESS ENTRY MODULE (8W-61-6)


BATTERY POSITIVE TERMINAL
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 8 60A
(7) C151
POWER DISTRIBUTION CENTER
A1 10RD
C108
A1 12RD
A1 12RD
(7)
(4) C224
IGNITION SWITCH
START
ACC
RUN
OFF
C224
(6)
A48 12VT
FUSE BLOCK
(B3) C201
A48
FUSE 2 15A
FUSE 5 30A
(A2)
(C2)
(C3) C201
F85 18VT WT
C7 12BK TN
A48 12VT BR
S207
8W-70-12
S210
8W-70-13
(D) C226
FRONT WIPER CIRCUIT BREAKER
4.8A
(B) C226
F85 18VT WT
F85 18VT WT
F85 18VT WT
C7 12BK TN
C7 12BK TN
F86 18LG BK
F86 18LG BK
C108
F86 18LG BK
RADIO (8W-47-3)
LCD ILLUMINATION RELAY (8W-44-10) (8W-47-4)
CIGAR LIGHTER (8W-41-4)
A/C-HEATER CONTROL SWITCH (8W-42-5)
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
FRONT WIPER MOTOR (8W-53-3)


BATTERY POSITIVE TERMINAL
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 8 60A
(7) C151
POWER DISTRIBUTION CENTER
A1 10RD
C108
A1 12RD
A1 12RD
(4)
(7) C224
IGNITION SWITCH
START
ACC
RUN
OFF
S202
8W-70-10
C224
(5)
A38 120R
A38 120R
A38 120R/WT
A38 120R VT
FUSE BLOCK
(D5)
(A3)
(D7)
(C7) C201
FUSE 7 2A
FUSE 1 25A
CIRCUIT BREAKER 6 30A
FUSE 3 10A
FUSE 10 20A
(D4)
(A4)
(C6)
(E8) C201
A236 18LG YL
V15 18LB RD
RED
F60 18RD WT
F83 18YL RD
F81 12TN
C317
F81 12TN
C114
B236 18LG YL
REAR WIPER/ WASHER SWITCH (8W-53-5)
EXTENDED IDLE SWITCH (POLICE PACKAGE) (8W-30-6)
LEFT FRONT DOOR POWER LOCK/WINDOW SWITCH (8W-60-4)
COMBINATION FLASHER (8W-52-3)
S110
8W-70-5
B236 18LG YL
B236 18LG YL
CONTROLLER ANTI-LOCK BRAKE CAVITY A5 (8W-35-4)
ABS MAIN RELAY (8W-35-4)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 19 20A
(A18) C151
UNDERHOOD LAMP (8W-44-4)
A6 18RD/BK
A6 18RD/BK
A6 18RD/DB
C108
(D2) C201
FUSE 9 10A
(C1) C201
FUSE BLOCK
M1 20PK
GLOVE BOX LAMP AND SWITCH (8W-44-5)
LEFT COURTESY LAMP (8W-44-5)
RIGHT COURTESY LAMP (8W-44-5)
M1 20PK
C206
C217
C218
M1 20PK
S206
8W-70-12
WITH POLICE PACKAGE
DOME/ READING LAMP (8W-44-12)
RADIO (8W-47-3)
M1 18PK
C204
LEFT VISOR VANITY MIRROR LAMP (8W-44-12)
RIGHT VISOR VANITY MIRROR LAMP (8W-44-12)
S316
8W-70-20
TIME DELAY RELAY (8W-44-4)
C309
C301
C317
C321
P38 18PK
P38 20PK
P38 140R WT
OVERHEAD CONSOLE (8W-49-4)
WITH RKE
CARGO LAMP (8W-44-9)
POWER MIRROR SWITCH (8W-62-3)
LEFT FRONT DOOR POWER LOCK/WINDOW SWITCH (8W-61-3)
RIGHT FRONT DOOR POWER LOCK/WINDOW SWITCH (8W-61-3)
REMOTE KEYLESS ENTRY MODULE CAVITY1 (8W-61-7)


HEADLAMP SWITCH (8W-44-6)
E2 200R/BK
(H3) C201
FUSE BLOCK
FUSE 19 5A
(H4) C201
E2 200R DG
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6)
E2 200R/BK
A/C-HEATER CONTROL ILLUMINATION LAMP (8W-44-6)
E2 200R/BK
REAR WIPER/ WASHER SWITCH ILLUMINATION LAMP (8W-44-6)
E2 200R/BK
E2 180R/BK
RADIO (8W-47-3)
E2 200R/BK
LCD ILLUMINATION RELAY (8W-44-10)
S208
8W-70-13
E2 200R/BK
INSTRUMENT CLUSTER ILLUMINATION LAMPS (8W-40-5) (8W-44-6)
E2 200R BK
C220
OVERHEAD CONSOLE (8W-49-3)
E2 200R/BK
E2 200R/BK
C204
E2 200R/BK
FOG LAMP SWITCH ILLUMINATION LAMP (8W-44-7) OR EXTENDED IDLE SWITCH ILLUMINATION LAMP (8W-44-7)
E2 200R BK
C302
E2 200R
E2 200R
PRNDL ILLUMINATION LAMP (8W-44-7)
TRANSFER CASE ILLUMINATION LAMP (8W-44-7)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3) C151
A7 12RD/YL
C108
A7 12RD YL
A7 12RD/YL
FUSE BLOCK
(G5)
(F5)
(F7) C201
FUSE 11 25A
CIRCUIT BREAKER 16 30A
FUSE 13 20A
(E4)
(F8) C201
BLACK
X4 16GY OR
X4 16GY PK
A11 14RD
S302
8W-70-16
P37 18LG
A11 14RD
C303
A11 14RD
C352
F35 14RD
HEADLAMP DELAY MODULE (8W-50-5)
X4 16GY/PK
P37 18LG
HORN RELAY (8W-41-3)
HORN RELAY (8W-41-3)
LEFT POWER SEAT SWITCH (8W-63-3)
POWER DOOR LOCK RELAY (8W-61-4)
POWER DOOR UNLOCK RELAY (8W-61-4)

8W-11 POWER DISTRIBUTION

DESCRIPTION AND OPERATION

INTRODUCTION

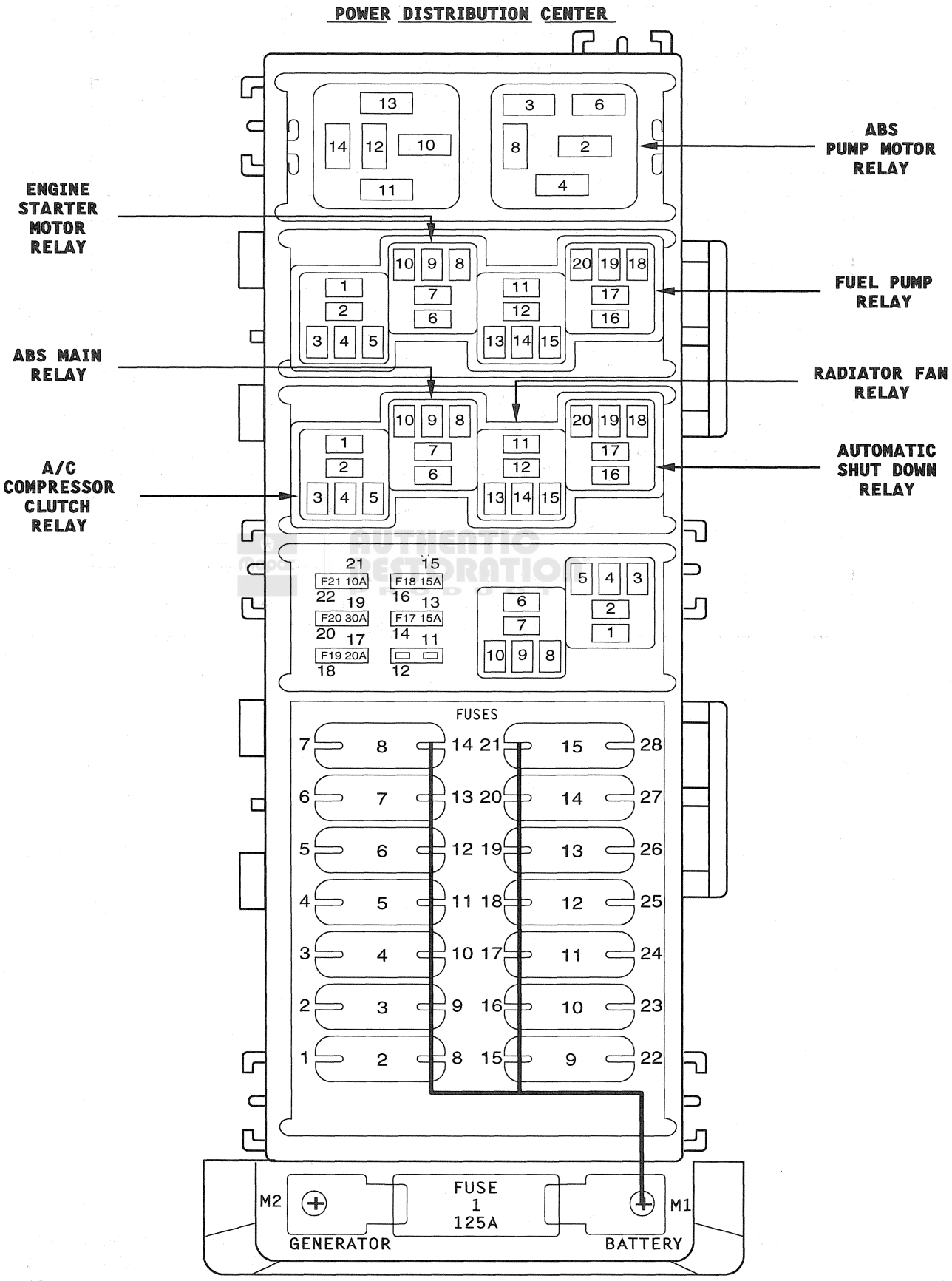
This section covers the power distribution center and all circuits involved with it. For additional information on system operation, refer to the appropriate section of the wiring diagrams.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

Component	Page
A/C Compressor Clutch Relay	8W-11-13
ABS Main Relay	8W-11-7
ABS Pump Motor Relay	8W-11-8
Automatic Shut Down Relay	8W-11-12
Circuit Breaker 16 (Fuse Block)	8W-11-8
Engine Starter Motor Relay	8W-11-6
Fuel Pump Relay	8W-11-9, 10, 11
Fuse 1 (PDC)	8W-11-8
Fuse 2 (PDC)	8W-11-14
Fuse 3 (PDC)	8W-11-6
Fuse 4	8W-11-15
Fuse 4 (PDC)	8W-11-8
Fuse 5 (PDC)	8W-11-8
Fuse 6 (PDC)	8W-11-9, 10, 11
Fuse 7	8W-11- 7
Fuse 8 (PDC)	8W-11-6, 7, 9, 10, 11
Fuse 9	8W-11-15
Fuse 10 (PDC)	8W-11-13
Fuse 11	8W-11-8
Fuse 13	8W-11- 8
Fuse 13 (PDC)	8W-11-15
Fuse 14 (PDC)	8W-11-7
Fuse 15	8W-11-15
Fuse 15 (PDC)	8W-11-13
Fuse 17 (PDC)	8W-11-14
Fuse 18	8W-11-6
Fuse 18 (PDC)	8W-11-11
Fuse 19 (PDC)	8W-11-15
Fuse 20 (PDC)	8W-11-12
Fuse 21 (PDC)	8W-11-10
Ignition Switch	8W-11-6, 7, 9, 10, 11
PDC Application Chart	8W-11-4
PDC Relay Chart	8W-11-5
PDC Face Illustration	8W-11-3
Radiator Fan Relay	8W-11-13
Relay Bank Chart	8W-11-16, 17
Relay Bank Face Illustration	8W-11-16

Mopar AUTHENTIC RESTORATION PRODUCT


POWER DISTRIBUTION CENTER
ENGINE STARTER MOTOR RELAY
ABS MAIN RELAY
A/C COMPRESSOR CLUTCH RELAY
ABS PUMP MOTOR RELAY
FUEL PUMP RELAY
RADIATOR FAN RELAY
AUTOMATIC SHUT DOWN RELAY
F21 10A
F20 30A
F19 20A
F18 15A
F17 15A
FUSES
FUSE 1 125A
M2
M1
GENERATOR
BATTERY

FUSES

FUSE NO.	AMPS	CIRCUIT	FUNCTION
1	125	A0 6RD	B(+)
2	20	L9 18BK/WT	FUSED B(+)
3	40	A4 12BK/RD	FUSED B(+)
		A4 14BK/RD	FUSED B(+)
4	40	A7 14RD/BK	FUSED B(+)
5	40	A10 12RD/DG	FUSED B(+)
6	30	A14 14RD	FUSED B(+)
7	–	–	–
8	60	A1 10RD	FUSED B(+)
9	–	–	–
10	30	A17 14RD/BK	FUSED B(+)
11	–	–	–
12	–	–	–
13	40	A3 12RD/WT	FUSED B(+)
		A3 12RD/WT	FUSED B(+)
14	30	A20 14RD/DG	FUSED B(+)
15	30	F141 14LG/RD	FUSED B(+)
16	–	–	–
17	15	F39 18PK/LG	FUSED B(+)
		F39 18PK/LG	FUSED B(+)
18	15	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
19	20	A6 18RD/BK	FUSED B(+)
		A6 18RD/BK	FUSED B(+)
20	30	A18 14RD/BK	FUSED B(+)
21	10	T17 18YL	FUSED IGNITION FEED (RUN/START)*
	10	T22 14DB/WT	TCC SOLENOID CONTROL**

* WITH 4.0L ENGINE AUTO TRANS
** WITH 2.5L ENGINE AUTO TRANS

RELAYS

A/C COMPRESSOR CLUTCH RELAY

CAVITY	CIRCUIT	FUNCTION
B1	A17 14RD/BK	FUSED B(+)
B2	C3 14DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
B3	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B5	C13 20DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL

ABS MAIN RELAY

CAVITY	CIRCUIT	FUNCTION
B6	B235 14GY/YL	ABS MAIN RELAY OUTPUT
	B235 14GY/YL	ABS MAIN RELAY OUTPUT
B7	A20 14RD/DG	FUSED B(+)
B8	B236 18LG/YL	FUSED IGNITION FEED (RUN/START)
B9	Z12 12BK/TN	GROUND
B10	B207 18PK	ABS MAIN RELAY CONTROL

RADIATOR FAN RELAY (WITH 4.0L ENG)

CAVITY	CIRCUIT	FUNCTION
B11	F141 14LG/RD	FUSED B(+)
B12	C25 14LG	RADIATOR FAN RELAY OUTPUT
B13	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B15	C27 20DB/PK	RADIATOR FAN CONTROL RELAY

AUTOMATIC SHUT DOWN RELAY

CAVITY	CIRCUIT	FUNCTION
B16	A18 14RD/BK	FUSED B(+)
B17	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
B18	A21 12DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B20	K51 20DB/YL	AUTO SHUT DOWN RELAY CONTROL

ENGINE STARTER MOTOR RELAY

CAVITY	CIRCUIT	FUNCTION
C6	A4 14BK/RD	FUSED B(+)
C7	T40 14BR	START RELAY OUTPUT
C8	A41 14YL	FUSED IGNITION SWITCH OUTPUT (START)
C10	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE**
	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE**
C10	Z1 18BK	GROUND*

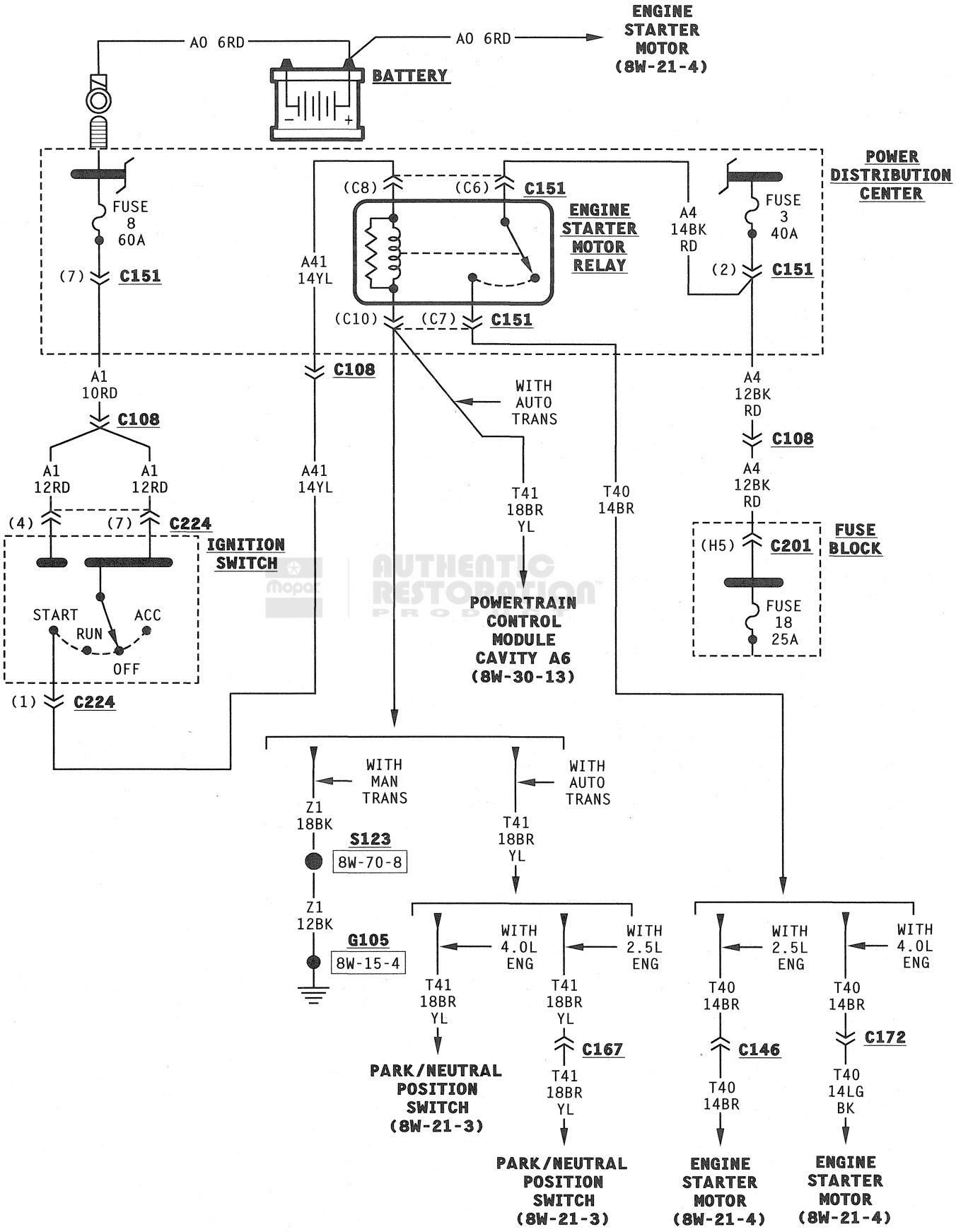
FUEL PUMP RELAY

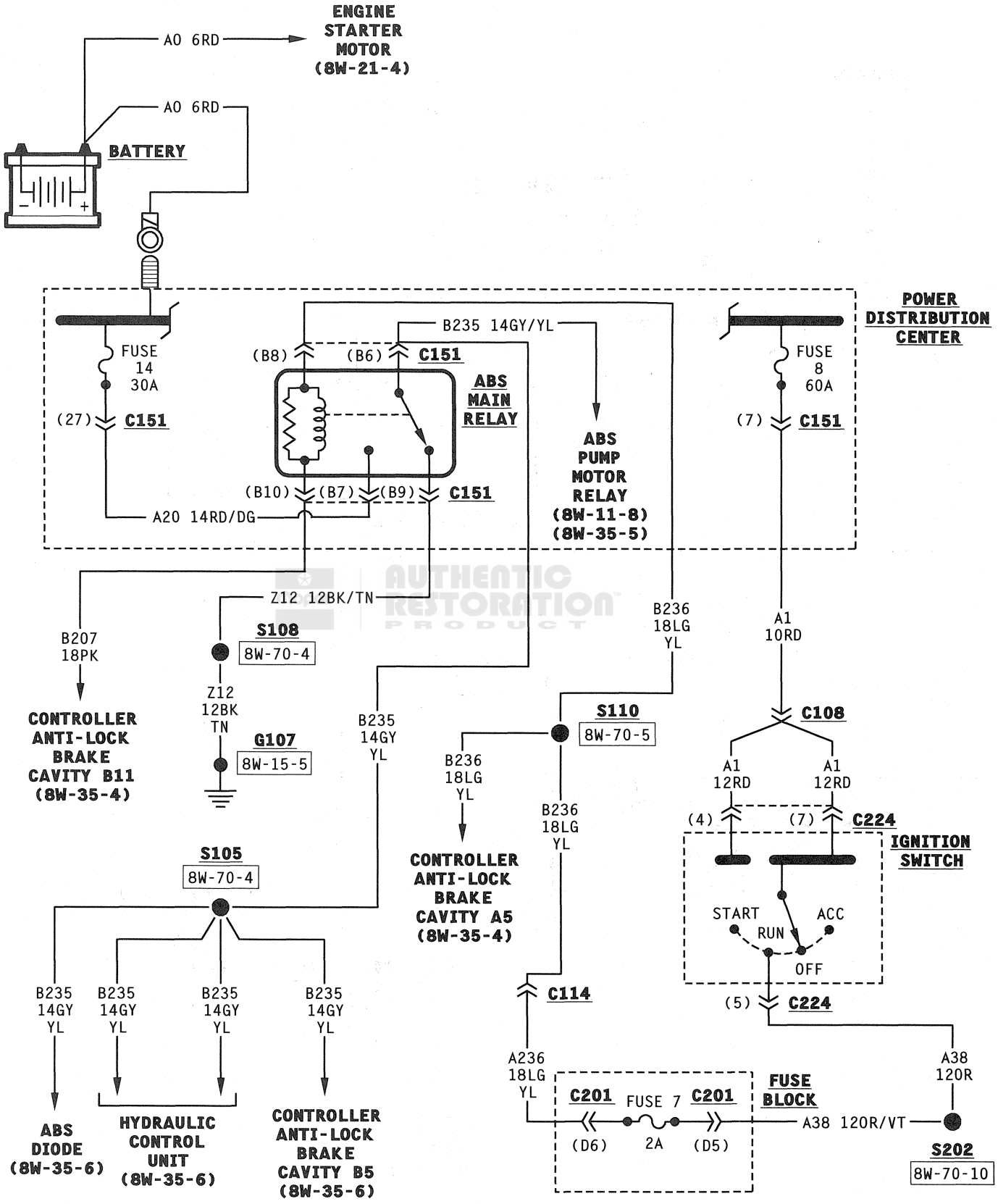
CAVITY	CIRCUIT	FUNCTION
C16	A14 14RD	FUSED B(+)
C17	A141 14DG/WT	FUEL PUMP RELAY OUTPUT
C18	A21 12DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
C20	K31 20BR	FUEL PUMP RELAY CONTROL

ABS PUMP MOTOR RELAY

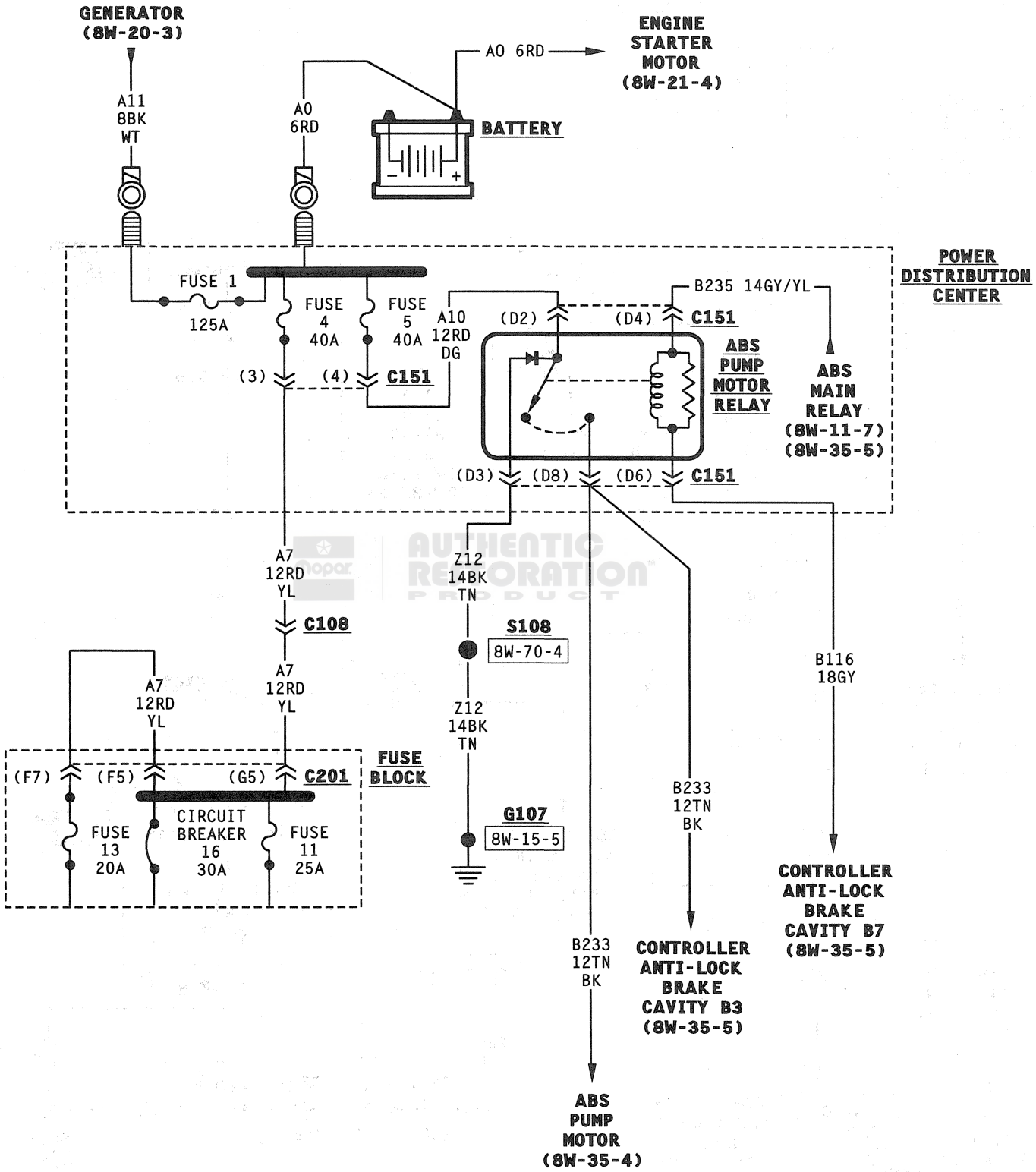
CAVITY	CIRCUIT	FUNCTION
D2	A10 12RD/DG	FUSED B(+)
D3	Z12 14BK/TN	GROUND
D4	B235 14GY/YL	ABS MAIN RELAY OUTPUT
D6	B116 18GY	ABS PUMP MOTOR RELAY CONTROL
D8	B233 12TN/BK	ABS PUMP MOTOR RELAY OUTPUT
	B233 14TN/BK	ABS PUMP MOTOR RELAY OUTPUT

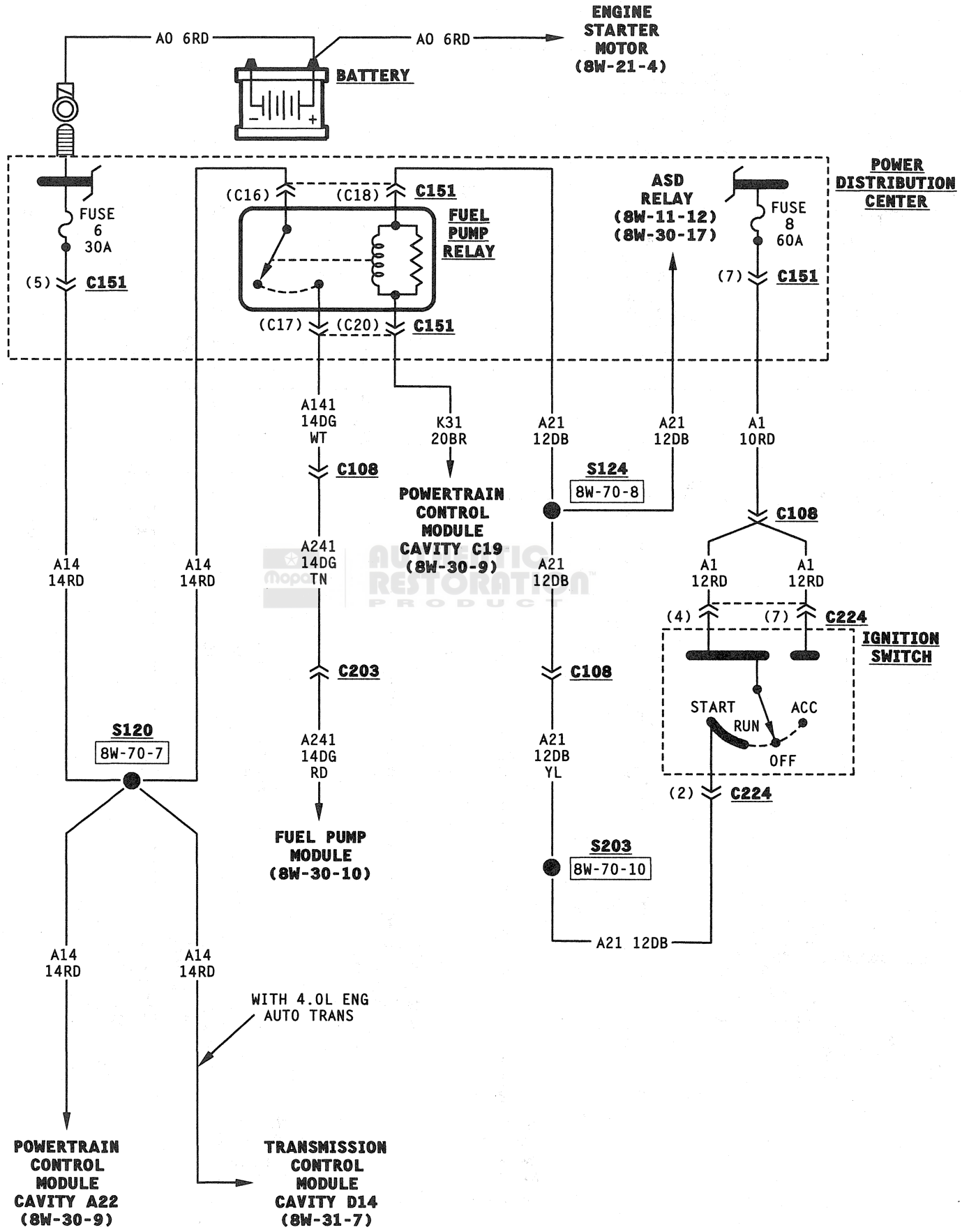
* WITH MAN TRANS
** WITH AUTO TRANS

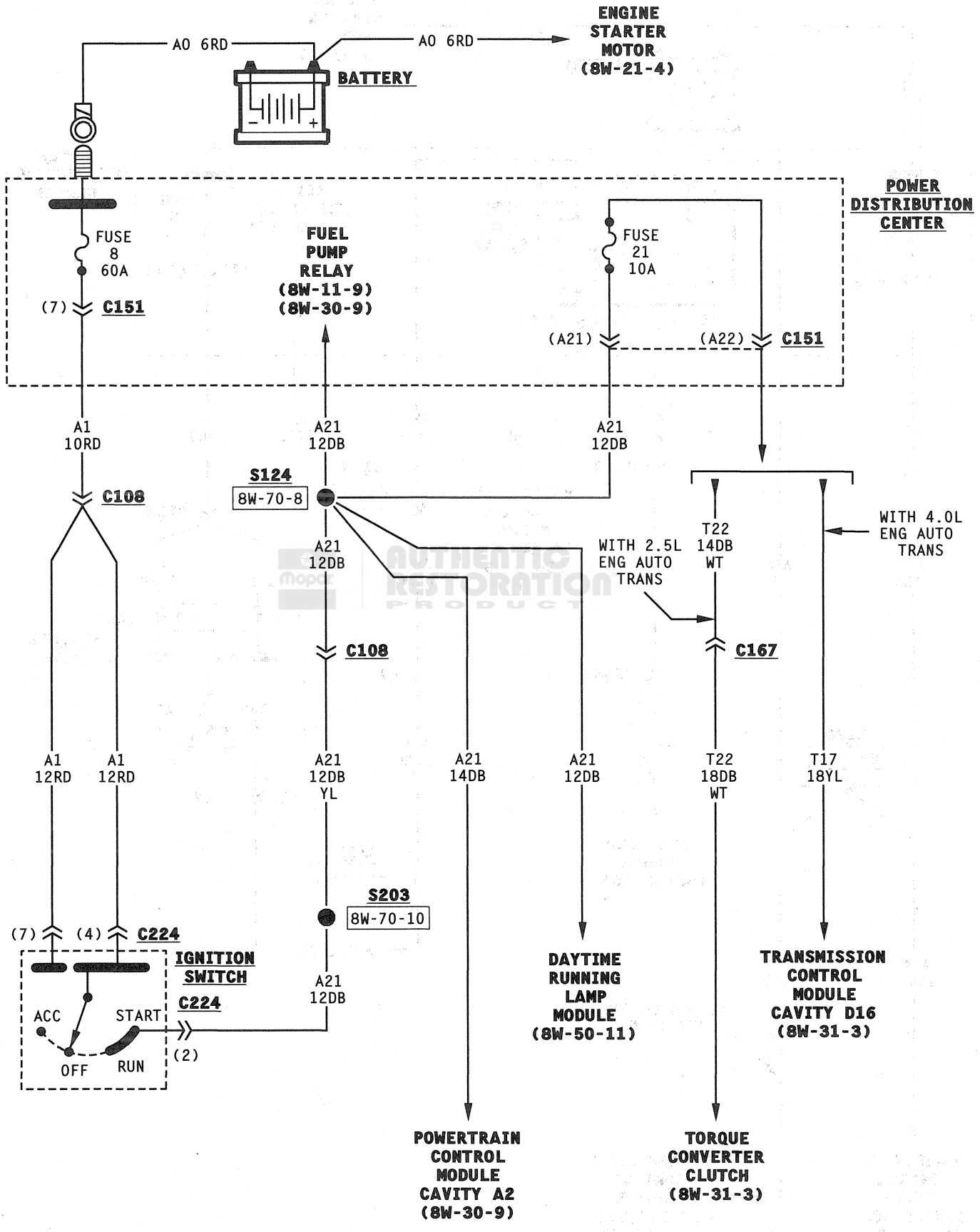

ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
A0 6RD
BATTERY
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
(C8)
(C6) C151
ENGINE STARTER MOTOR RELAY
(C10)
(C7) C151
A41 14YL
A4 14BK RD
FUSE 3 40A
(2) C151
A1 10RD
C108
C108
A41 14YL
WITH AUTO TRANS
A4 12BK RD
C108
A1 12RD
A1 12RD
(4)
(7) C224
IGNITION SWITCH
START
ACC
RUN
OFF
(1) C224
T41 18BR YL
T40 14BR
A4 12BK RD
(H5) C201
FUSE BLOCK
FUSE 18 25A
POWERTRAIN CONTROL MODULE CAVITY A6 (8W-30-13)
WITH MAN TRANS
WITH AUTO TRANS
Z1 18BK
S123
8W-70-8
T41 18BR YL
Z1 12BK
G105
8W-15-4
WITH 4.0L ENG
WITH 2.5L ENG
WITH 2.5L ENG
WITH 4.0L ENG
T41 18BR YL
T41 18BR YL
T40 14BR
T40 14BR
C167
C146
C172
T41 18BR YL
T40 14BR
T40 14LG BK
PARK/NEUTRAL POSITION SWITCH (8W-21-3)
PARK/NEUTRAL POSITION SWITCH (8W-21-3)
ENGINE STARTER MOTOR (8W-21-4)
ENGINE STARTER MOTOR (8W-21-4)

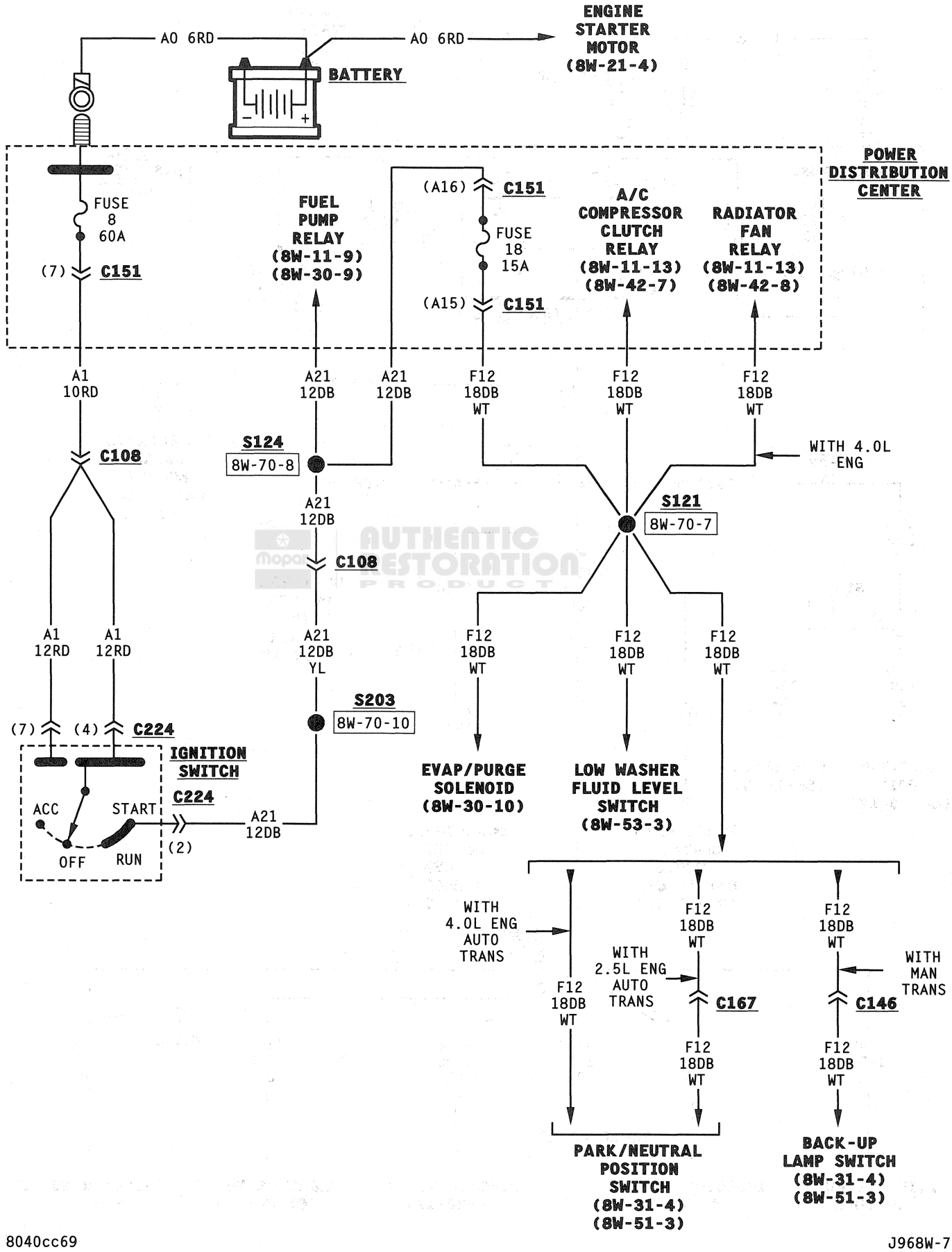


AUTHENTIC RESTORATION PRODUCT

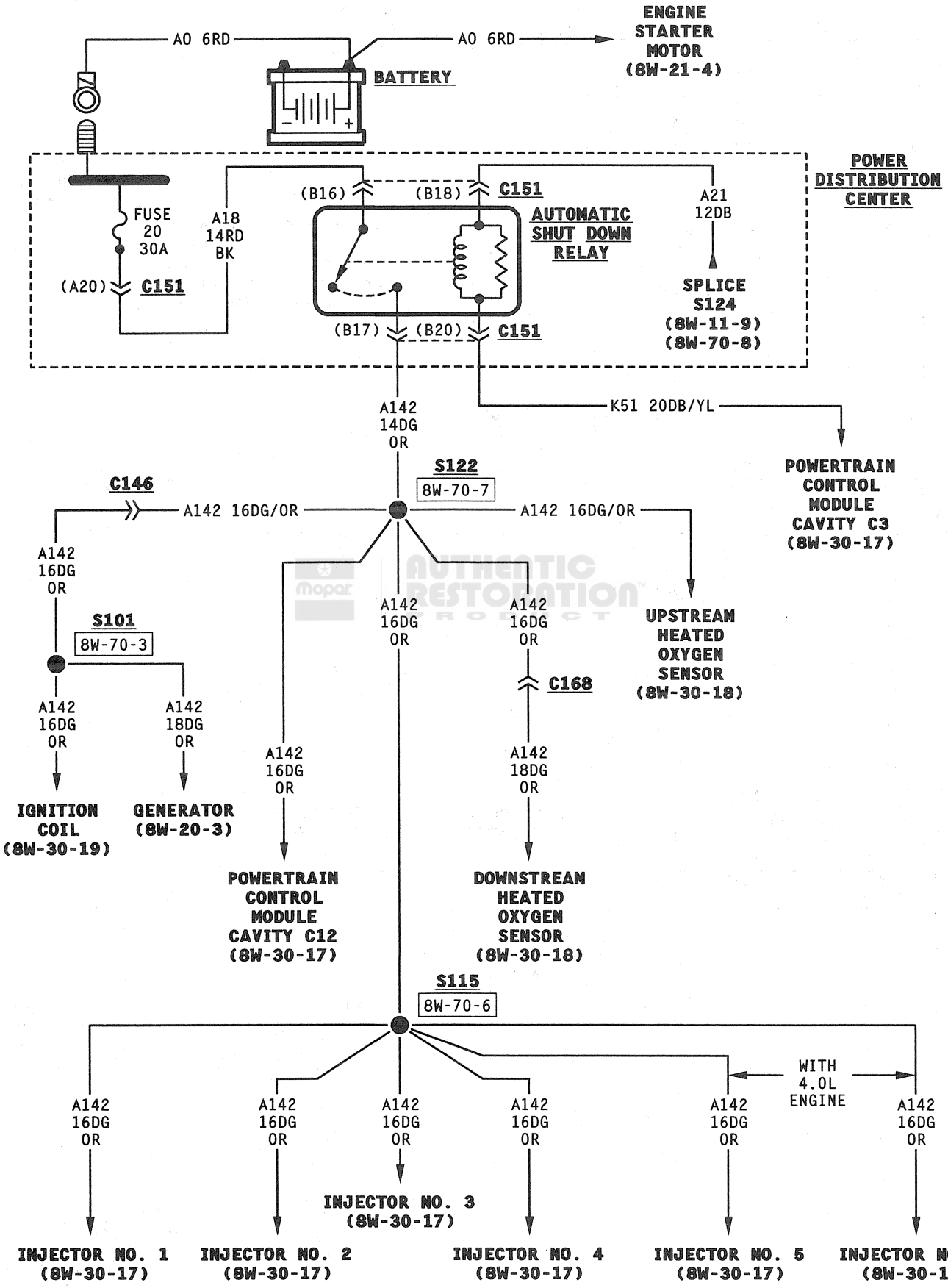

GENERATOR
(8W-20-3)
A11
8BK
WT
A0
6RD
A0 6RD
ENGINE
STARTER
MOTOR
(8W-21-4)
BATTERY
POWER
DISTRIBUTION
CENTER
FUSE 1
125A
FUSE
4
40A
FUSE
5
40A
A10
12RD
DG
(D2)
(D4)
C151
B235 14GY/YL
ABS
PUMP
MOTOR
RELAY
ABS
MAIN
RELAY
(8W-11-7)
(8W-35-5)
(3)
(4)
C151
(D3)
(D8)
(D6)
C151
A7
12RD
YL
C108
Z12
14BK
TN
S108
8W-70-4
B116
18GY
A7
12RD
YL
A7
12RD
YL
Z12
14BK
TN
(F7)
(F5)
(G5)
C201
FUSE
BLOCK
FUSE
13
20A
CIRCUIT
BREAKER
16
30A
FUSE
11
25A
G107
8W-15-5
B233
12TN
BK
CONTROLLER
ANTI-LOCK
BRAKE
CAVITY B7
(8W-35-5)
B233
12TN
BK
CONTROLLER
ANTI-LOCK
BRAKE
CAVITY B3
(8W-35-5)
ABS
PUMP
MOTOR
(8W-35-4)

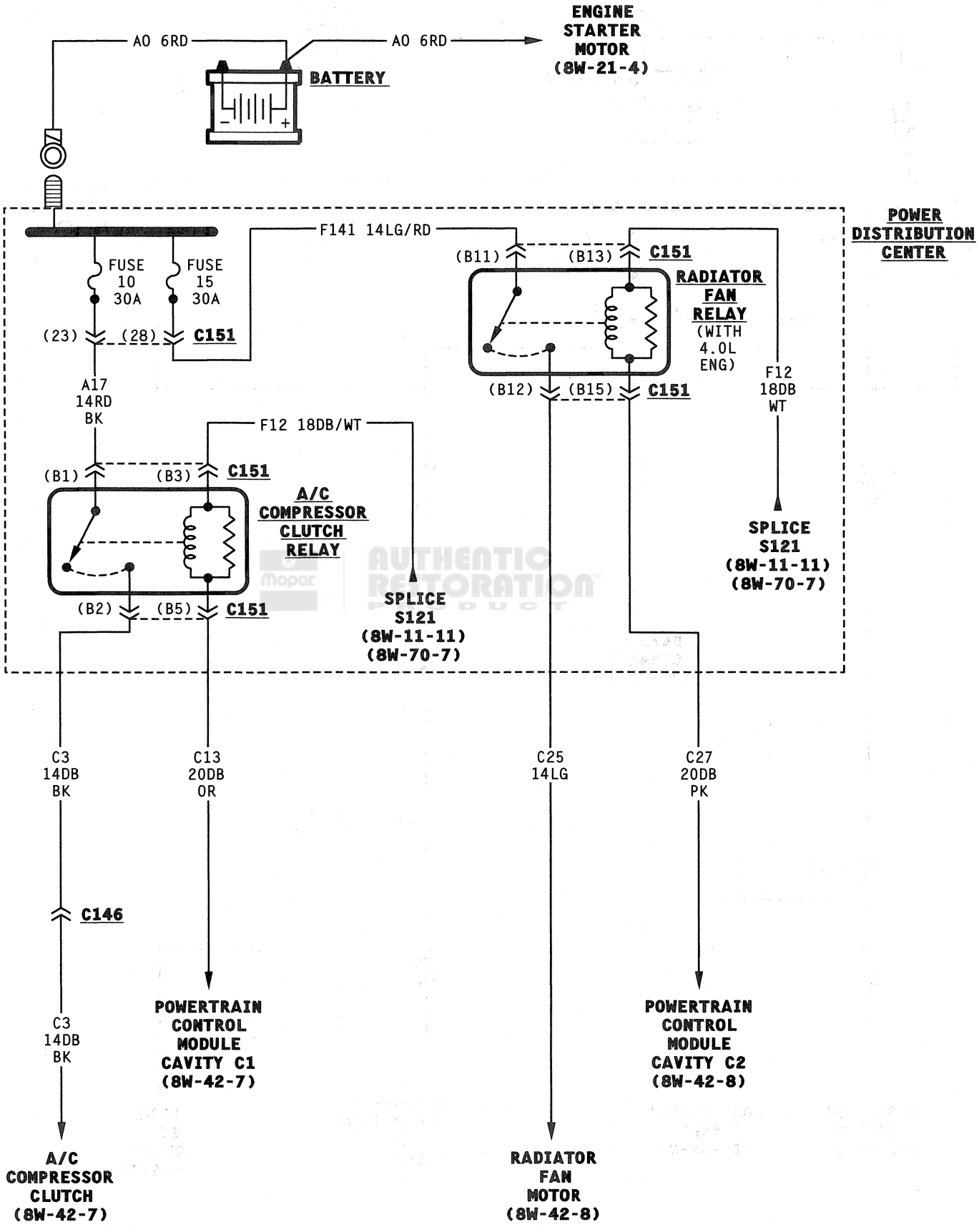

A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 6 30A
(5) C151
(C16) (C18) C151
FUEL PUMP RELAY
(C17) (C20) C151
ASD RELAY (8W-11-12) (8W-30-17)
FUSE 8 60A
(7) C151
A141 14DG WT
K31 20BR
A21 12DB
A21 12DB
A1 10RD
C108
POWERTRAIN CONTROL MODULE CAVITY C19 (8W-30-9)
S124
8W-70-8
C108
A14 14RD
A14 14RD
A241 14DG TN
A21 12DB
A1 12RD
A1 12RD
(4) (7) C224
IGNITION SWITCH
C203
C108
START
ACC
RUN
OFF
S120
8W-70-7
A241 14DG RD
A21 12DB YL
(2) C224
FUEL PUMP MODULE (8W-30-10)
S203
8W-70-10
A21 12DB
A14 14RD
A14 14RD
WITH 4.0L ENG AUTO TRANS
POWERTRAIN CONTROL MODULE CAVITY A22 (8W-30-9)
TRANSMISSION CONTROL MODULE CAVITY D14 (8W-31-7)

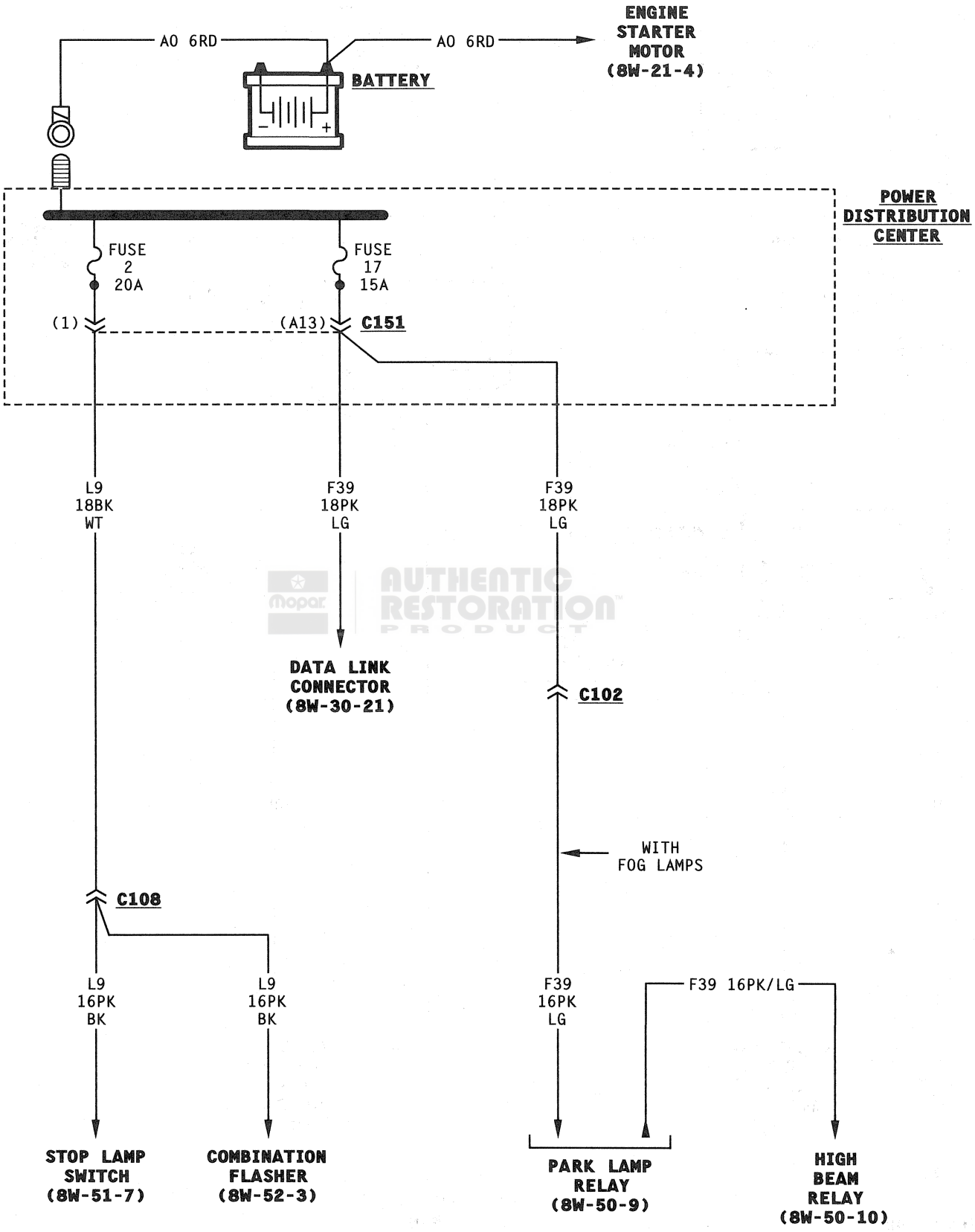

A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
FUEL PUMP RELAY (8W-11-9) (8W-30-9)
FUSE 21 10A
(A21) (A22) C151
A1 10RD
A21 12DB
A21 12DB
S124
8W-70-8
C108
WITH 4.0L ENG AUTO TRANS
T22 14DB WT
WITH 2.5L ENG AUTO TRANS
A21 12DB
C108
C167
A1 12RD
A1 12RD
A21 12DB YL
A21 14DB
A21 12DB
T22 18DB WT
T17 18YL
S203
8W-70-10
(7) (4) C224
IGNITION SWITCH
C224
ACC
START
OFF
RUN
(2)
A21 12DB
DAYTIME RUNNING LAMP MODULE (8W-50-11)
TRANSMISSION CONTROL MODULE CAVITY D16 (8W-31-3)
POWERTRAIN CONTROL MODULE CAVITY A2 (8W-30-9)
TORQUE CONVERTER CLUTCH (8W-31-3)

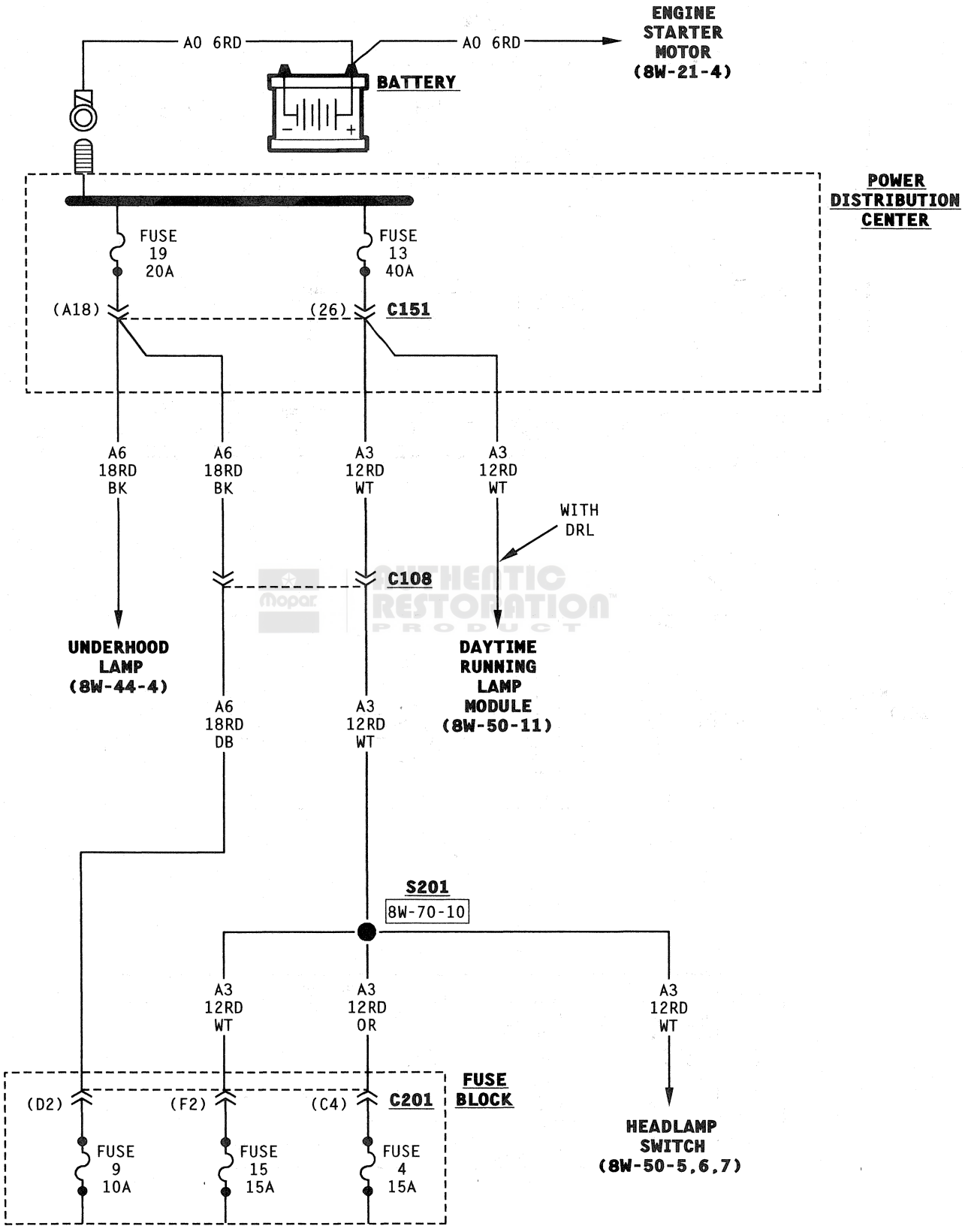


Mopar AUTHENTIC RESTORATION PRODUCT


A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 20 30A
A18 14RD BK
(B16)
(B18)
C151
AUTOMATIC SHUT DOWN RELAY
A21 12DB
(A20)
C151
(B17)
(B20)
C151
SPLICE S124 (8W-11-9) (8W-70-8)
A142 14DG OR
K51 20DB/YL
POWERTRAIN CONTROL MODULE CAVITY C3 (8W-30-17)
S122
8W-70-7
C146
A142 16DG/OR
A142 16DG/OR
A142 16DG OR
S101
8W-70-3
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
C168
UPSTREAM HEATED OXYGEN SENSOR (8W-30-18)
A142 16DG OR
A142 18DG OR
A142 16DG OR
A142 18DG OR
IGNITION COIL (8W-30-19)
GENERATOR (8W-20-3)
POWERTRAIN CONTROL MODULE CAVITY C12 (8W-30-17)
DOWNSTREAM HEATED OXYGEN SENSOR (8W-30-18)
S115
8W-70-6
WITH 4.0L ENGINE
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
INJECTOR NO. 3 (8W-30-17)
INJECTOR NO. 1 (8W-30-17)
INJECTOR NO. 2 (8W-30-17)
INJECTOR NO. 4 (8W-30-17)
INJECTOR NO. 5 (8W-30-17)
INJECTOR NO. 6 (8W-30-17)

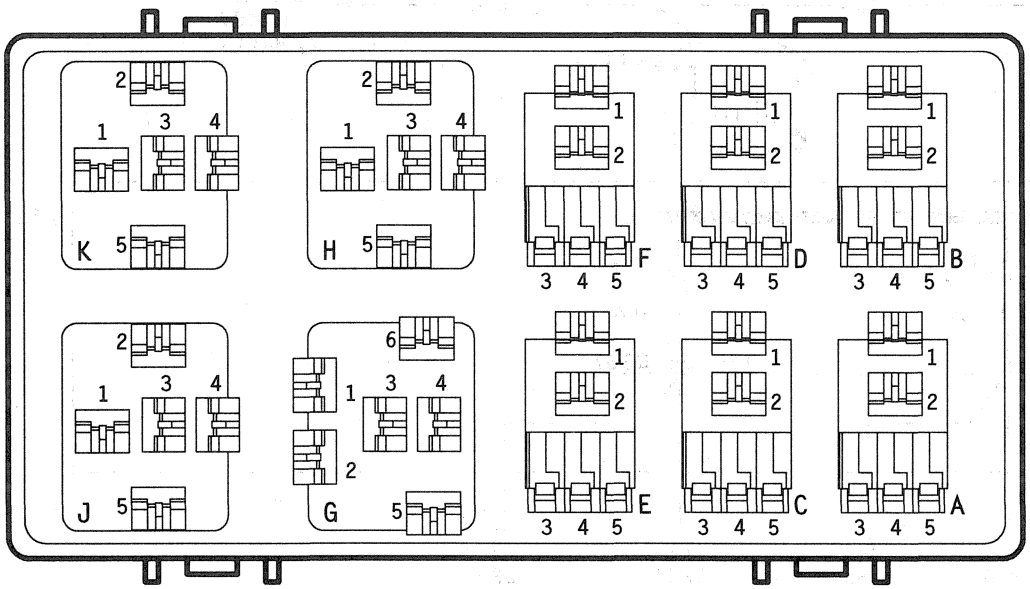

ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
A0 6RD
BATTERY
POWER DISTRIBUTION CENTER
F141 14LG/RD
FUSE 10 30A
FUSE 15 30A
(23)
(28)
C151
A17 14RD BK
(B11)
(B13)
C151
RADIATOR FAN RELAY (WITH 4.0L ENG)
(B12)
(B15)
C151
F12 18DB WT
F12 18DB/WT
(B1)
(B3)
C151
A/C COMPRESSOR CLUTCH RELAY
(B2)
(B5)
C151
SPLICE S121 (8W-11-11) (8W-70-7)
SPLICE S121 (8W-11-11) (8W-70-7)
C3 14DB BK
C13 20DB OR
C25 14LG
C27 20DB PK
C146
C3 14DB BK
POWERTRAIN CONTROL MODULE CAVITY C1 (8W-42-7)
POWERTRAIN CONTROL MODULE CAVITY C2 (8W-42-8)
A/C COMPRESSOR CLUTCH (8W-42-7)
RADIATOR FAN MOTOR (8W-42-8)


A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 2 20A
FUSE 17 15A
(1)
(A13)
C151
L9 18BK WT
F39 18PK LG
F39 18PK LG
DATA LINK CONNECTOR (8W-30-21)
C102
WITH FOG LAMPS
C108
L9 16PK BK
L9 16PK BK
F39 16PK LG
F39 16PK/LG
STOP LAMP SWITCH (8W-51-7)
COMBINATION FLASHER (8W-52-3)
PARK LAMP RELAY (8W-50-9)
HIGH BEAM RELAY (8W-50-10)


A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 19 20A
FUSE 13 40A
(A18)
(26)
C151
A6 18RD BK
A6 18RD BK
A3 12RD WT
A3 12RD WT
WITH DRL
C108
UNDERHOOD LAMP (8W-44-4)
DAYTIME RUNNING LAMP MODULE (8W-50-11)
A6 18RD DB
A3 12RD WT
S201
8W-70-10
A3 12RD WT
A3 12RD OR
A3 12RD WT
FUSE BLOCK
(D2)
(F2)
(C4)
C201
FUSE 9 10A
FUSE 15 15A
FUSE 4 15A
HEADLAMP SWITCH (8W-50-5,6,7)

RELAY BANK

C242



DOOR LOCK RELAY (8W-61-4)

CAV	CIRCUIT	FUNCTION
A1	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
A2	P37 18LG	FUSED B(+)
	P37 18LG	FUSED B(+)
A3	P35 20OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
A4	Z1 18BK	GROUND
A5	Z1 18BK	GROUND
	Z1 18BK	GROUND

DOOR UNLOCK RELAY (8W-61-4)

CAV	CIRCUIT	FUNCTION
B1	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT
B2	P37 18LG	FUSED B(+)
B3	P36 20PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
B4	Z1 18BK	GROUND
	Z1 18BK	GROUND
B5	Z1 18BK	GROUND
	Z1 18BK	GROUND

LCD ILLUMINATION RELAY (8W-44-10)

CAV	CIRCUIT	FUNCTION
C1	X5 18LB/RD	RADIO DISPLAY OUTPUT
C2	E2 200R/BK	FUSED PNEL LAMPS DIMMER SW OUTPUT
C3	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
C4	F85 18VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
C5	Z1 18BK	GROUND
	Z1 18BK	GROUND

HORN RELAY (8W-41-2)

CAV	CIRCUIT	FUNCTION
F1	X4 16GY/PK	FUSED B(+)
	X4 16GY/PK	FUSED B(+)
F2	X2 16DG/RD	HORN RELAY OUTPUT
F3	X3 20BK/RD	HORN RELAY CONTROL
F4	--	-
F5	X4 16GY/PK	FUSED B(+)

Mopar AUTHENTIC RESTORATION PRODUCT

REAR WINDOW DEFOGGER RELAY (8W-48-2)

CAV	CIRCUIT	FUNCTION
H1	C15 12BK/RD	REAR WINDOW DEFOGGER RELAY OUTPUT
H2	Z1 18BK	GROUND
	Z1 18BK	GROUND
H3	C80 18DB/WT	REAR WINDOW DEFOGGER SWITCH SIGNAL
H4	F81 12BR	FUSED B(+)
H5	F83 18YL/RD	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)

COMBINATION FLASHER (8W-52-2)

CAV	CIRCUIT	FUNCTION
J1	F83 18YL/RD	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
	F83 18YL/RD	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
J2	L9 16 PK/BK	FUSED B(+)
J3	L12 18VT/TN	COMBINATION FLASHER OUTPUT (HAZARD)
J4	L5 18GY	COMBINATION FLASHER OUTPUT (TURN SIGNALS)
J5	Z1 18BK	GROUND
	Z1 14BK	GROUND

8W-15 GROUND DISTRIBUTION

DESCRIPTION AND OPERATION

INTRODUCTION

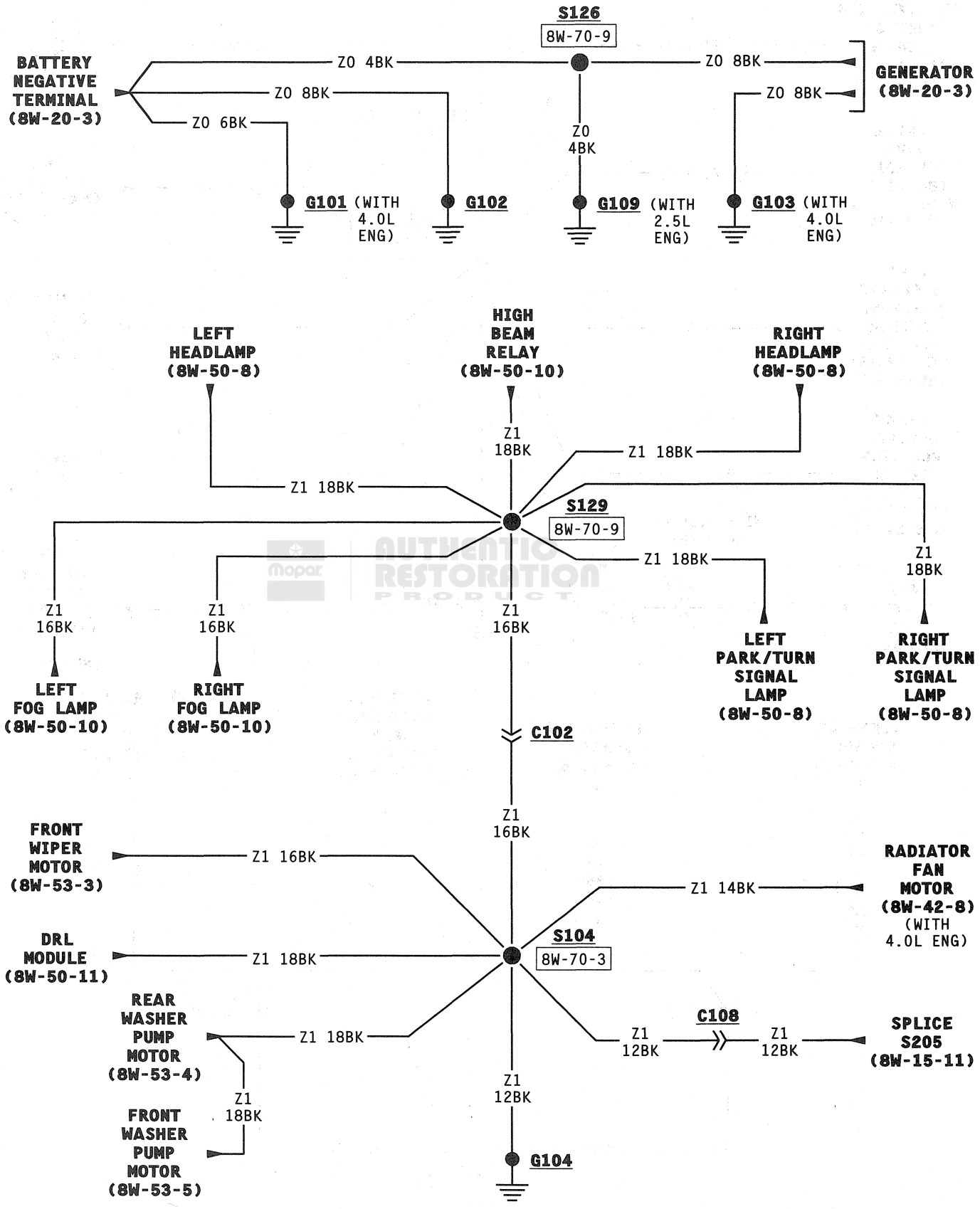
This section identifies the grounds, splices that connect to those grounds, and the components that connect those grounds. For additional information on system operation, refer to the appropriate section of the wiring diagrams. For an illustration of the physical location of each ground, refer to group 8W-90.

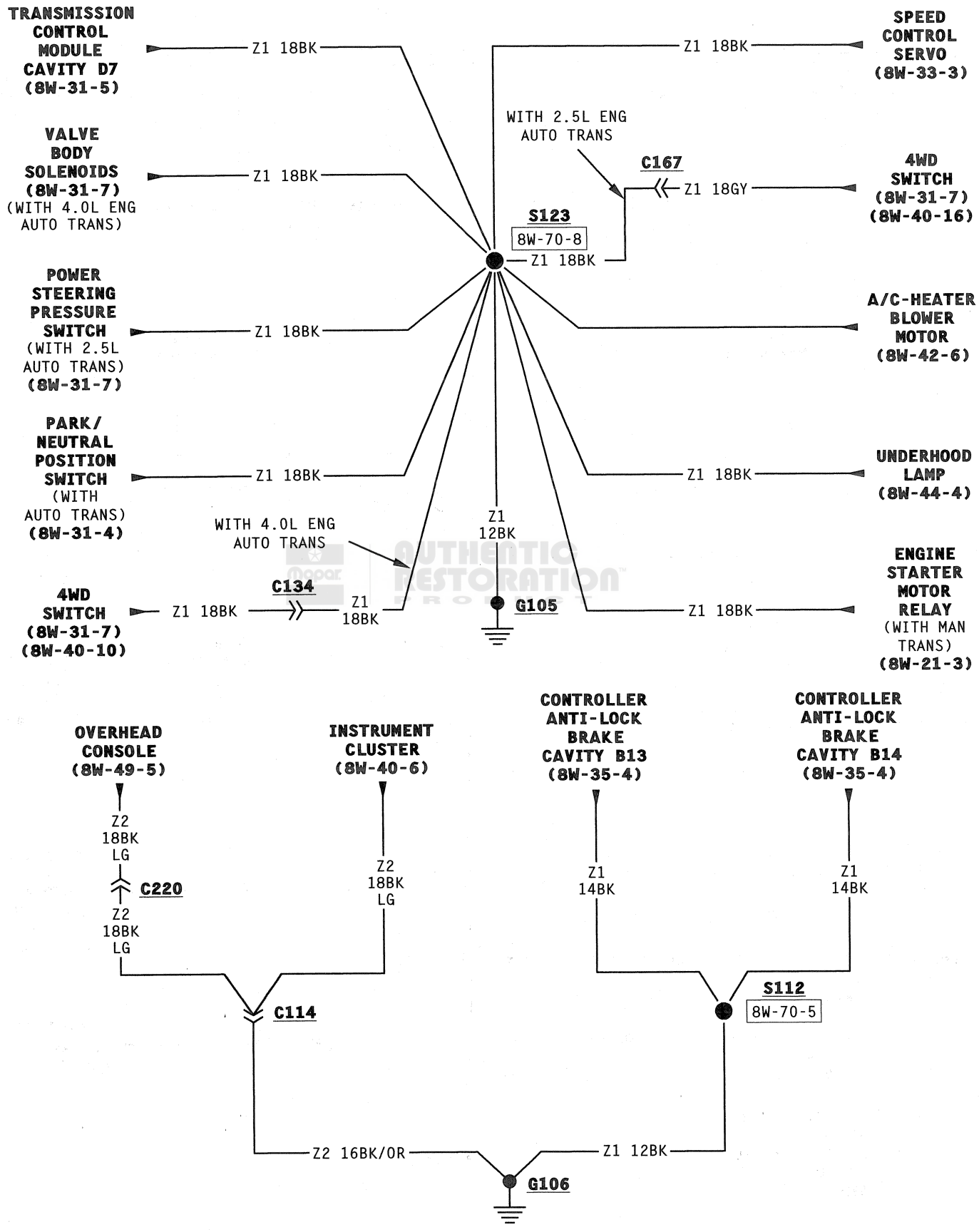
Mopar AUTHENTIC RESTORATION PRODUCT

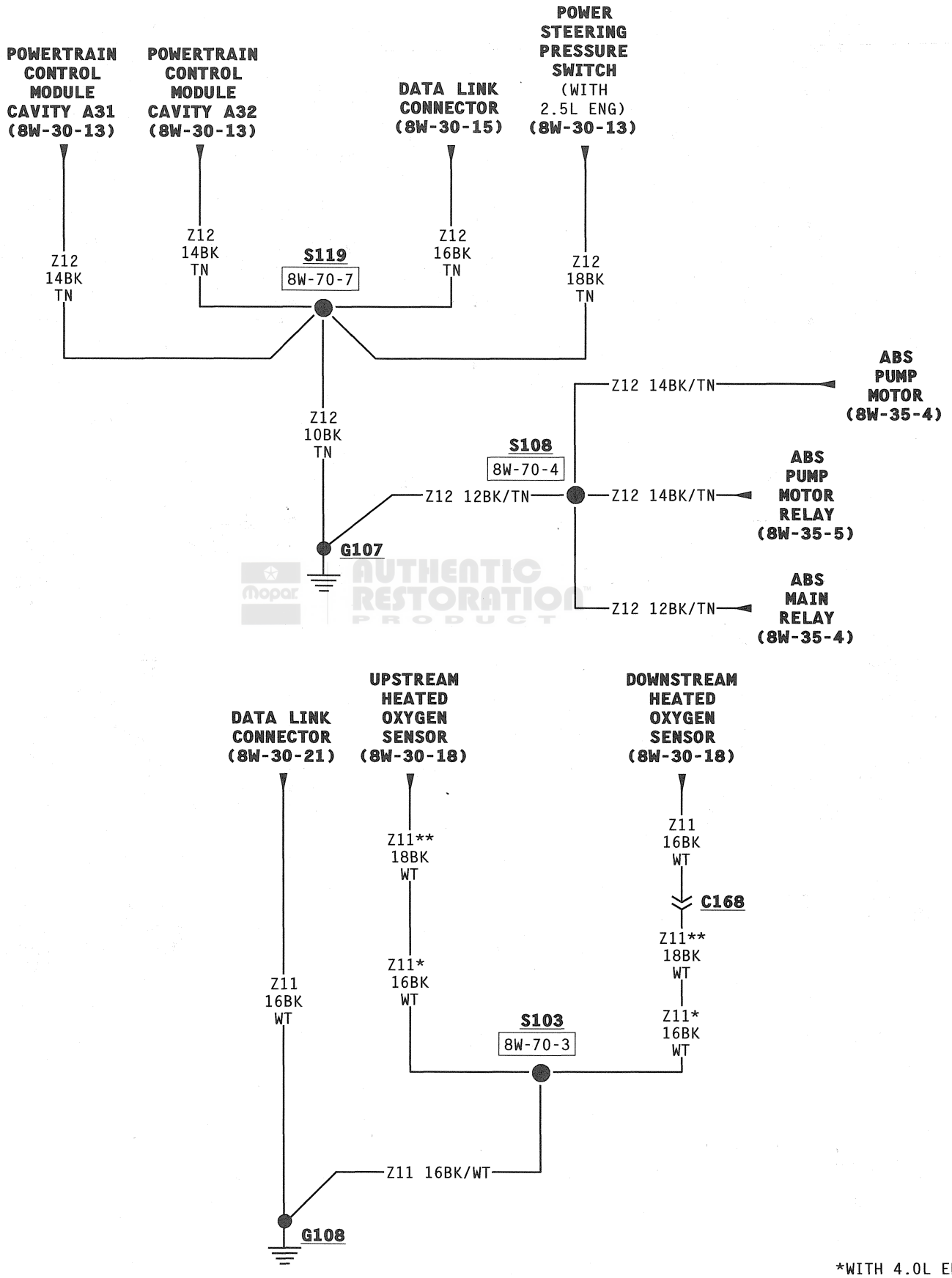
DIAGRAM INDEX

Component	Page
G101	8W-15-3
G102	8W-15-3
G103	8W-15-3
G104	8W-15-3
G105	8W-15-4
G106	8W-15-4
G107	8W-15-5
G108	8W-15-5
G109	8W-15-3
G201	8W-15-6, 7
G301	8W-15-8, 9
S103	8W-15-5
S104	8W-15-3
S108	8W-15-5
S112	8W-15-4
S119	8W-15-5
S123	8W-15-4
S126	8W-15-3
S129	8W-15-3
S205	8W-15-6, 7
S214	8W-15-7
S307	8W-15-8, 9
S314	8W-15-7
S318	8W-15-9
S319	8W-15-9
S403	8W-15-9
S404	8W-15-9

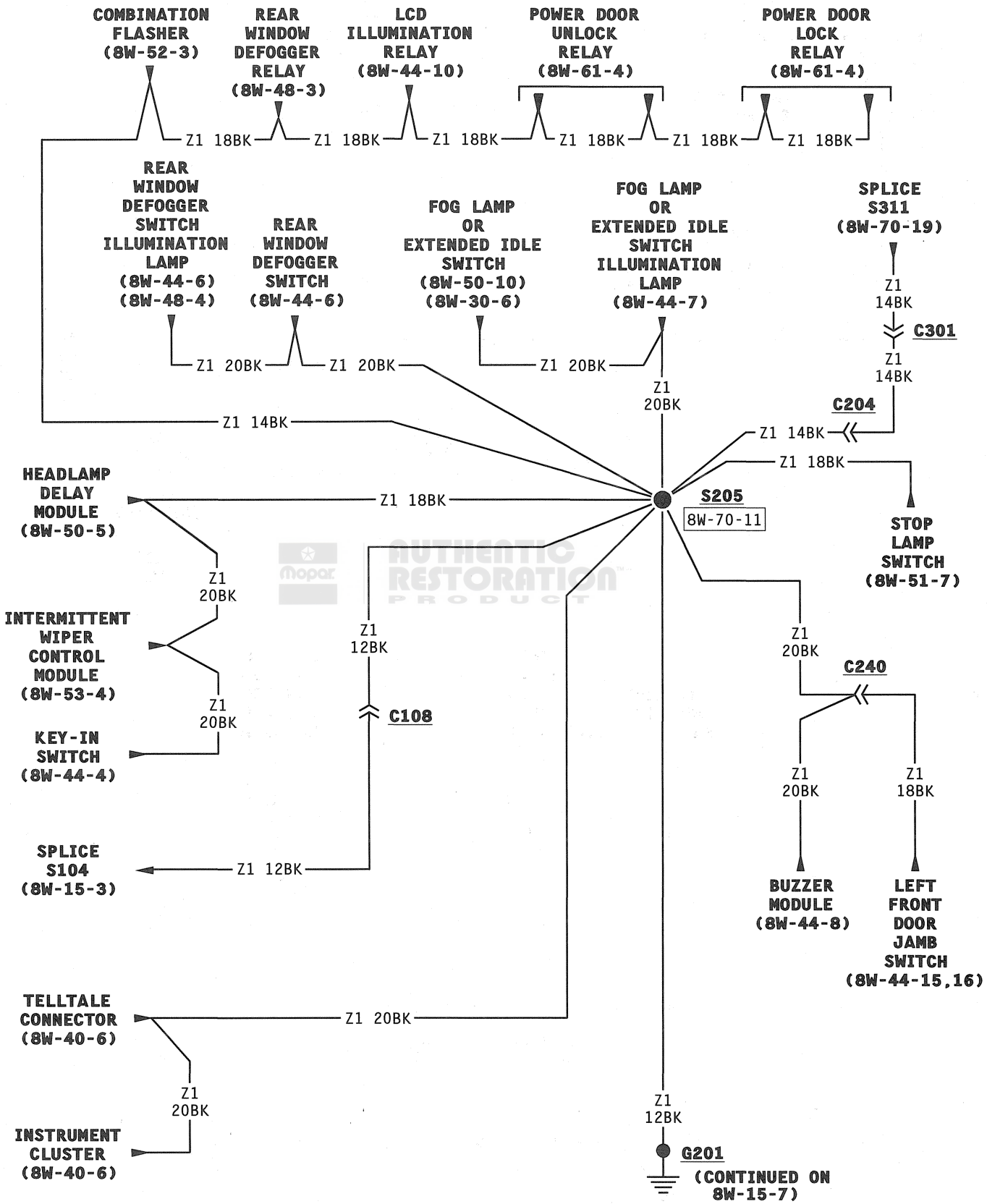
Mopar AUTHENTIC RESTORATION PRODUCT

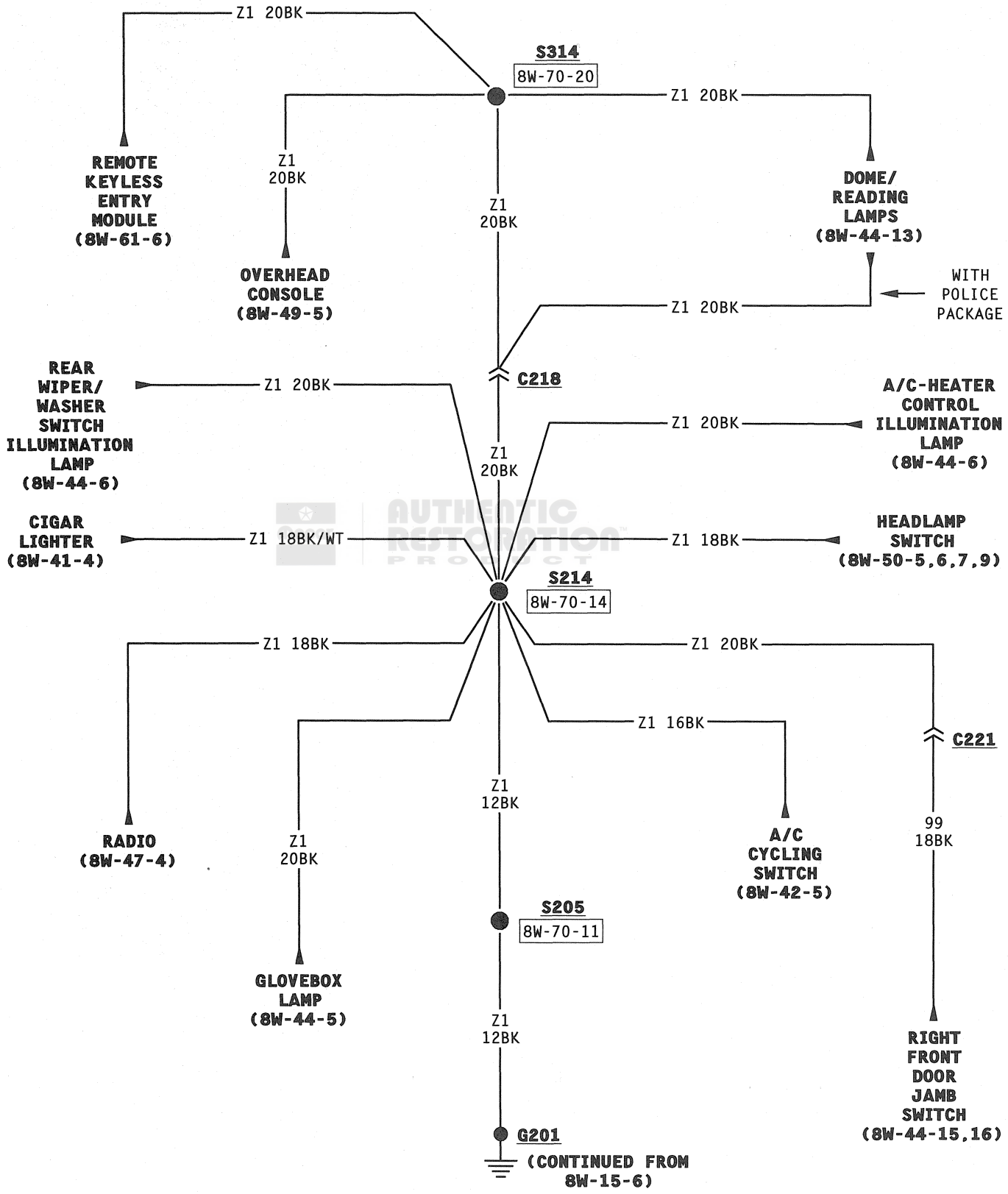

S126
8W-70-9
BATTERY NEGATIVE TERMINAL (8W-20-3)
Z0 4BK
Z0 8BK
Z0 6BK
Z0 8BK
Z0 4BK
Z0 8BK
GENERATOR (8W-20-3)
G101 (WITH 4.0L ENG)
G102
G109 (WITH 2.5L ENG)
G103 (WITH 4.0L ENG)
LEFT HEADLAMP (8W-50-8)
HIGH BEAM RELAY (8W-50-10)
RIGHT HEADLAMP (8W-50-8)
Z1 18BK
Z1 18BK
Z1 18BK
S129
8W-70-9
Z1 18BK
Z1 18BK
Z1 16BK
Z1 16BK
Z1 16BK
LEFT FOG LAMP (8W-50-10)
RIGHT FOG LAMP (8W-50-10)
LEFT PARK/TURN SIGNAL LAMP (8W-50-8)
RIGHT PARK/TURN SIGNAL LAMP (8W-50-8)
C102
Z1 16BK
FRONT WIPER MOTOR (8W-53-3)
Z1 16BK
Z1 14BK
RADIATOR FAN MOTOR (8W-42-8) (WITH 4.0L ENG)
DRL MODULE (8W-50-11)
Z1 18BK
S104
8W-70-3
REAR WASHER PUMP MOTOR (8W-53-4)
Z1 18BK
C108
Z1 12BK
Z1 12BK
SPLICE S205 (8W-15-11)
Z1 18BK
FRONT WASHER PUMP MOTOR (8W-53-5)
Z1 12BK
G104

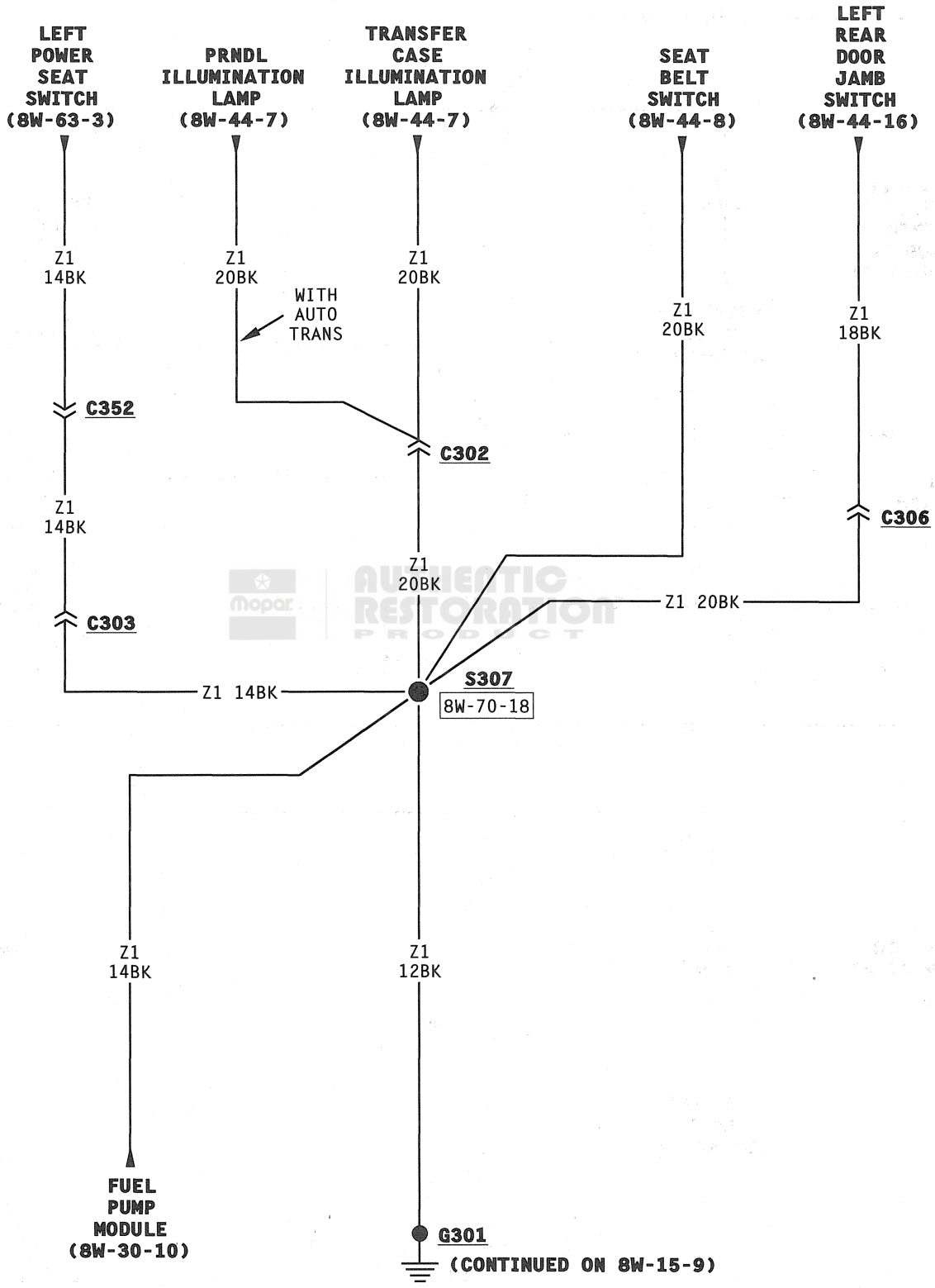

TRANSMISSION CONTROL MODULE CAVITY D7 (8W-31-5)
Z1 18BK
SPEED CONTROL SERVO (8W-33-3)
Z1 18BK
WITH 2.5L ENG AUTO TRANS
C167
VALVE BODY SOLENOIDS (8W-31-7) (WITH 4.0L ENG AUTO TRANS)
Z1 18BK
Z1 18GY
4WD SWITCH (8W-31-7) (8W-40-16)
S123
8W-70-8
Z1 18BK
POWER STEERING PRESSURE SWITCH (WITH 2.5L AUTO TRANS) (8W-31-7)
Z1 18BK
A/C-HEATER BLOWER MOTOR (8W-42-6)
PARK/ NEUTRAL POSITION SWITCH (WITH AUTO TRANS) (8W-31-4)
Z1 18BK
Z1 18BK
UNDERHOOD LAMP (8W-44-4)
WITH 4.0L ENG AUTO TRANS
Z1 12BK
C134
4WD SWITCH (8W-31-7) (8W-40-10)
Z1 18BK
Z1 18BK
G105
Z1 18BK
ENGINE STARTER MOTOR RELAY (WITH MAN TRANS) (8W-21-3)
OVERHEAD CONSOLE (8W-49-5)
INSTRUMENT CLUSTER (8W-40-6)
CONTROLLER ANTI-LOCK BRAKE CAVITY B13 (8W-35-4)
CONTROLLER ANTI-LOCK BRAKE CAVITY B14 (8W-35-4)
Z2 18BK LG
C220
Z2 18BK LG
Z2 18BK LG
Z1 14BK
Z1 14BK
C114
S112
8W-70-5
Z2 16BK/OR
Z1 12BK
G106

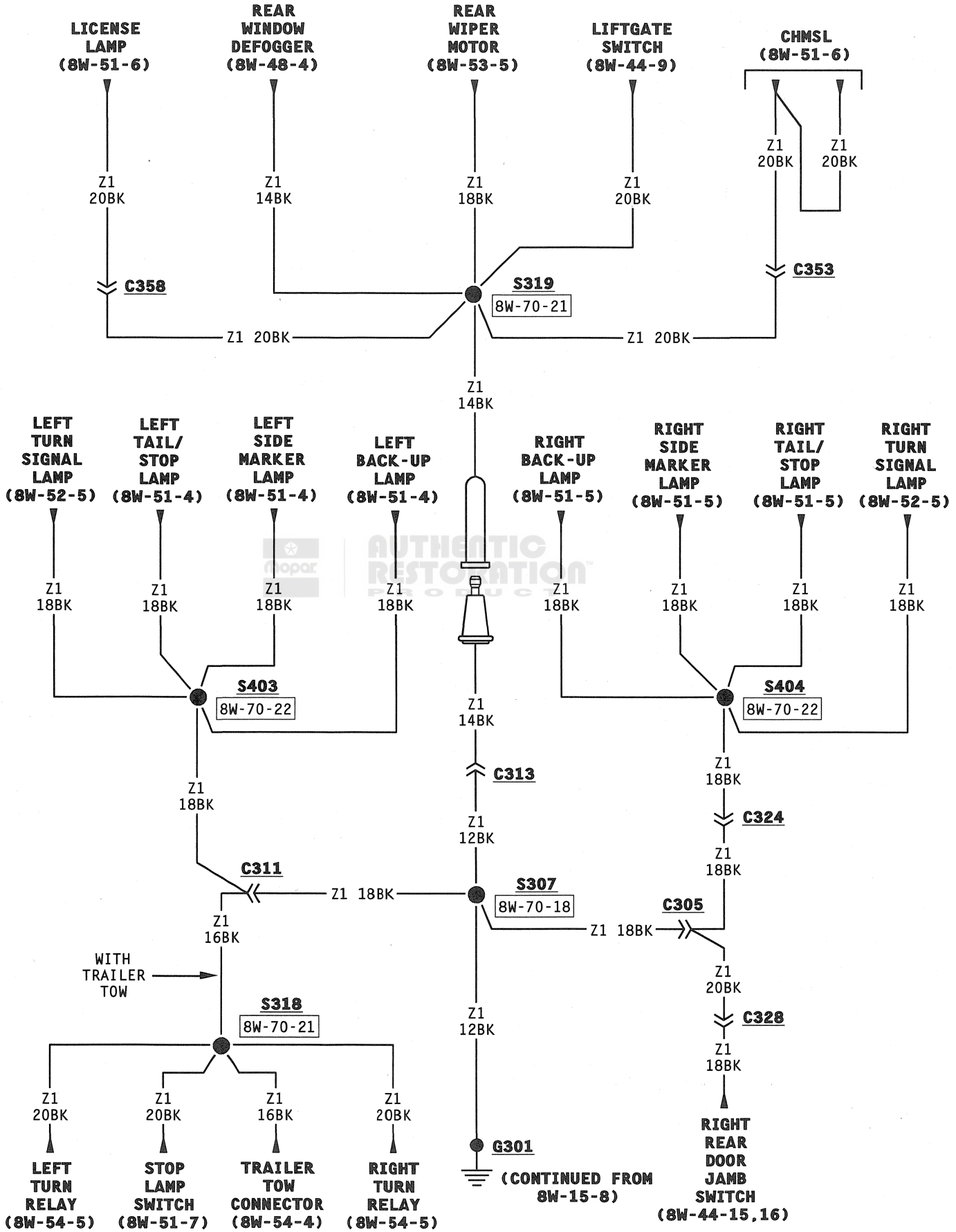


*WITH 4.0L ENG
**WITH 2.5L ENG


COMBINATION FLASHER (8W-52-3)
REAR WINDOW DEFOGGER RELAY (8W-48-3)
LCD ILLUMINATION RELAY (8W-44-10)
POWER DOOR UNLOCK RELAY (8W-61-4)
POWER DOOR LOCK RELAY (8W-61-4)
Z1 18BK
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6) (8W-48-4)
REAR WINDOW DEFOGGER SWITCH (8W-44-6)
FOG LAMP OR EXTENDED IDLE SWITCH (8W-50-10) (8W-30-6)
FOG LAMP OR EXTENDED IDLE SWITCH ILLUMINATION LAMP (8W-44-7)
SPLICE S311 (8W-70-19)
Z1 20BK
Z1 14BK
C301
C204
Z1 14BK
Z1 18BK
HEADLAMP DELAY MODULE (8W-50-5)
S205
8W-70-11
STOP LAMP SWITCH (8W-51-7)
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
KEY-IN SWITCH (8W-44-4)
Z1 12BK
C108
C240
SPLICE S104 (8W-15-3)
BUZZER MODULE (8W-44-8)
LEFT FRONT DOOR JAMB SWITCH (8W-44-15,16)
TELLTALE CONNECTOR (8W-40-6)
INSTRUMENT CLUSTER (8W-40-6)
G201
(CONTINUED ON 8W-15-7)


Z1 20BK
S314
8W-70-20
Z1 20BK
REMOTE KEYLESS ENTRY MODULE (8W-61-6)
Z1 20BK
OVERHEAD CONSOLE (8W-49-5)
Z1 20BK
DOME/ READING LAMPS (8W-44-13)
WITH POLICE PACKAGE
Z1 20BK
C218
REAR WIPER/ WASHER SWITCH ILLUMINATION LAMP (8W-44-6)
Z1 20BK
Z1 20BK
A/C-HEATER CONTROL ILLUMINATION LAMP (8W-44-6)
CIGAR LIGHTER (8W-41-4)
Z1 18BK/WT
Z1 18BK
HEADLAMP SWITCH (8W-50-5,6,7,9)
S214
8W-70-14
Z1 18BK
Z1 20BK
Z1 16BK
C221
Z1 12BK
RADIO (8W-47-4)
Z1 20BK
A/C CYCLING SWITCH (8W-42-5)
99 18BK
S205
8W-70-11
GLOVEBOX LAMP (8W-44-5)
Z1 12BK
RIGHT FRONT DOOR JAMB SWITCH (8W-44-15,16)
G201
(CONTINUED FROM 8W-15-6)


LEFT POWER SEAT SWITCH (8W-63-3)
PRNDL ILLUMINATION LAMP (8W-44-7)
TRANSFER CASE ILLUMINATION LAMP (8W-44-7)
SEAT BELT SWITCH (8W-44-8)
LEFT REAR DOOR JAMB SWITCH (8W-44-16)
Z1 14BK
Z1 20BK
WITH AUTO TRANS
Z1 20BK
Z1 20BK
Z1 18BK
C352
C302
C306
Z1 14BK
Z1 20BK
Z1 20BK
C303
S307
8W-70-18
Z1 14BK
Z1 14BK
Z1 12BK
FUEL PUMP MODULE (8W-30-10)
G301
(CONTINUED ON 8W-15-9)



Mopar AUTHENTIC RESTORATION PRODUCT

8040d0e5

J968W-7

8W-20 CHARGING SYSTEM

DESCRIPTION AND OPERATION

CHARGING SYSTEM

The charging system is an integral part of the battery and starting systems. Because all these systems work in conjunction, diagnose and test them together.

Circuit A11 connects to the generator output terminal and fuse 1 in the Power Distribution Center (PDC). Circuit A0 connects the battery to the PDC. Circuit Z0 provides ground for the generator.

When the ignition switch is in either the START or RUN positions, it connects circuit A1 from fuse 8 in the PDC to circuit A21. Circuit A21 splices to supply current to the coil side of the Automatic Shut Down (ASD) relay. The Powertrain Control Module (PCM) provides ground for the relay on circuit K51. Circuit K51 connects to cavity C3 of the PCM.

When the PCM grounds the ASD relay, contacts inside the relay close and connect circuit A18 from the fuse 20 in the PDC to circuit A142. Circuit A142 splices to the generator field terminal.

The PCM has an internal voltage regulator that controls generator output. The PCM controls the generator field on circuit K20. Circuit K20 connects to PCM cavity B10.

When the engine operates and there is current in the generator field, the generator produces a B+ voltage. The generator supplies B+ voltage to the battery through the A11 and A0 circuits.

HELPFUL INFORMATION

- The ignition switch also connects circuit A1 with circuits A41, A38, and A48.
- Circuit A21 also splices to power fuse 17 in the fuse block.
- Circuit A21 also powers the coil side of the fuel pump relay.
- The ASD relay supplies battery voltage for the fuel injectors, ignition coil, and the heated oxygen sensors. The fuel pump relay powers the fuel pump module.

SCHEMATICS AND DIAGRAMS

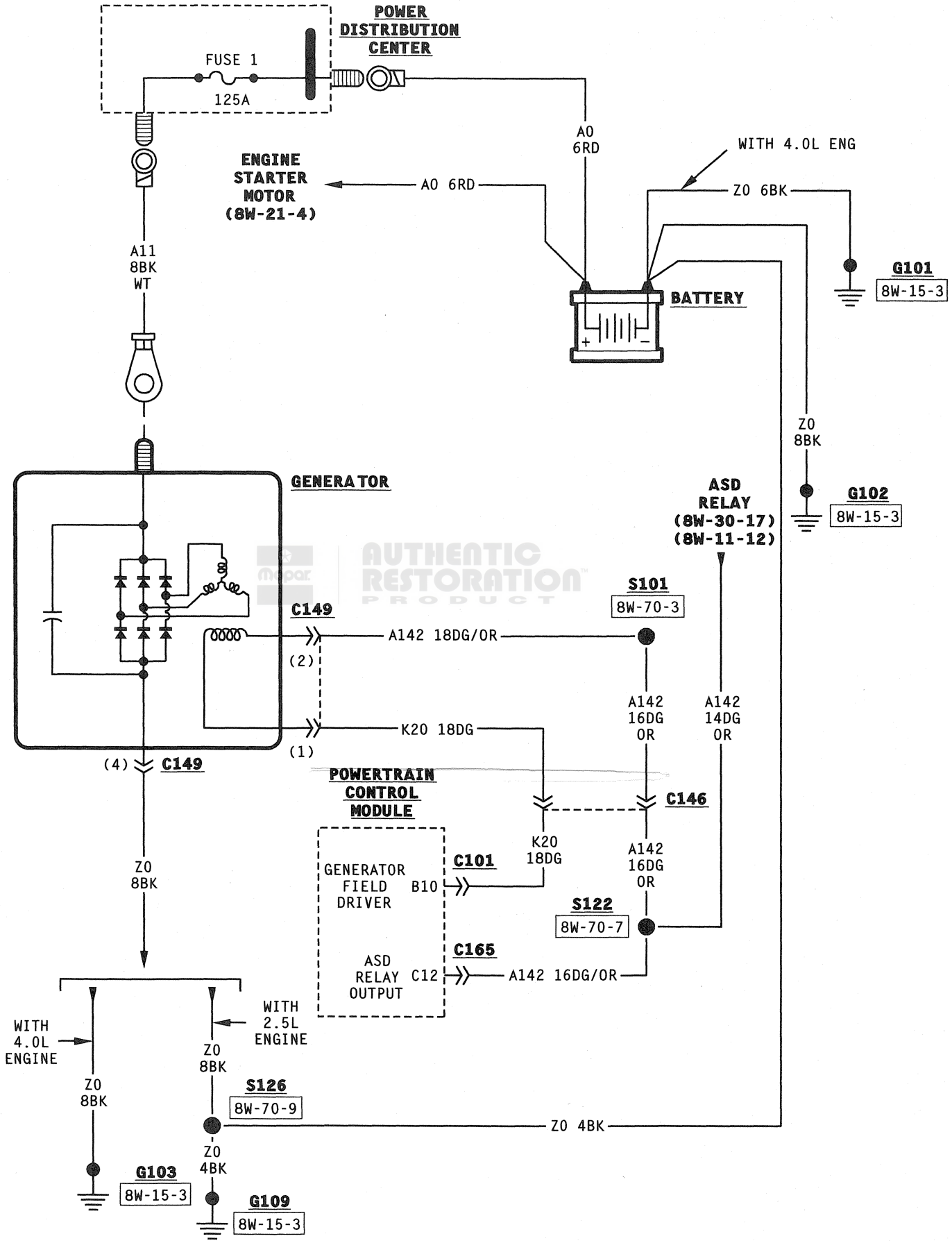
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Battery	8W-20-3
Generator	8W-20-3
Powertrain Control Module	8W-20-3
Power Distribution Center	8W-20-3

Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-21 STARTING SYSTEM

DESCRIPTION AND OPERATION

STARTING SYSTEM—AUTOMATIC TRANSMISSIONS

Circuit A0 from the battery is double crimped at the positive battery post. One branch of circuit A0 (battery positive cable) connects to the engine starter motor. The other A0 branch supplies voltage to the bus bar in the Power Distribution Center (PDC).

Fuse 3 in the PDC supplies battery voltage to the contact side of the engine starter motor relay on circuit A4. When the coil side of the engine starter motor relay energizes, the contacts close and connect circuit A4 to circuit T40. Circuit T40 supplies battery voltage to the starter motor solenoid.

The ignition switch supplies battery voltage to the coil side of the starter motor relay on circuit A41 when the key is moved to the START position and the PARK/NEUTRAL position switch is closed. Ground for the coil side of the starter motor relay is supplied by the PARK/NEUTRAL position switch. Circuit T41 connects the coil side of the relay to the PARK/NEUTRAL position switch.

When the starter motor relay energizes and the contacts close, circuit T40 supplies battery voltage to the starter motor solenoid. Circuit A0 from the battery supplies voltage to the starter motor when the solenoid energizes.

STARTING SYSTEM—MANUAL TRANSMISSION

Circuit A0 from the battery is double crimped at the positive battery post. One branch of circuit A0 (battery positive cable) connects to the battery starter motor. The other A0 branch supplies voltage to the bus bar in the Power Distribution Center (PDC).

Fuse 3 in the PDC supplies battery voltage to the contact side of the engine starter motor relay on circuit A4. When the coil side of the engine starter motor relay energizes, the contacts close and connect circuit A4 to circuit T40. Circuit T40 supplies battery voltage to the starter motor solenoid.

The ignition switch supplies battery voltage to the coil side of the starter motor relay on circuit A41 when the key is moved to the START position. Circuit Z1 provides ground for the coil side of the relay.

When the starter motor relay energizes and the contacts close, circuit T40 supplies battery voltage to the starter motor solenoid. Circuit A0 from the battery supplies voltage to the starter motor when the solenoid energizes.

SCHEMATICS AND DIAGRAMS

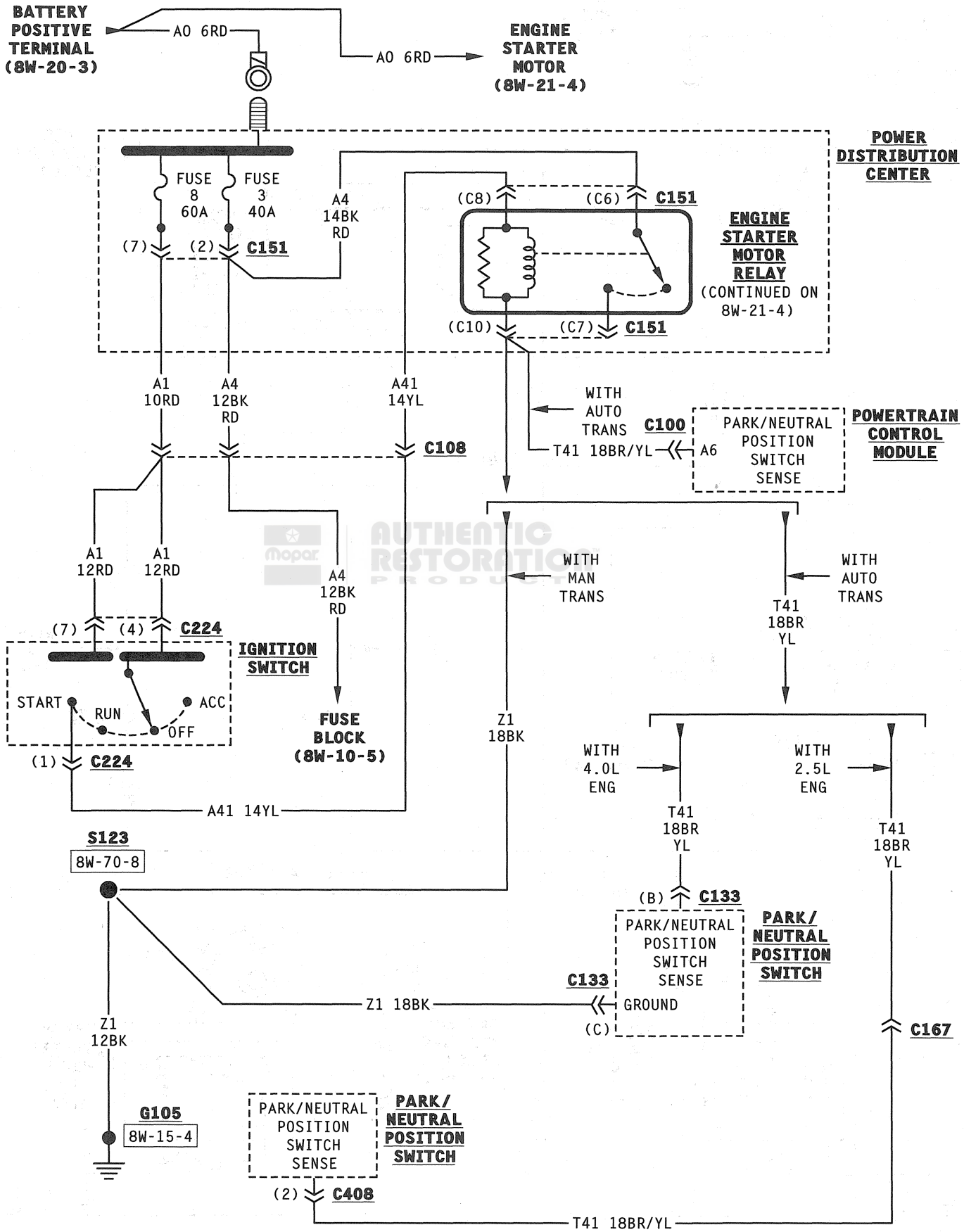
WIRING DIAGRAM INDEX

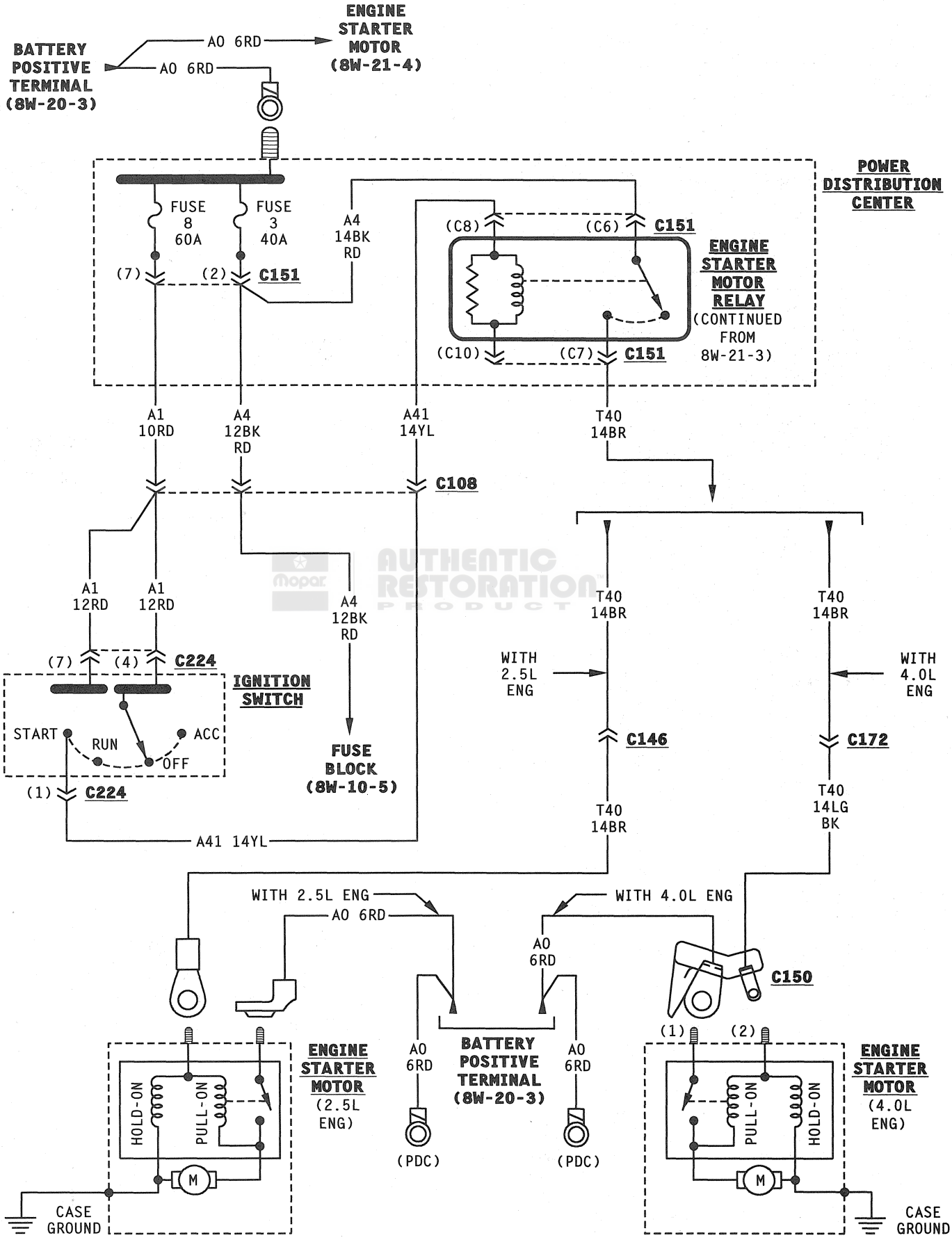
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Engine Starter Motor (2.5 L)	8W-21-4
Engine Starter Motor Relay (4.0 L)	8W-21-4
Engine Starter Motor Relay	8W-21-3, 4
Fuse 3 (PDC)	8W-21-3, 4
Fuse 8 (PDC)	8W-21-3, 4
Ignition Switch	8W-21-3, 4
Park/Neutral Position Switch (2.5L)	8W-21-3
Park/Neutral Position Switch (4.0L)	8W-21-3
Powertrain Control Module	8W-21-3
Power Distribution Center	8W-21-3, 4

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 8 60A
FUSE 3 40A
A4 14BK RD
(7)
(2)
C151
(C8)
(C6)
C151
ENGINE STARTER MOTOR RELAY
(CONTINUED ON 8W-21-4)
(C10)
(C7)
C151
A1 10RD
A4 12BK RD
A41 14YL
C108
WITH AUTO TRANS
C100
T41 18BR/YL
A6
PARK/NEUTRAL POSITION SWITCH SENSE
POWERTRAIN CONTROL MODULE
A1 12RD
A1 12RD
A4 12BK RD
WITH MAN TRANS
WITH AUTO TRANS
T41 18BR YL
(7)
(4)
C224
IGNITION SWITCH
START
RUN
ACC
OFF
(1)
C224
FUSE BLOCK (8W-10-5)
Z1 18BK
A41 14YL
WITH 4.0L ENG
WITH 2.5L ENG
T41 18BR YL
T41 18BR YL
S123
8W-70-8
(B)
C133
PARK/NEUTRAL POSITION SWITCH SENSE
PARK/ NEUTRAL POSITION SWITCH
C133
GROUND
(C)
Z1 18BK
Z1 12BK
C167
G105
8W-15-4
PARK/NEUTRAL POSITION SWITCH SENSE
PARK/ NEUTRAL POSITION SWITCH
(2)
C408
T41 18BR/YL



Mopar AUTHENTIC RESTORATION PRODUCT

8W-30 FUEL/IGNITION SYSTEMS

INDEX

page

DESCRIPTION AND OPERATION
- AUTOMATIC SHUT DOWN (ASD) RELAY 2
- BATTERY FEED 1
- BATTERY TEMPERATURE SENSOR 3
- CAMSHAFT POSITION SENSOR 3
- CCD BUS 5
- CRANKSHAFT POSITION SENSOR 3
- DATA LINK CONNECTOR 2
- DUTY CYCLE EVAP\PURGE SOLENOID 5
- ENGINE COOLANT TEMPERATURE SENSOR . . . 3
- EXTENDED IDLE SWITCH 5
- FUEL INJECTORS 4
- FUEL PUMP MODULE 2
- FUEL PUMP RELAY 2
- GROUND 1
- HEATED OXYGEN SENSORS 3
- IDLE AIR CONTROL (IAC) MOTOR 5
- IGNITION COIL 5
- IGNITION SWITCH 1
- INTAKE AIR TEMPERATURE SENSOR 4
- MALFUNCTION INDICATOR LAMP (MIL) 5
- MANIFOLD ABSOLUTE PRESSURE SENSOR . . . 4
- MANUAL TRANSMISSION UP-SHIFT LAMP 5
- PARK/NEUTRAL POSITION SWITCH 4
- POWER STEERING PRESSURE SWITCH 4
- STOP LAMP SWITCH INPUT 4
- TACHOMETER SIGNAL 5
- THROTTLE POSITION SENSOR 4
- TORQUE CONVERTER CLUTCH (TCC) SOLENOID 5
- VEHICLE SPEED SENSOR 2

SCHEMATICS AND DIAGRAMS
- WIRING DIAGRAM INDEX 5

Mopar AUTHENTIC RESTORATION PRODUCTS

DESCRIPTION AND OPERATION

IGNITION SWITCH

Circuit A1 from fuse 8 in the power distribution center (PDC), supplies battery voltage to the ignition switch. Depending upon position, the ignition switch powers circuits A21, A38, A41, or A48.

START POSITION

In the START position, the ignition switch connects circuit A1 to circuit A41. Circuit A41 connects to the coil side of the starter motor relay.

Additionally in the START position, the case grounded ignition switch provides ground for the brake lamp switch and the warning lamps in the instrument cluster.

START OR RUN POSITION

In the START or RUN position, the ignition switch connects circuit A1 to circuit A21. Circuit A21 splices to power fuse 17 in the fuse block and the coil side of the Automatic Shut Down (ASD) relay and the fuel pump relay.

RUN (ONLY) POSITION

When the ignition switch is in the RUN position, it connects circuit A1 to circuit A38. Circuit A38 splices to power fuses 1, 3, 7 and 10 in the fuse block. Circuit A38 also connects to the circuit breaker in cavity 6 of the fuse block.

ACCESSORY OR RUN POSITIONS

In the ACCESSORY or RUN positions, the ignition switch connects circuit A1 to circuit A48. Circuit A48 connects to a bus bar in the fuse block that feeds fuses 2 and 5.

BATTERY FEED

Circuit A14 from fuse 6 in the Power Distribution Center (PDC) supplies battery voltage to cavity A22 of the Powertrain Control Module (PCM).

HELPFUL INFORMATION

Circuit A14 also supplies power to the contact sides of the fuel pump relay.

GROUND

Circuit Z12 connects to cavities A31 and A32 of the PCM. The Z12 circuit provides ground for PCM internal drivers that operate high current devices like the injectors and ignition coil.

Internal to the PCM, the power (device) ground circuit connects to the PCM sensor return circuit (from circuit K4).

HELPFUL INFORMATION

- The grounding point for circuit Z12 is the right rear of the engine.
- If the system loses ground for the Z12 circuits at the rear of the engine, the vehicle will not operate. Check the connection at the ganged-ground circuit eyelet.

DESCRIPTION AND OPERATION (Continued)

DATA LINK CONNECTOR

Circuit F39 from the Power Distribution Center (PDC) supplies battery voltage to the data link connector.

Circuit T137 from the Transmission Control Module (TCM) connects to the data link connector. Circuit T137 originates at cavity C4 of the TCM.

Circuit D20 connects to cavity C29 of the PCM. Circuit D20 is the SCI receive circuit for the Powertrain Control Module (PCM). Circuit D21 connects to cavity C27 of the PCM and cavity A3 of the Controller- Anti Lock Brakes. Circuit D21 is the SCI transmit circuit for the PCM. CCD Bus Circuits D1 and D2 connect to the data link connector.

Circuits Z11 and Z12 provide ground for the data link connector. Circuit Z12 also connects to cavities A31 and A32 of the PCM.

AUTOMATIC SHUT DOWN (ASD) RELAY

When the ignition switch is in either the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 supplies battery voltage to the coil side of the Automatic Shut Down (ASD) relay. The Powertrain Control Module (PCM) provides ground for the relay on circuit K51. Circuit K51 connects to cavity C3 of the PCM.

When the PCM grounds the ASD relay, contacts inside the relay close and connect circuit A18 from fuse 20 in the PDC to circuit A142. Circuit A142 splices to the generator field terminal, fuel injectors, ignition coil and the upstream and downstream heated oxygen sensors. Circuit A142 also connects to cavity C12 of the PCM.

HELPFUL INFORMATION

Along with supplying voltage to the coil side of the ASD relay, circuit A21 also supplies voltage to the coil side of the fuel pump relay.

FUEL PUMP RELAY

When the ignition switch is in either the START or RUN positions, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 supplies battery voltage to the coil side of the fuel pump relay. The Powertrain Control Module (PCM) provides ground for the relay on circuit K31. Circuit K31 connects to cavity C19 of the PCM.

When the PCM grounds the fuel pump relay, contacts inside the relay close and connect circuit A14 from fuse 6 in the PDC to circuit A141. Circuit A141 connects to circuit A241. Circuit A241 supplies voltage to the fuel pump motor (part of the in-tank fuel pump module).

HELPFUL INFORMATION

Circuit A14 also splices to supply battery voltage to cavity A22 of the PCM.

FUEL PUMP MODULE

The in-tank fuel pump module contains the fuel pump motor and fuel level sensor.

FUEL PUMP MOTOR

When the fuel pump relay contacts close, the relay supplies voltage to the fuel pump motor. Circuit A141 from the relay supplies voltage to circuit A241. Circuit A241 powers the fuel pump module. Circuit Z1 provides ground for the fuel pump motor.

FUEL LEVEL SENSOR

The fuel level sensor is a variable resistor. Circuit G4 connects the fuel level sensor to the fuel gauge in the instrument cluster. Circuit G4 also supplies the fuel level sensor signal to the Powertrain Control Module (PCM). Circuit F87 from fuse 17 in the fuse block supplies voltage to the fuel gauge. The fuel level sensor draws voltage from circuit F87 through the fuel gauge on circuit G4. Circuit Z1 provides the ground path for the fuel level sensor.

HELPFUL INFORMATION

As current flows through the coils in the fuel gauge, it creates a magnetic field. One of the coils in the gauge receives fixed current. The other coil is connected to the level sensor. The magnetic field controls the position of the fuel gauge pointer.

The fuel level sensor contains a variable resistor. As the position of the float arm on the fuel level sensor changes, the resistor changes the current flow through second coil in the fuel gauge. A change in current flow alters the magnetic field in the fuel gauge, which changes the pointer position.

VEHICLE SPEED SENSOR

Circuit K7 supplies 5 volts from the Powertrain Control Module (PCM) to the vehicle speed sensor. The K7 circuit connects to cavity B31 of the PCM.

Circuit G7 from the vehicle speed sensor provides an input signal to the PCM. The G7 circuit connects to cavity B27 of the PCM.

The PCM provides a ground for the vehicle speed sensor signal (circuit G7) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Heated oxygen sensor
- Camshaft position sensor
- Crankshaft position sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DESCRIPTION AND OPERATION (Continued)

HEATED OXYGEN SENSORS

When the Automatic Shut Down (ASD) relay contacts close, they connect circuits A18 and A142. Circuit A142 splices to supply voltage to the upstream and downstream heated oxygen sensors.

Circuit K41 delivers the signal from the upstream heated oxygen sensor to the Powertrain Control Module (PCM). Circuit K41 connects to cavity A24 of the PCM. Circuit K341 supplies the signal from the downstream heated oxygen sensor to the PCM. Circuit K341 connects to PCM cavity A25.

The PCM provides a ground for the heated oxygen sensor signals (circuits K41 and K341) through circuit K4. Circuit K4 connects to cavity A4 of the PCM connector.

Circuit Z11 provides ground for the heater circuit in each sensor.

HELPFUL INFORMATION

Circuit A142 also supplies battery voltage to the fuel injectors, ignition coil, and generator.

Circuit K4 splices to supply ground for the signals from the following:

- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

BATTERY TEMPERATURE SENSOR

The Powertrain Control Module (PCM) determines battery temperature on circuit K118. Circuit K118 connects the PCM to the battery temperature sensor. Circuit K118 connects to cavity C15 of the PCM. Circuit K4 provides ground for the sensor and connects to PCM cavity A4.

CRANKSHAFT POSITION SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the crankshaft position sensor on circuit K6. Circuit K6 connects to cavity A17 of the PCM.

The PCM receives the crankshaft position sensor signal on circuit K24. Circuit K24 connects to cavity A8 of the PCM.

The PCM provides a ground for the crankshaft position sensor (circuit K24) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

- Circuit K6 splices to supply 5 volts to the camshaft position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensor
- Camshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

CAMSHAFT POSITION SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the camshaft position sensor (in distributor) on circuit K6. Circuit K6 connects to cavity A17 of the PCM.

The PCM receives the camshaft position sensor signal on circuit K44. Circuit K44 connects to cavity A18 of the PCM.

The PCM provides a ground for the camshaft position sensor signal (circuit K44) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

- Circuit K6 splices to supply 5 volts to the crankshaft position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K2. From circuit K2, the engine coolant temperature sensor draws up to 5 volts from the PCM. The sensor is a variable resistor. As coolant temperature changes, the resistance in the sensor changes, causing a change in current draw. The K2 circuit connects to cavity A16 of the PCM.

The PCM provides a ground for the engine coolant temperature sensor signal (circuit K2) through circuit K4. Circuit K4 connects to cavity A4 of the PCM connector.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Battery temperature sensor
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Upstream and downstream heated oxygen sensor
- Vehicle speed sensor

DESCRIPTION AND OPERATION (Continued)

THROTTLE POSITION SENSOR

From the Powertrain Control Module (PCM), circuit K6 supplies 5 volts to the throttle position sensor (TPS). Circuit K6 connects to cavity A17 of the PCM.

Circuit K22 delivers the TPS signal to the PCM. Circuit K22 connects to cavity A23 of the PCM.

The PCM provides a ground for the throttle position sensor signal (circuit K22) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Refer to Group 14 for throttle position sensor operation.

Circuit K6 splices to supply 5 volts to the manifold absolute pressure sensor, battery temperature sensor, camshaft position sensor, and crankshaft position sensor.

On vehicles equipped with the 4.0L engine and automatic transmission, circuit K22 splices to the transmission control module.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

MANIFOLD ABSOLUTE PRESSURE SENSOR

From the Powertrain Control Module (PCM), circuit K6 supplies 5 volts to the manifold absolute pressure (MAP) sensor. Circuit K6 connects to cavity A17 of the PCM.

Circuit K1 delivers the MAP signal to the PCM. Circuit K1 connects to cavity A27 of the PCM.

The PCM provides a ground for the MAP sensor signal (circuit K1) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Refer to Group 14 for MAP sensor operation.

Circuit K6 splices to supply 5 volts to the camshaft position sensor, crankshaft position sensor and throttle position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

INTAKE AIR TEMPERATURE SENSOR

The intake air temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K21. Circuit K21 connects to cavity A15 of the PCM.

From circuit K21, the intake air temperature sensor draws voltage from the PCM. The sensor is a variable resistor. As intake air temperature changes, the resistance in the sensor changes, causing a change in current draw.

The PCM provides a ground for the intake air temperature sensor signal (circuit K21) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Camshaft position sensor
- Crankshaft position sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

PARK/NEUTRAL POSITION SWITCH

When closed, the park/neutral position switch provides a ground path on circuit T41 for the coil side of the starter motor relay. Circuit A41 from the ignition switch provides battery voltage to the coil side of the relay.

Circuit T41 is double crimped at the coil side of the relay and connects to cavity A6 of the Powertrain Control Module (PCM). The park/neutral position switch provides an input to the PCM.

POWER STEERING PRESSURE SWITCH

The Powertrain Control Module (PCM) connects to the power steering pressure switch on circuit K10. On vehicles equipped with a manual transmission, circuit Z12 provides ground for the switch. If the vehicle has an automatic transmission, circuit Z1 provides ground. When the switch closes, it connects circuit K10 to ground. The switch closes during periods of high power steering pump load and low engine speed; such as parking maneuvers.

Circuit K10 connects to cavity A12 of the PCM. Circuit Z12 also connects to cavities A31 and A32 of the PCM.

STOP LAMP SWITCH INPUT

Circuit K29 provides the stop lamp switch input to the PCM. Circuit K29 connects to cavity C24 of the PCM. Circuit K29 also connects to the Transmission Control Module (TCM) and the shift interlock.

FUEL INJECTORS

When the Automatic Shut Down (ASD) relay contacts close, they connect circuits A18 and A142. Circuit A142 supplies voltage to the fuel injectors. Each

DESCRIPTION AND OPERATION (Continued)

injector has a separate ground circuit controlled by the Powertrain Control Module (PCM).

Circuit K11 provides ground for injector number one. The K11 circuit connects to cavity B4 of the PCM.

Circuit K12 provides ground for injector number two. The K12 circuit connects to cavity B15 of the PCM.

Circuit K13 provides ground for injector number three. The K13 circuit connects to cavity B5 of the PCM.

Circuit K14 provides ground for injector number four. The K14 circuit connects to cavity B16 of the PCM.

On the 4.0L engine, circuit K38 provides ground for injector number five. The K38 circuit connects to cavity B6 of the PCM.

Also on the 4.0L engine, circuit K58 provides ground for injector number six. The K58 circuit connects to cavity B12 of the PCM.

HELPFUL INFORMATION

- Circuit A142 splices to supply voltage to the upstream and downstream heated oxygen sensors, ignition coil, PCM, and generator.
- For information about fuel injector operation, refer to Group 14.

IGNITION COIL

When the Automatic Shut Down (ASD) relay contacts close, they connect circuits A18 and A142. Circuit A142 splices to supply voltage to the ignition coil. The Powertrain Control Module (PCM) controls the ground path for the ignition coil on circuit K19. Circuit K19 connects to cavity A7 of the PCM.

HELPFUL INFORMATION

Circuit A142 splices to supply voltage to the fuel injectors, PCM, heated oxygen sensors, and generator.

IDLE AIR CONTROL (IAC) MOTOR

The Powertrain Control Module (PCM) operates the idle air control motor through 4 circuits; K39, K40, K59, and K60. Each circuit connects to separate cavities in the PCM connector.

- Circuit K39 connects to cavity A19 of the PCM
- Circuit K40 connects to cavity A11 of the PCM
- Circuit K59 connects to cavity A20 of the PCM
- Circuit K60 connects to cavity A10 of the PCM

DUTY CYCLE EVAP\PURGE SOLENOID

When the ignition switch is in the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 powers circuit F12 through fuse 18 in the fuse block. Circuit F12 supplies power to the Duty Cycle EVAP/Purge solenoid.

The Powertrain Control Module (PCM) provides the ground path for the solenoid on circuit K52. Circuit K52 connects to cavity C20 of the PCM.

TORQUE CONVERTER CLUTCH (TCC) SOLENOID

The TCC solenoid is only used on 2.5L engines with the three-speed automatic transmissions. Circuit T22 from fuse 21 in the Power Distribution Center (PDC) powers the TCC solenoid. The Powertrain Control Module (PCM) provides ground for the solenoid on circuit K54. Circuit K54 connects to cavity B11 of the PCM.

MANUAL TRANSMISSION UP-SHIFT LAMP

Circuit F87 supplies power for the manual transmission up-shift lamp. The lamp illuminates when the Powertrain Control Module (PCM) provides ground for the lamp on circuit K54. Circuit K54 connects to cavity B11 of the PCM.

TACHOMETER SIGNAL

The Powertrain Control Module (PCM) supplies the signal for the tachometer on circuit G21. Circuit G21 connects to cavity C31 of the PCM.

MALFUNCTION INDICATOR LAMP (MIL)

The Powertrain Control Module (PCM) provides ground for the instrument cluster malfunction indicator lamp on circuit G3. Circuit G3 connects to cavity C17 of the PCM. Circuit F87 provides voltage for the lamp. The MIL displays the message CHECK ENGINE when illuminated.

For information regarding diagnostic trouble code access using the MIL lamp, refer to Group 14, Fuel Systems.

EXTENDED IDLE SWITCH

On Police Package vehicles, an optional extended idle switch provides an input to the Powertrain Control Module (PCM) on circuit K10. Circuit K10 connects to cavity A12 of the PCM. When the ignition switch is in the RUN position, circuit F60 from fuse 3 in the fuse block supplies battery voltage to the extended idle switch. Circuit Z1 grounds the switch.

CCD BUS

Circuits D1 and D2 connect the Powertrain Control Module (PCM) to the CCD Bus. Circuit D1 connects to cavity C30 of the PCM. Circuit D2 connects to cavity C28 of the PCM. Circuits D1 and D2 are a twisted pair of wires.

SCHEMATICS AND DIAGRAMS

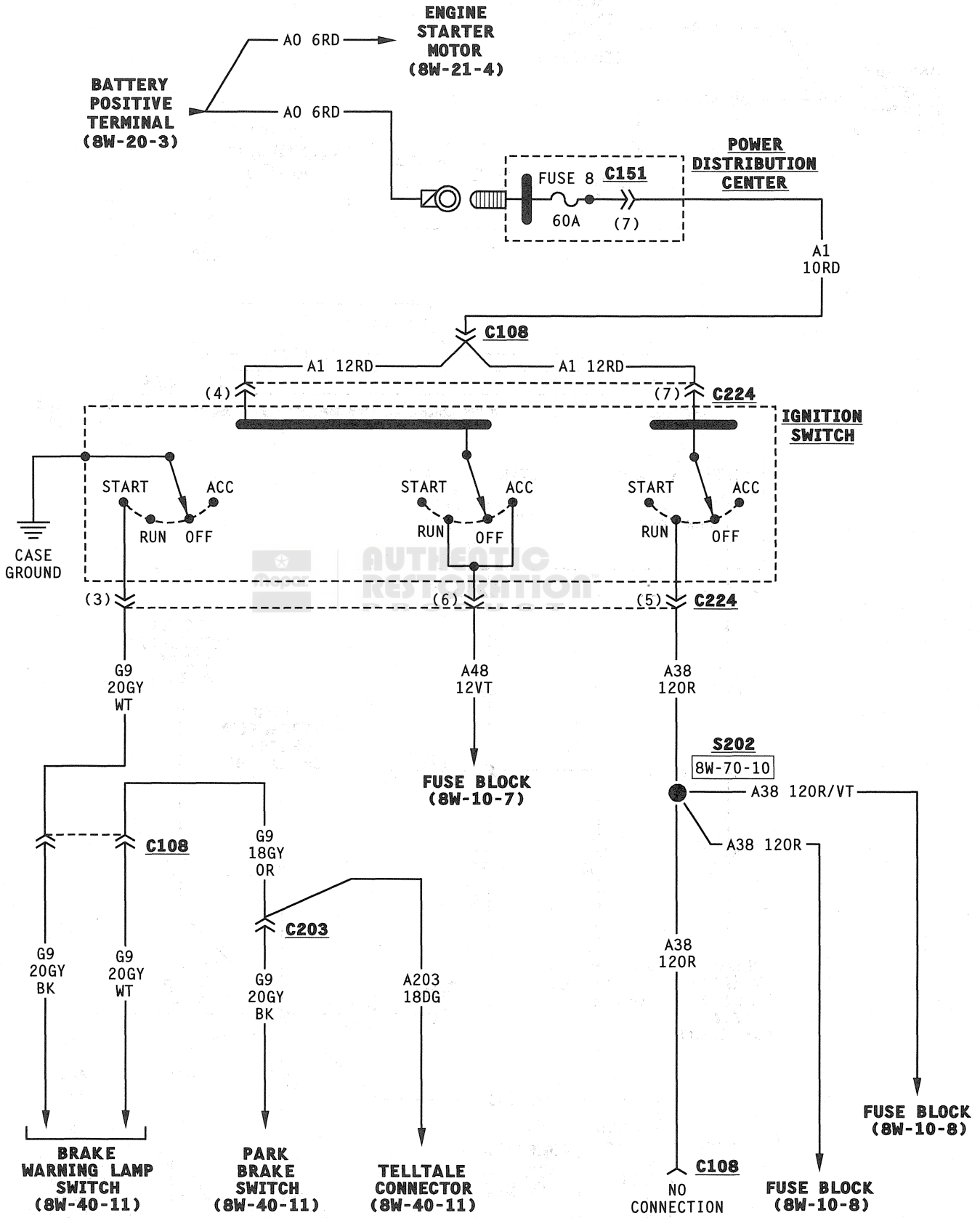
WIRING DIAGRAM INDEX

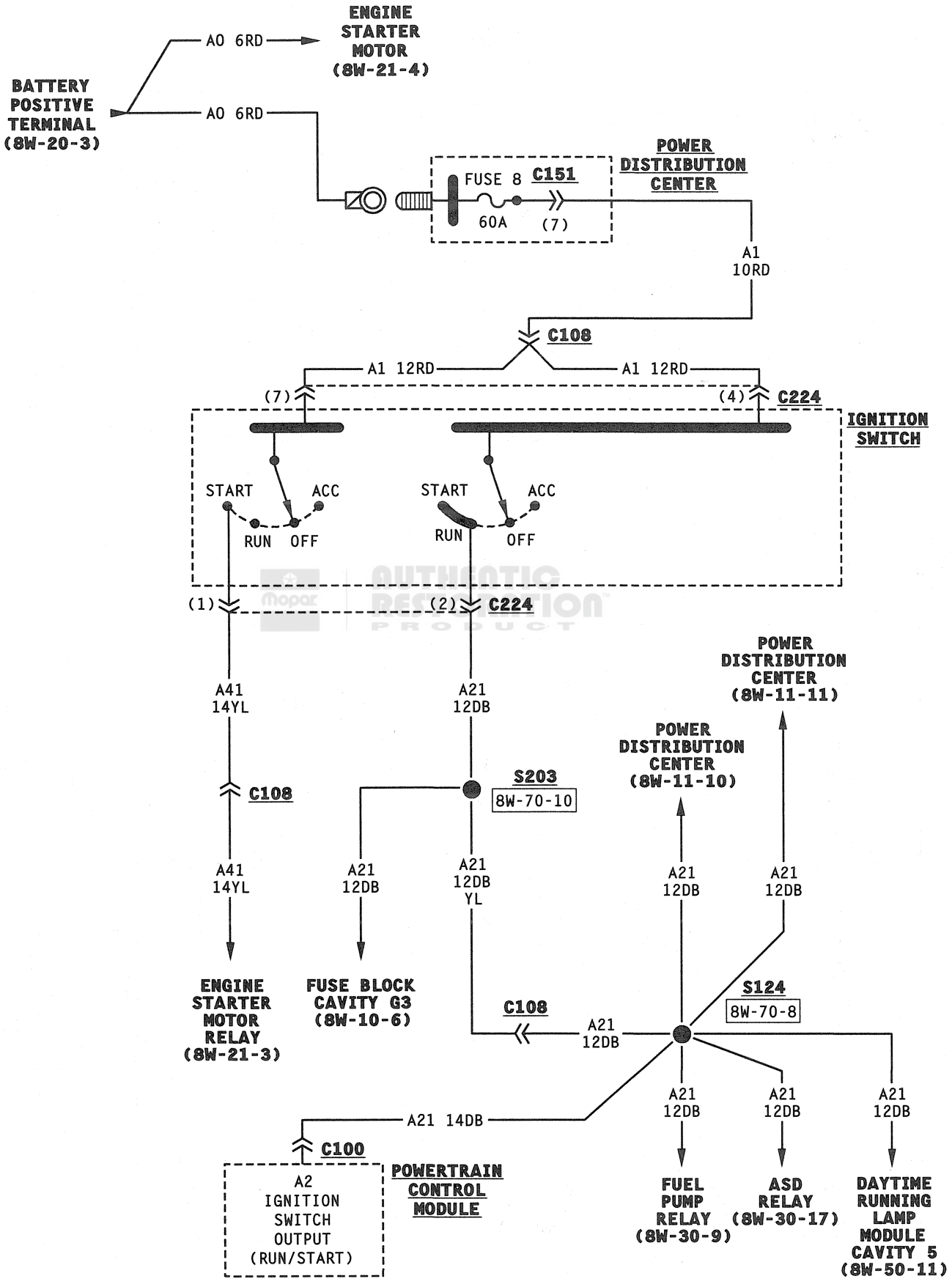
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

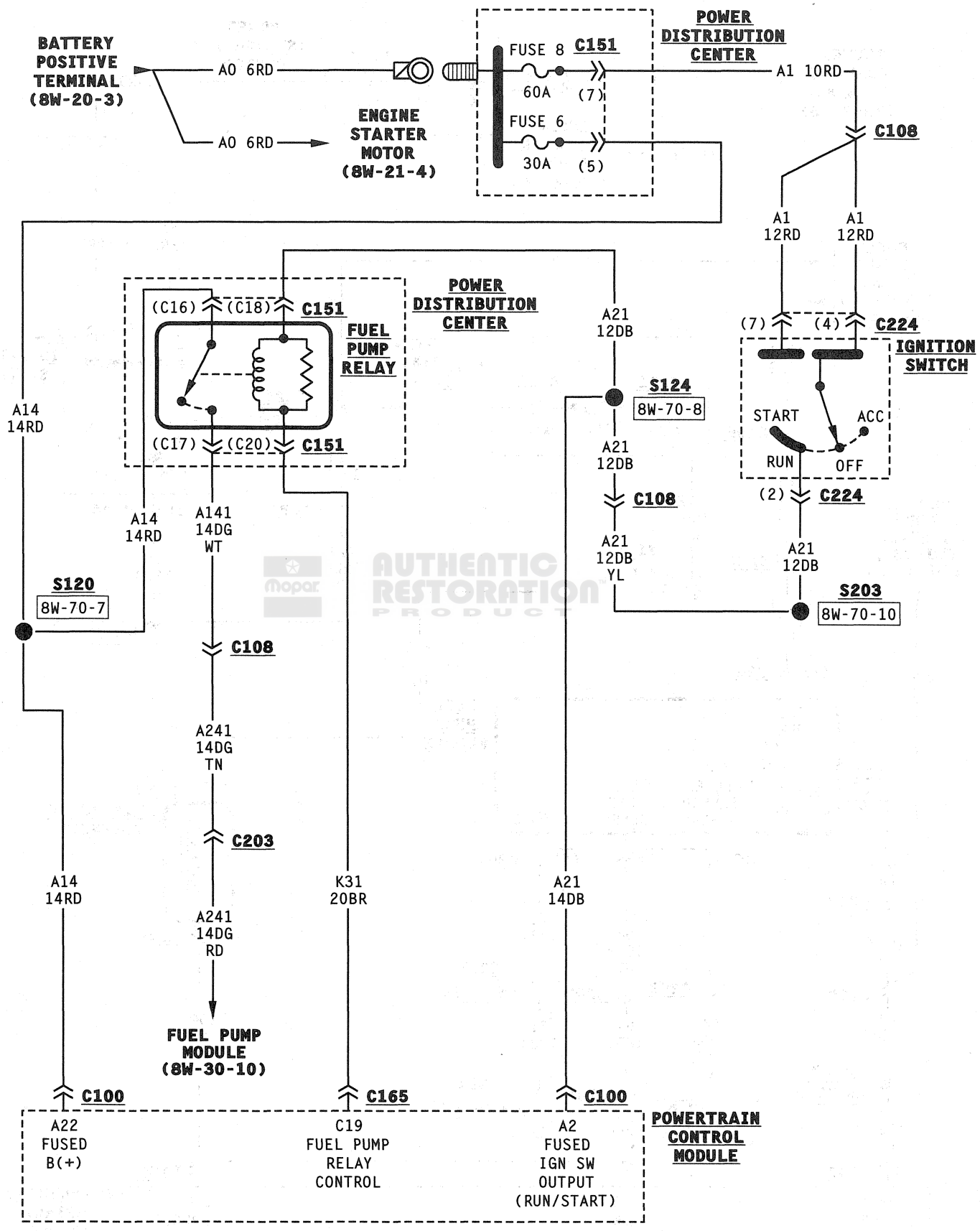
DIAGRAM INDEX

Component	Page
Automatic Shut Down Relay	8W-30-17
Battery Temperature Sensor	8W-30-16
Camshaft Position Sensor	8W-30-14
Controller Anti-Lock Brake	8W-30-21
Crankshaft Position Sensor	8W-30-14
Data Link Connector	8W-30-21
Downstream Heated Oxygen Sensor	8W-30-18
Engine Coolant Temperature Sensor	8W-30-11
Evap/Purge Solenoid	8W-30-10
Extended Idle Switch	8W-30-12
Extended Idle Switch Lamp	8W-30-12
Fuel Injectors	8W-30-17
Fuel Pump Module	8W-30-10
Fuel Pump Relay	8W-30-9
Fuse 3	8W-30-12
Fuse 6 (PDC)	8W-30-9
Fuse 8 (PDC)	8W-30-7, 8, 9, 10, 12, 17
Fuse 17 (PDC)	8W-30-21
Fuse 18 (PDC)	8W-30-10
Fuse 19	8W-30-12
Fuse 20 (PDC)	8W-30-17
Fuse 21 (PDC)	8W-30-20
Generator	8W-30-19
Idle Air Control Motor	8W-30-11
Ignition Coil	8W-30-19
Ignition Switch	8W-30-7, 8, 9, 10, 12, 17
Injectors	8W-30-17
Instrument Cluster	8W-30-20
Intake Air Temperature Sensor	8W-30-15
Manifold Absolute Pressure Sensor	8W-30-15
Power Steering Pressure Switch	8W-30-13
Powertrain Control Module	8W-30-8 through 22
Telltale Connector	8W-30-20
Throttle Position Sensor	8W-30-16
Torque Converter Clutch Solenoid	8W-30-20
Transmission Control Module	8W-30-21
Upstream Heated Oxygen Sensor	8W-30-18
Vehicle Speed Sensor	8W-30-22

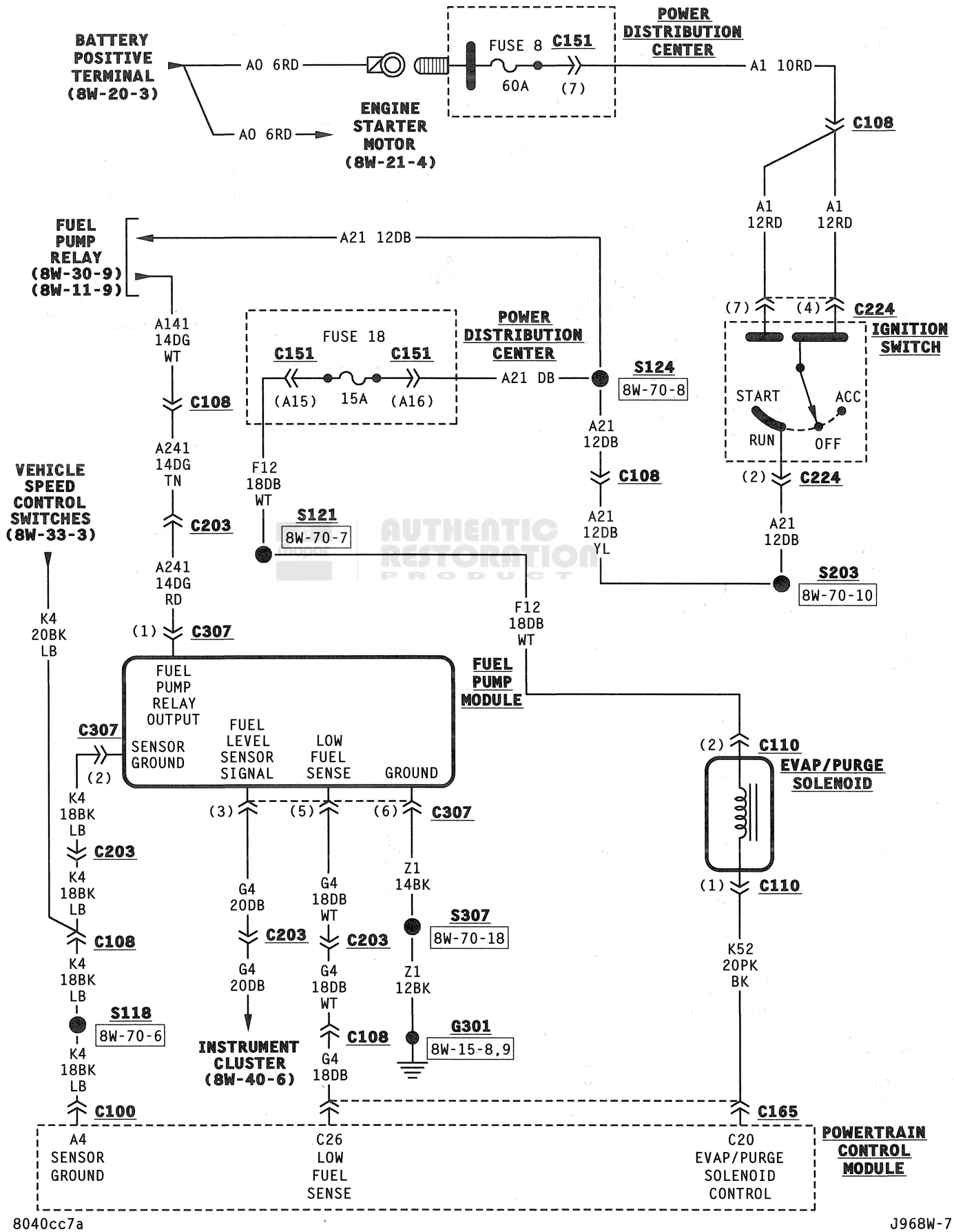
Mopar AUTHENTIC RESTORATION PRODUCT


ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
A1 10RD
C108
A1 12RD
A1 12RD
(4)
(7)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
START
ACC
RUN
OFF
START
ACC
RUN
OFF
CASE GROUND
(3)
(6)
(5)
C224
G9 20GY WT
A48 12VT
A38 120R
FUSE BLOCK (8W-10-7)
S202
8W-70-10
A38 120R/VT
C108
G9 18GY OR
A38 120R
C203
G9 20GY BK
G9 20GY WT
G9 20GY BK
A203 18DG
A38 120R
FUSE BLOCK (8W-10-8)
BRAKE WARNING LAMP SWITCH (8W-40-11)
PARK BRAKE SWITCH (8W-40-11)
TELLTALE CONNECTOR (8W-40-11)
C108
NO CONNECTION
FUSE BLOCK (8W-10-8)

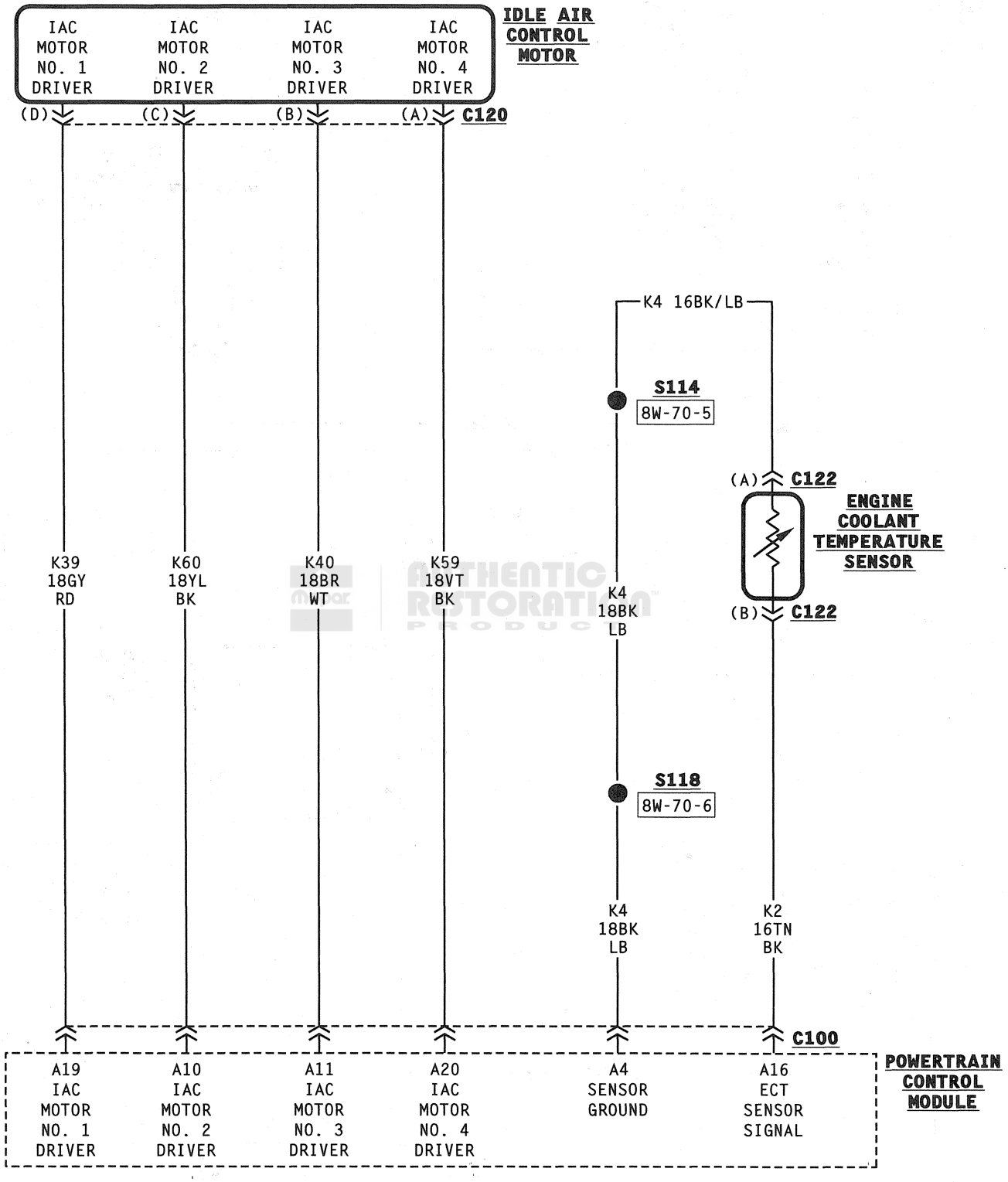

ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 8
C151
60A
(7)
POWER DISTRIBUTION CENTER
A1 10RD
C108
A1 12RD
A1 12RD
(7)
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
START
ACC
RUN
OFF
(1)
(2)
C224
A41 14YL
A21 12DB
POWER DISTRIBUTION CENTER (8W-11-11)
POWER DISTRIBUTION CENTER (8W-11-10)
C108
S203
8W-70-10
A41 14YL
A21 12DB
A21 12DB YL
A21 12DB
A21 12DB
ENGINE STARTER MOTOR RELAY (8W-21-3)
FUSE BLOCK CAVITY G3 (8W-10-6)
C108
A21 12DB
S124
8W-70-8
A21 14DB
A21 12DB
A21 12DB
A21 12DB
C100
A2 IGNITION SWITCH OUTPUT (RUN/START)
POWERTRAIN CONTROL MODULE
FUEL PUMP RELAY (8W-30-9)
ASD RELAY (8W-30-17)
DAYTIME RUNNING LAMP MODULE CAVITY 5 (8W-50-11)



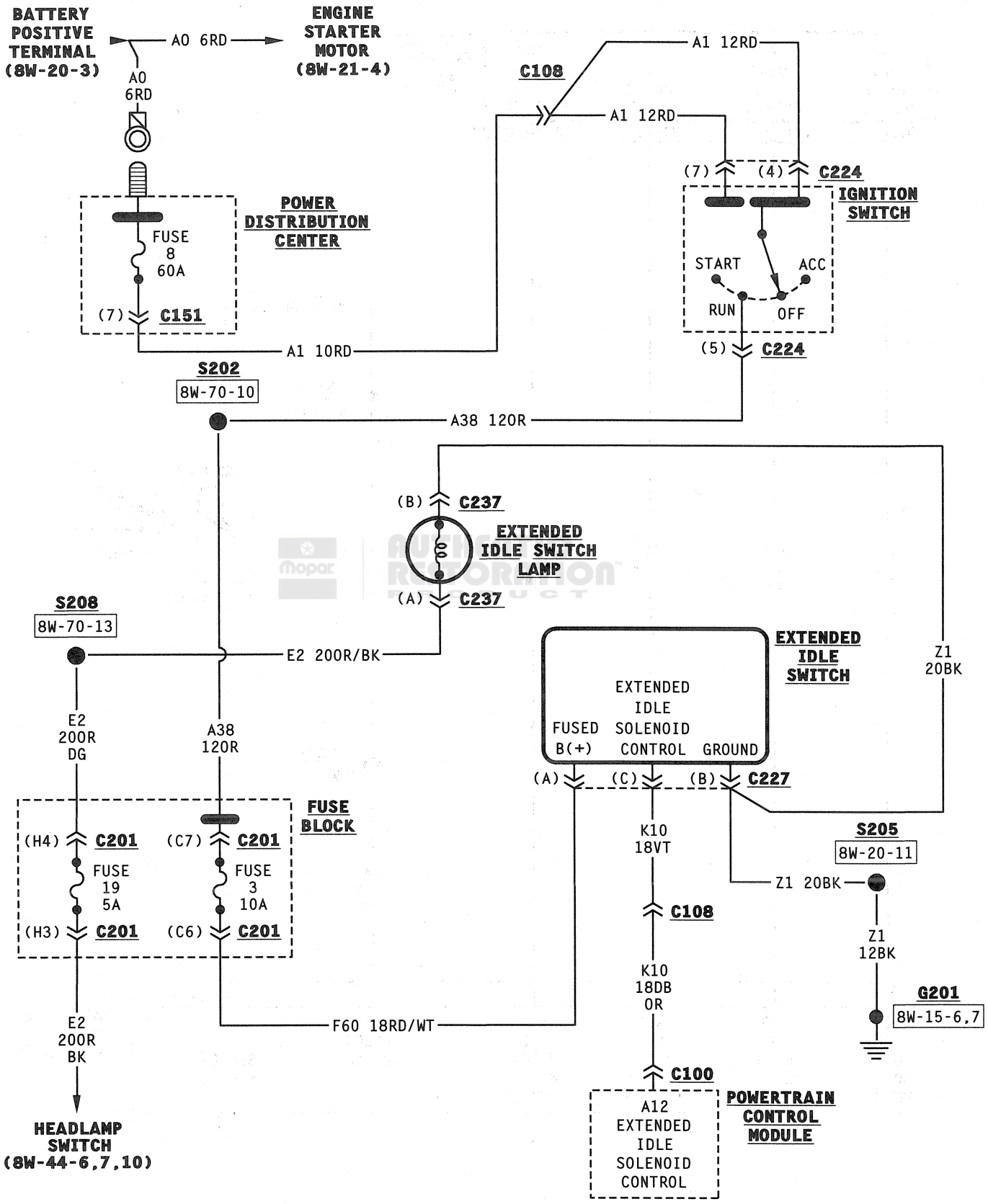
Mopar AUTHENTIC RESTORATION PRODUCT

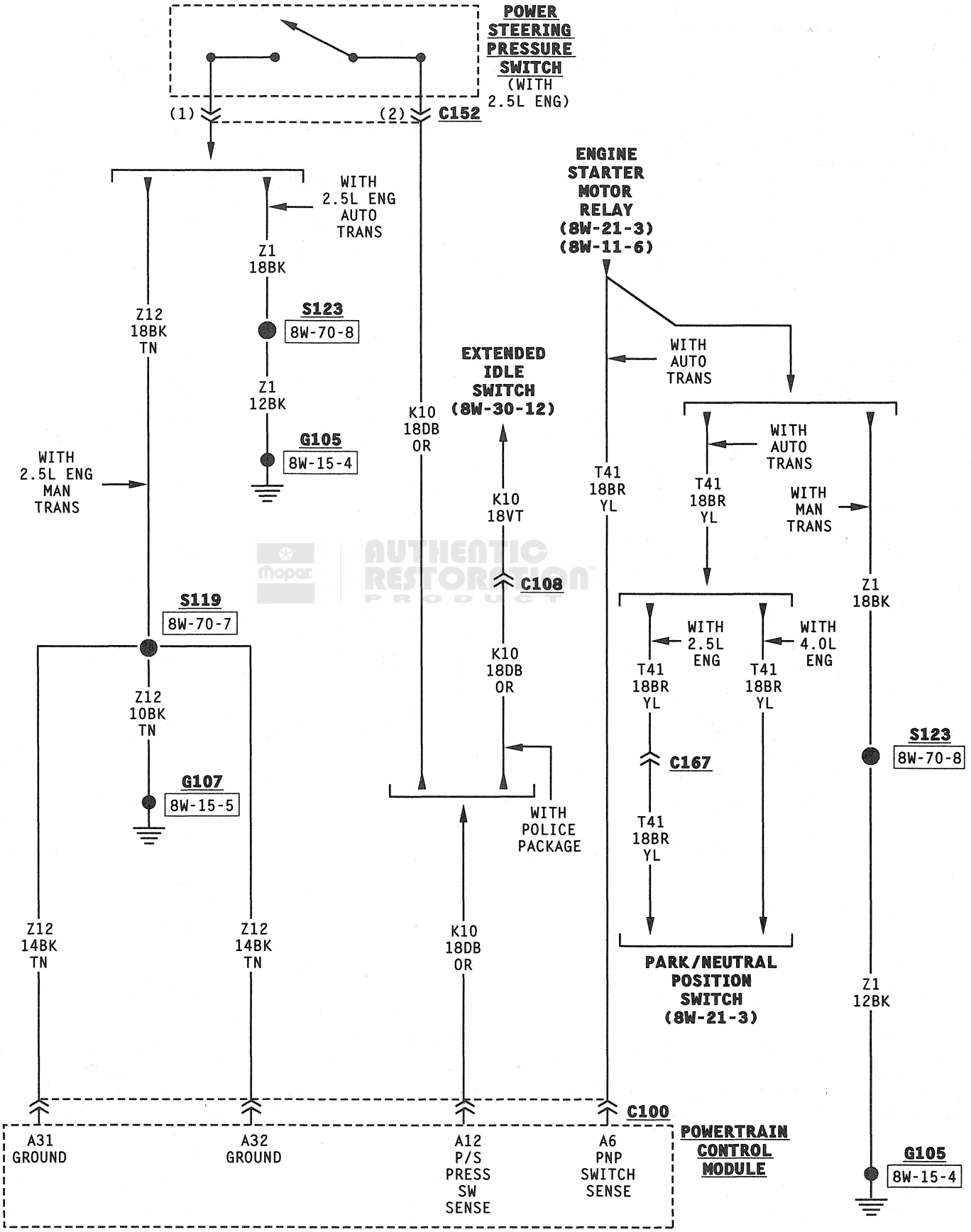


AUTHENTIC RESTORATION PRODUCT

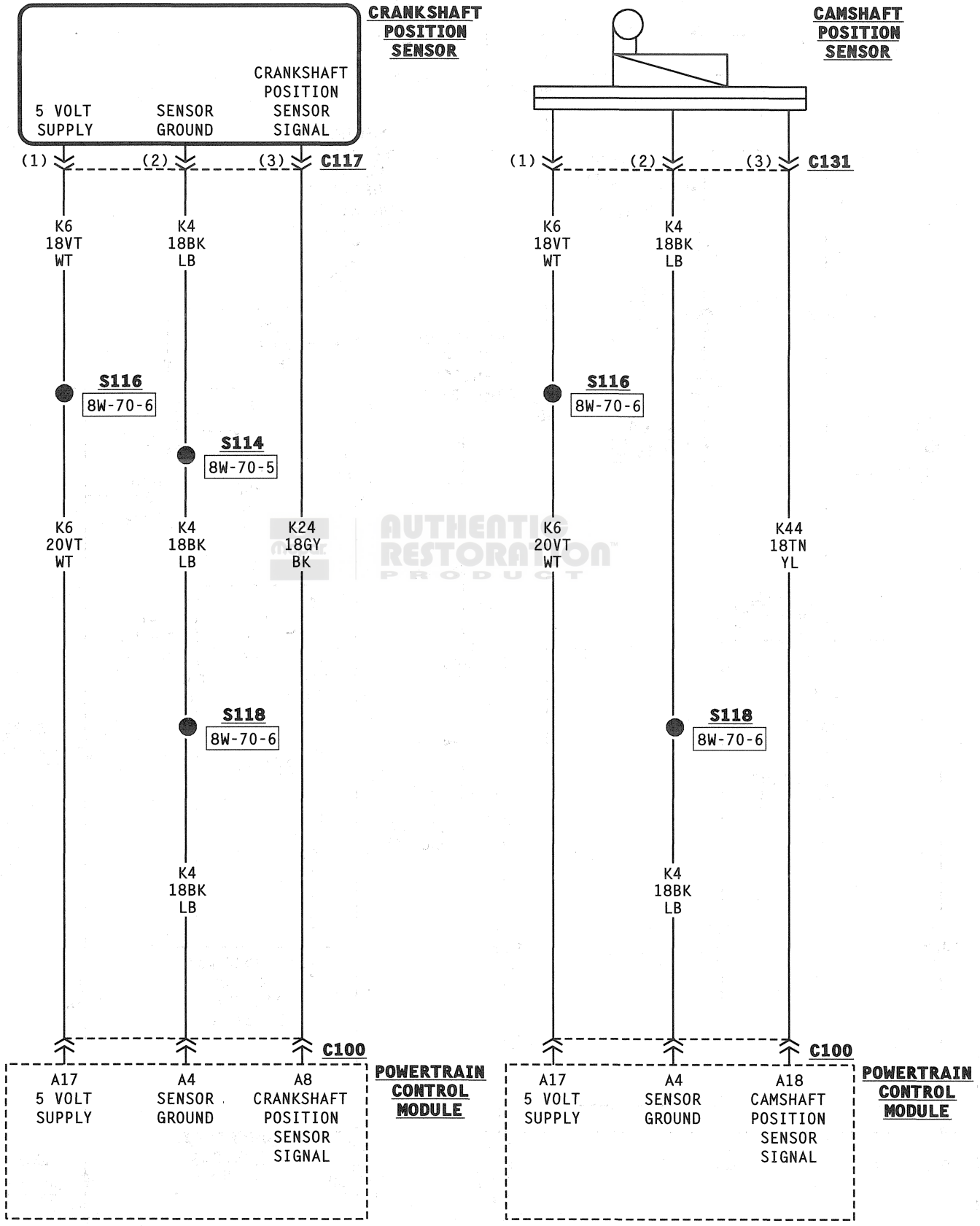

IAC MOTOR NO. 1 DRIVER
IAC MOTOR NO. 2 DRIVER
IAC MOTOR NO. 3 DRIVER
IAC MOTOR NO. 4 DRIVER
IDLE AIR CONTROL MOTOR
(D)
(C)
(B)
(A)
C120
K4 16BK/LB
S114
8W-70-5
(A)
C122
ENGINE COOLANT TEMPERATURE SENSOR
(B)
C122
K39 18GY RD
K60 18YL BK
K40 18BR WT
K59 18VT BK
K4 18BK LB
S118
8W-70-6
K4 18BK LB
K2 16TN BK
C100
A19 IAC MOTOR NO. 1 DRIVER
A10 IAC MOTOR NO. 2 DRIVER
A11 IAC MOTOR NO. 3 DRIVER
A20 IAC MOTOR NO. 4 DRIVER
A4 SENSOR GROUND
A16 ECT SENSOR SIGNAL
POWERTRAIN CONTROL MODULE

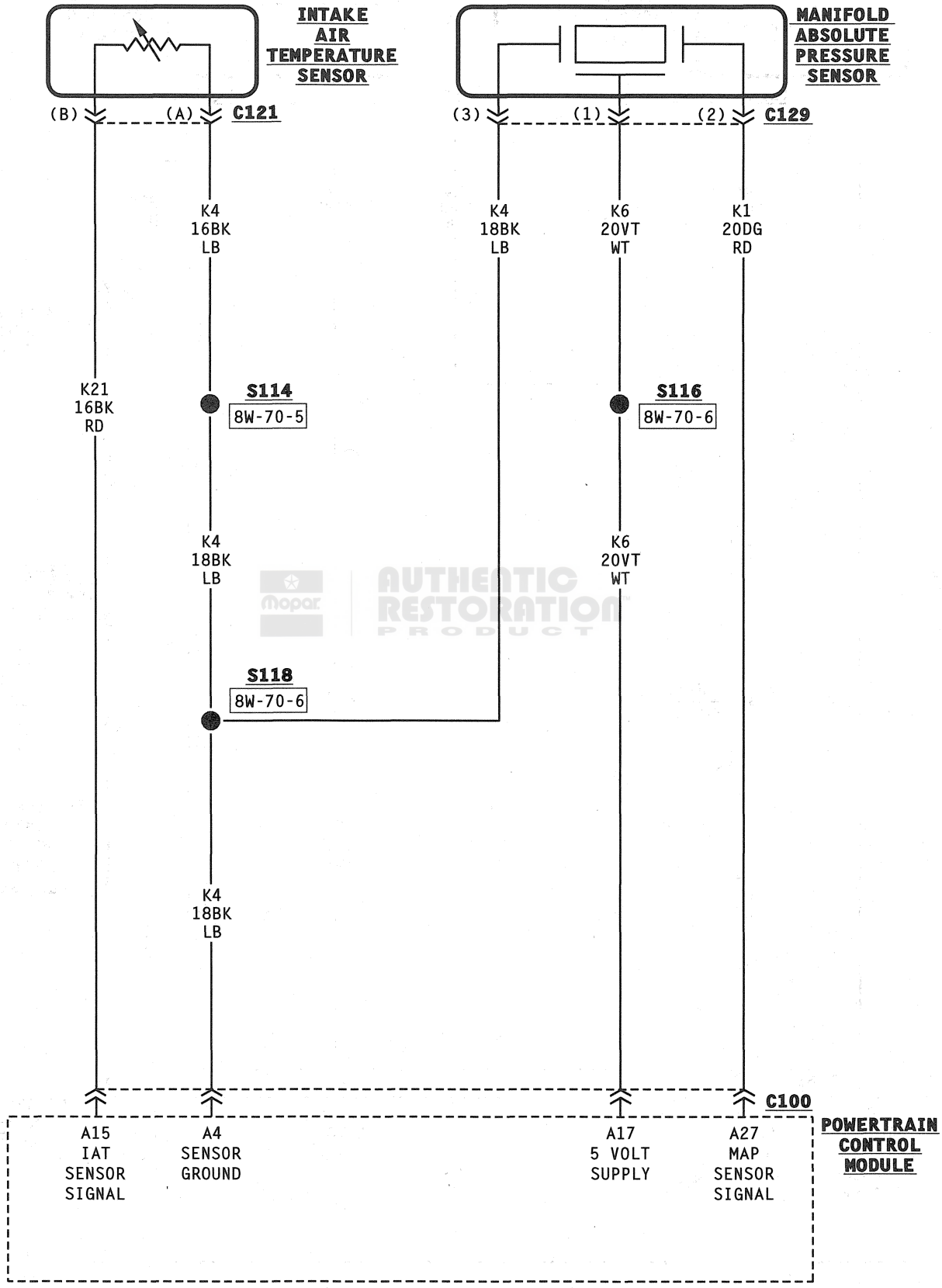
WITH 4.0L ENGINE - POLICE PACKAGE



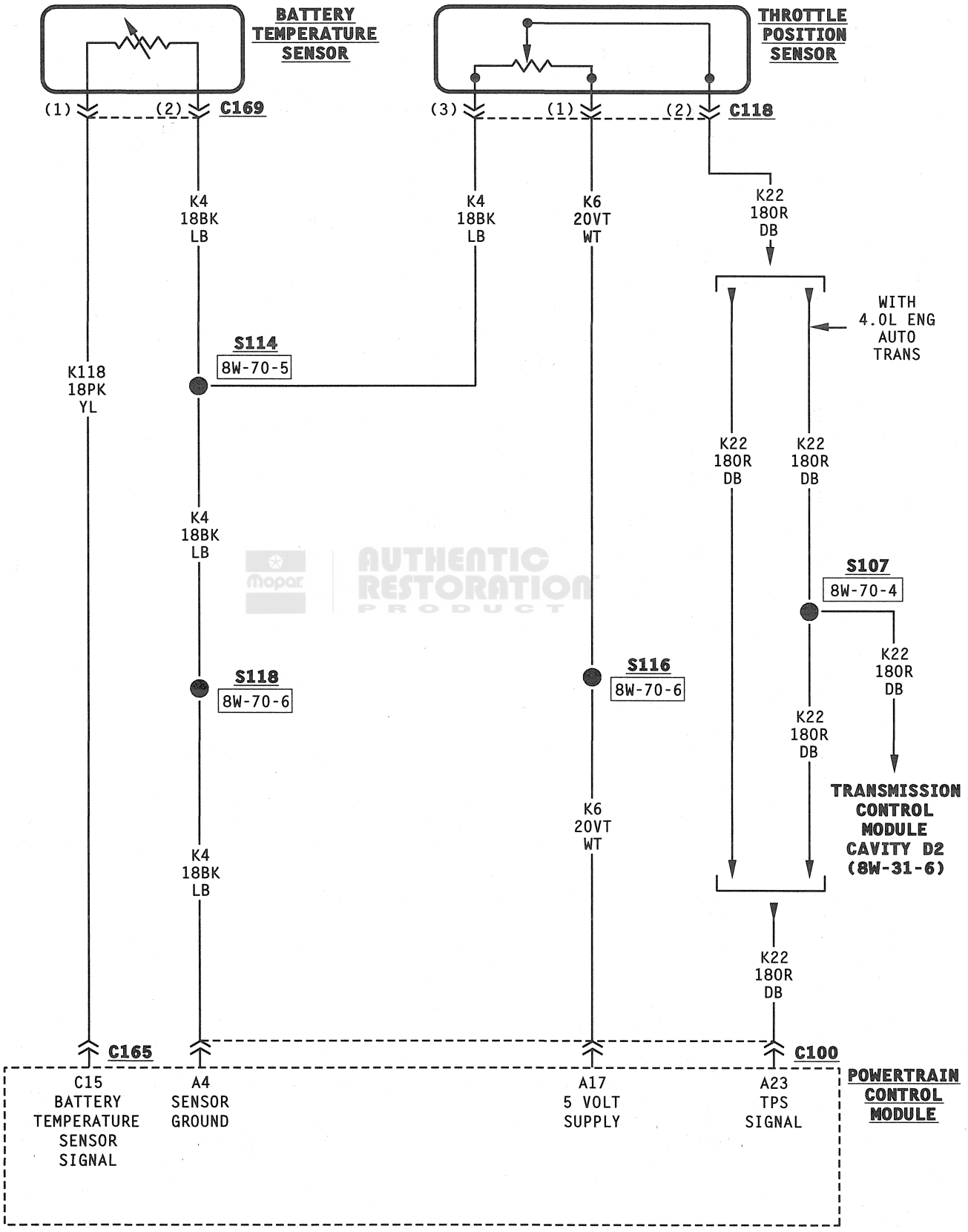


Mopar AUTHENTIC RESTORATION PRODUCT

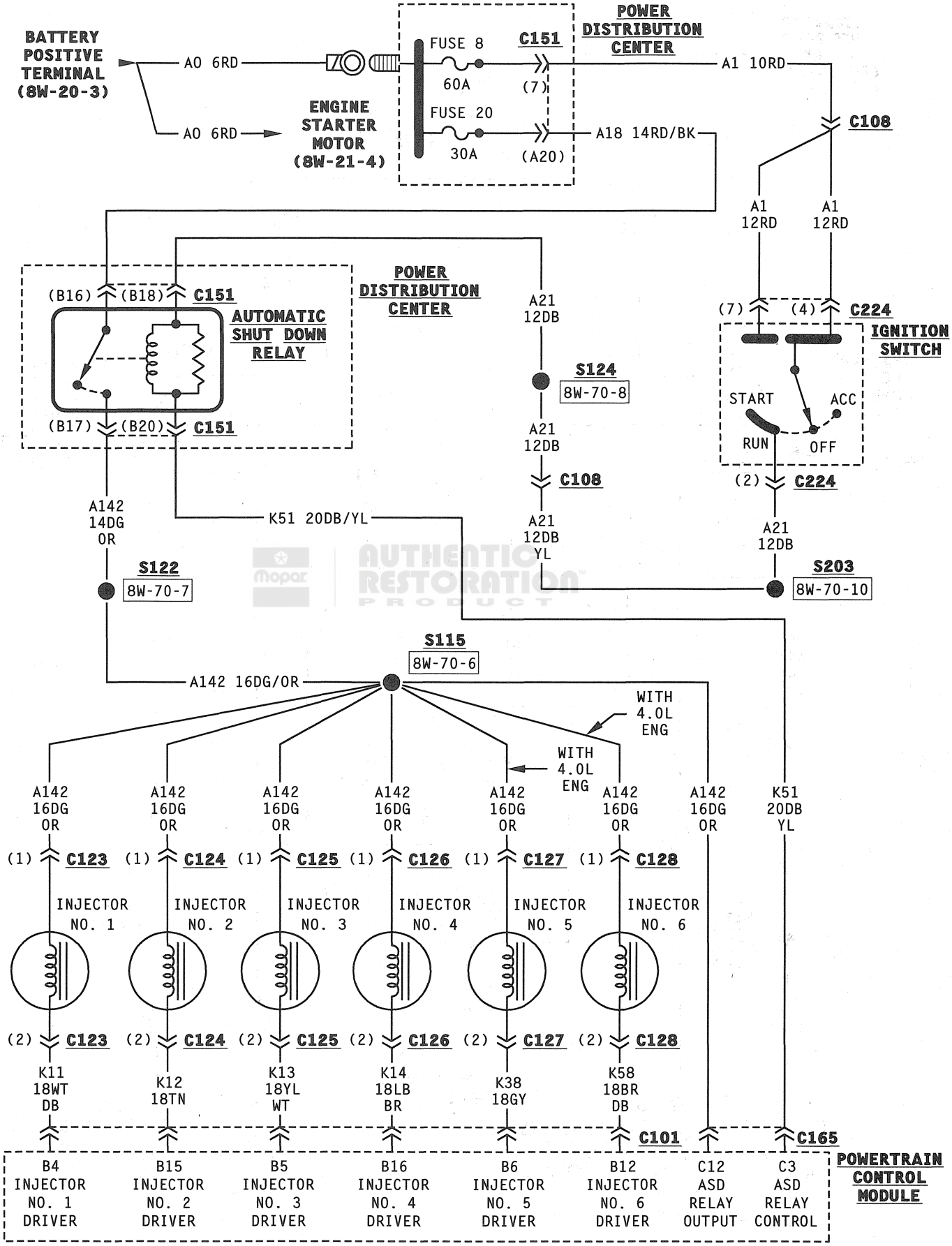

CRANKSHAFT POSITION SENSOR
5 VOLT SUPPLY
SENSOR GROUND
CRANKSHAFT POSITION SENSOR SIGNAL
(1)
(2)
(3)
C117
K6 18VT WT
K4 18BK LB
S116
8W-70-6
S114
8W-70-5
K6 20VT WT
K4 18BK LB
K24 18GY BK
S118
8W-70-6
K4 18BK LB
C100
POWERTRAIN CONTROL MODULE
A17 5 VOLT SUPPLY
A4 SENSOR GROUND
A8 CRANKSHAFT POSITION SENSOR SIGNAL
CAMSHAFT POSITION SENSOR
(1)
(2)
(3)
C131
K6 18VT WT
K4 18BK LB
S116
8W-70-6
K6 20VT WT
K44 18TN YL
S118
8W-70-6
K4 18BK LB
C100
POWERTRAIN CONTROL MODULE
A17 5 VOLT SUPPLY
A4 SENSOR GROUND
A18 CAMSHAFT POSITION SENSOR SIGNAL



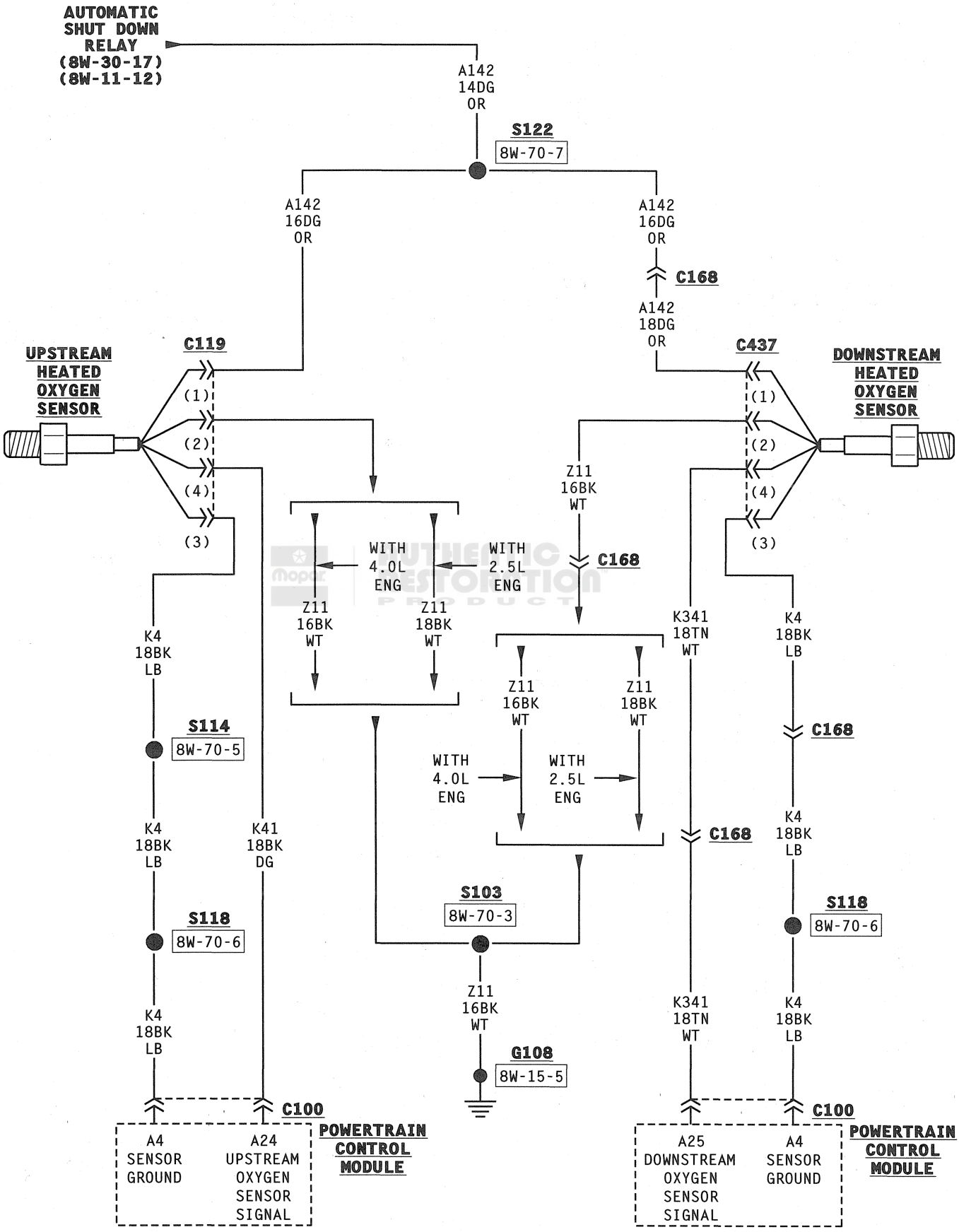
Mopar AUTHENTIC RESTORATION PRODUCT

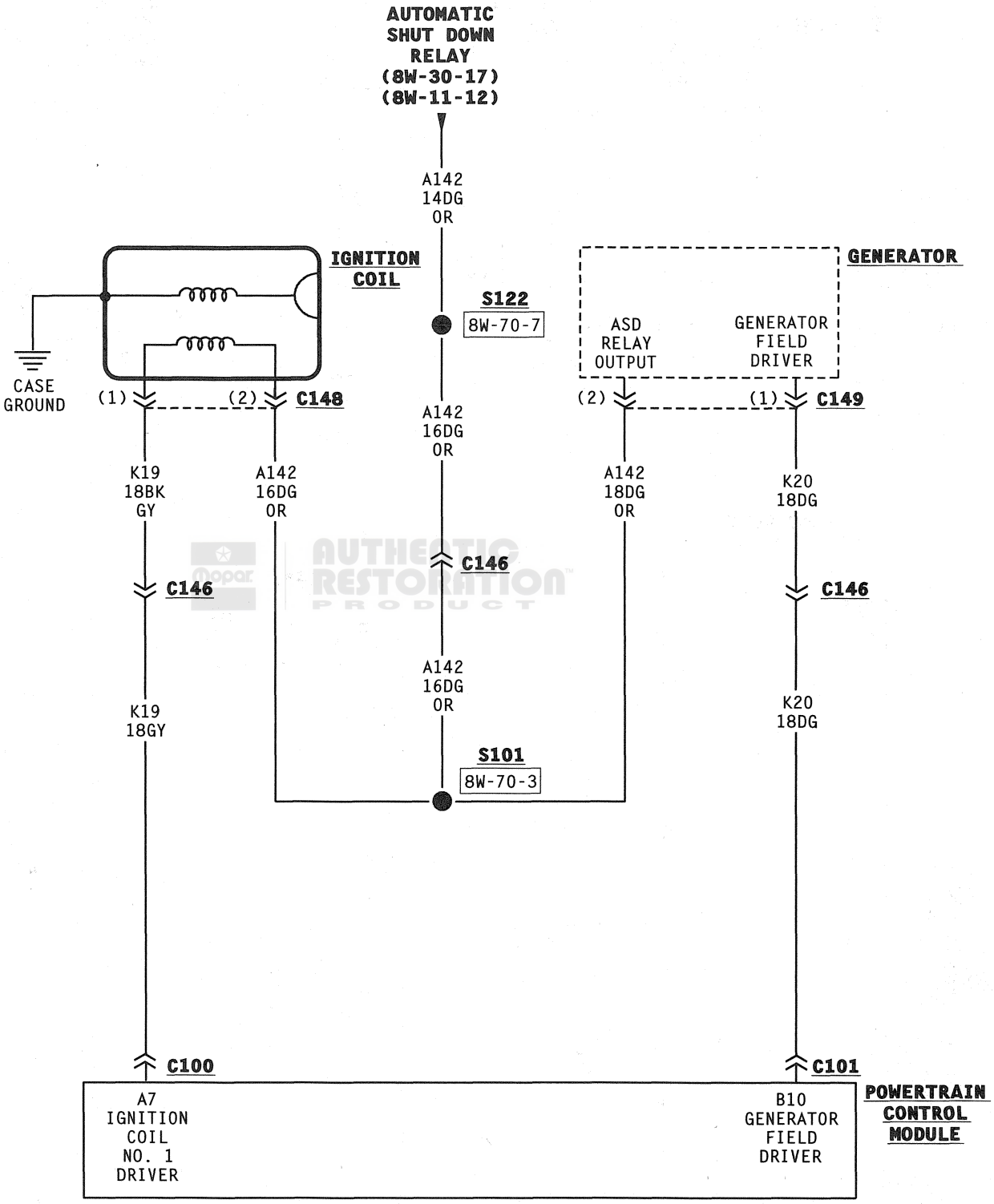


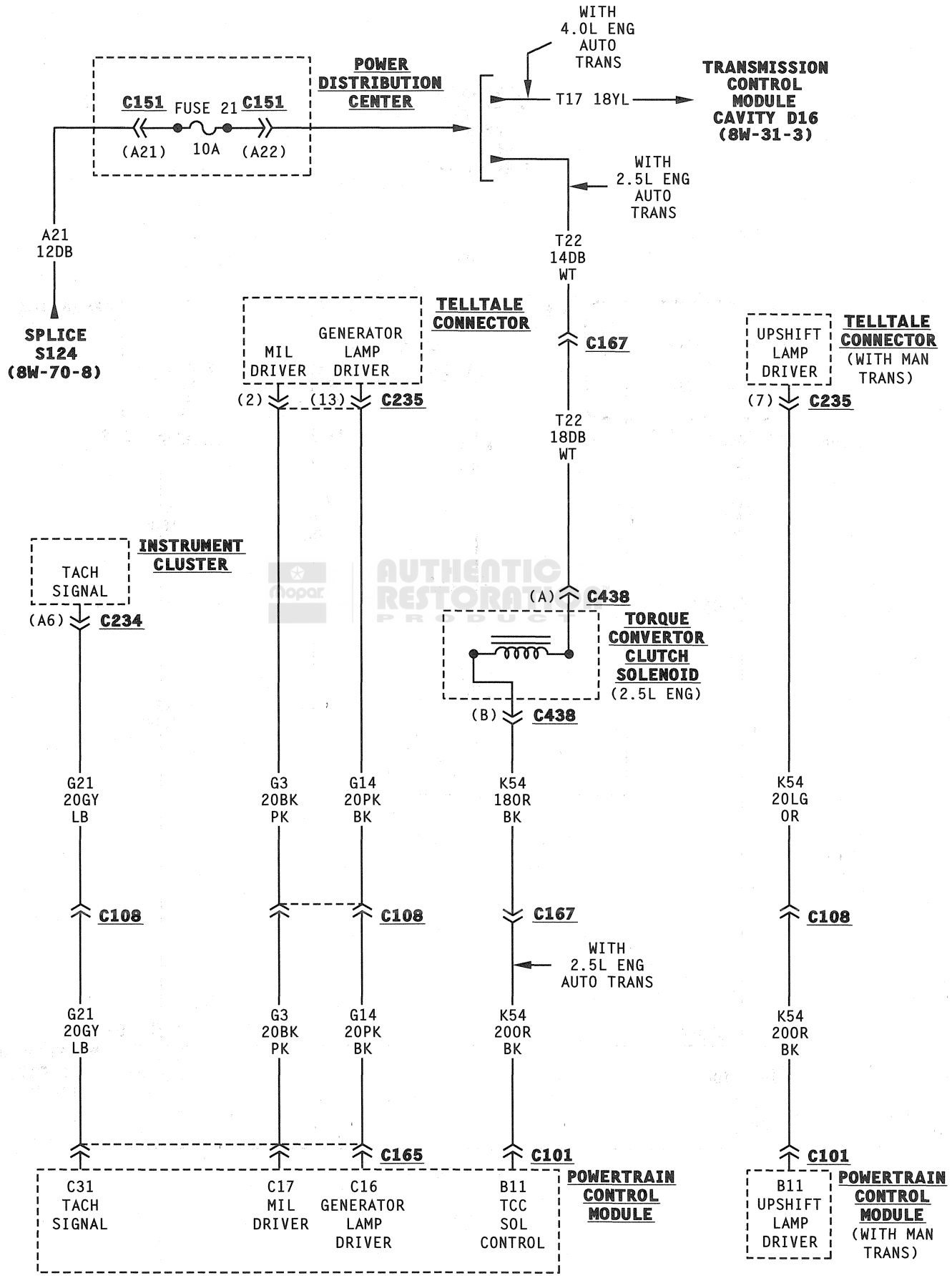
Mopar AUTHENTIC RESTORATION PRODUCT

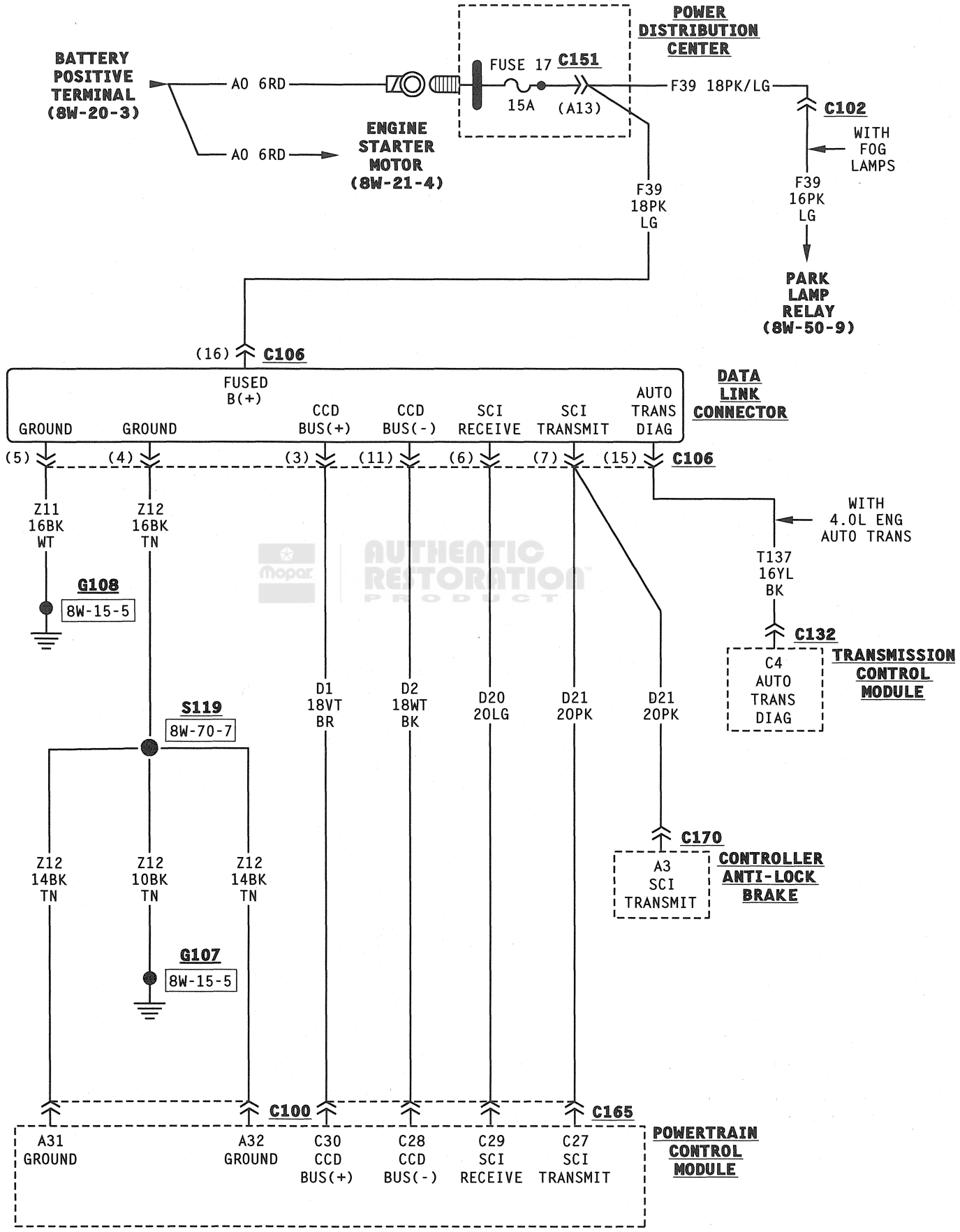


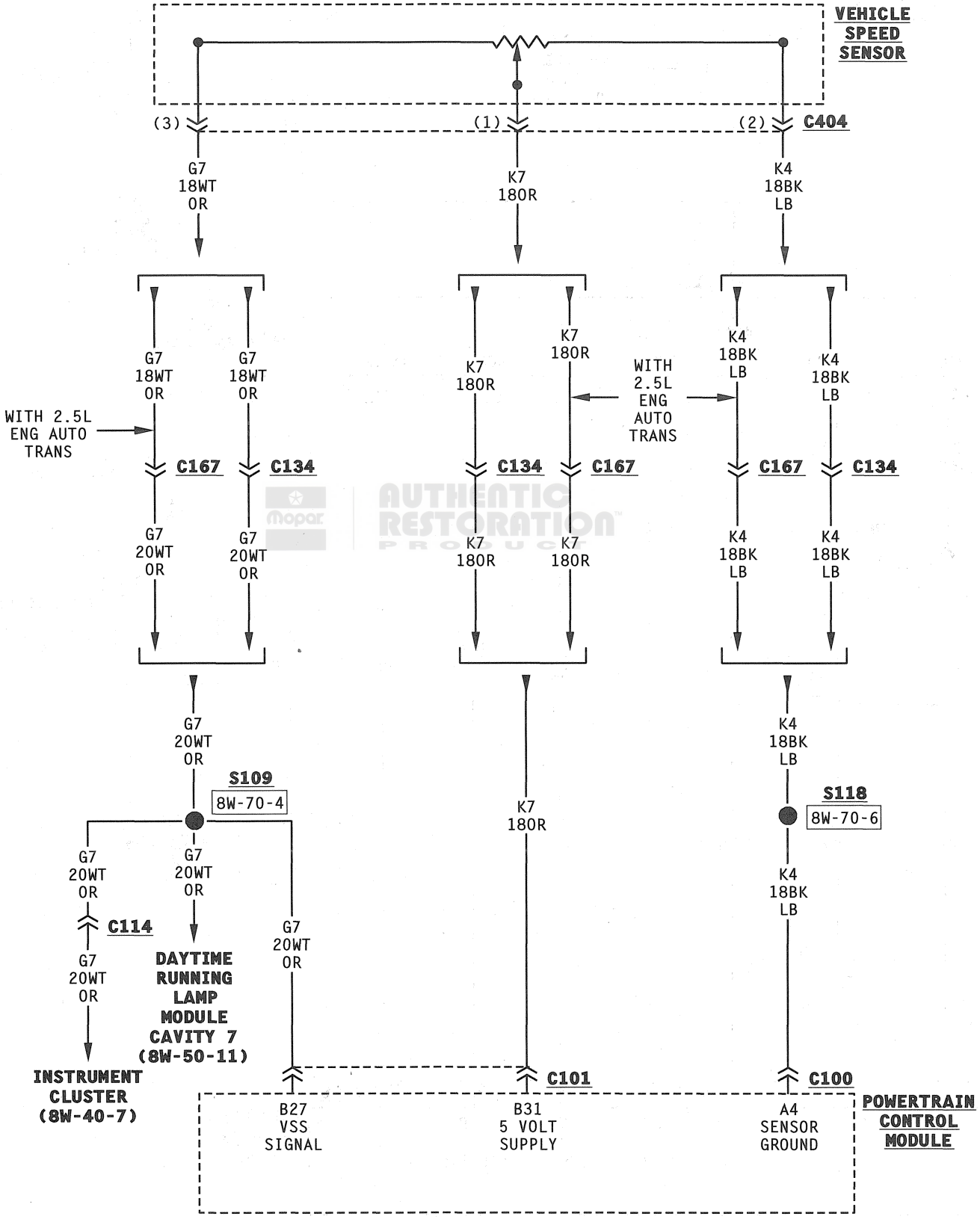
Mopar AUTHENTIC RESTORATION PRODUCT


AUTOMATIC SHUT DOWN RELAY (8W-30-17) (8W-11-12)
A142 14DG OR
S122
8W-70-7
A142 16DG OR
A142 16DG OR
C168
A142 18DG OR
UPSTREAM HEATED OXYGEN SENSOR
C119
(1)
(2)
(4)
(3)
C437
DOWNSTREAM HEATED OXYGEN SENSOR
(1)
(2)
(4)
(3)
WITH 4.0L ENG
WITH 2.5L ENG
Z11 16BK WT
Z11 18BK WT
Z11 16BK WT
C168
K4 18BK LB
S114
8W-70-5
K4 18BK LB
K41 18BK DG
S118
8W-70-6
K4 18BK LB
WITH 4.0L ENG
WITH 2.5L ENG
Z11 16BK WT
Z11 18BK WT
S103
8W-70-3
Z11 16BK WT
G108
8W-15-5
K341 18TN WT
K4 18BK LB
C168
C168
K4 18BK LB
S118
8W-70-6
K341 18TN WT
K4 18BK LB
C100
A4 SENSOR GROUND
A24 UPSTREAM OXYGEN SENSOR SIGNAL
POWERTRAIN CONTROL MODULE
C100
A25 DOWNSTREAM OXYGEN SENSOR SIGNAL
A4 SENSOR GROUND
POWERTRAIN CONTROL MODULE


AUTOMATIC SHUT DOWN RELAY (8W-30-17) (8W-11-12)
A142 14DG OR
IGNITION COIL
S122
8W-70-7
GENERATOR
ASD RELAY OUTPUT
GENERATOR FIELD DRIVER
CASE GROUND
(1)
(2)
C148
(2)
(1)
C149
A142 16DG OR
K19 18BK GY
A142 16DG OR
A142 18DG OR
K20 18DG
C146
C146
C146
A142 16DG OR
K19 18GY
K20 18DG
S101
8W-70-3
C100
C101
A7 IGNITION COIL NO. 1 DRIVER
B10 GENERATOR FIELD DRIVER
POWERTRAIN CONTROL MODULE


WITH 4.0L ENG AUTO TRANS
POWER DISTRIBUTION CENTER
C151 FUSE 21 C151
(A21) 10A (A22)
T17 18YL
TRANSMISSION CONTROL MODULE CAVITY D16 (8W-31-3)
WITH 2.5L ENG AUTO TRANS
A21 12DB
T22 14DB WT
SPLICE S124 (8W-70-8)
TELLTALE CONNECTOR
MIL DRIVER
GENERATOR LAMP DRIVER
(2) (13) C235
C167
UPSHIFT LAMP DRIVER
TELLTALE CONNECTOR (WITH MAN TRANS)
(7) C235
T22 18DB WT
INSTRUMENT CLUSTER
TACH SIGNAL
(A6) C234
(A) C438
TORQUE CONVERTOR CLUTCH SOLENOID (2.5L ENG)
(B) C438
G21 20GY LB
G3 20BK PK
G14 20PK BK
K54 18OR BK
K54 20LG OR
C108
C108
C167
C108
WITH 2.5L ENG AUTO TRANS
G21 20GY LB
G3 20BK PK
G14 20PK BK
K54 20OR BK
K54 20OR BK
C165
C101
C101
C31 TACH SIGNAL
C17 MIL DRIVER
C16 GENERATOR LAMP DRIVER
B11 TCC SOL CONTROL
POWERTRAIN CONTROL MODULE
B11 UPSHIFT LAMP DRIVER
POWERTRAIN CONTROL MODULE (WITH MAN TRANS)


POWER DISTRIBUTION CENTER
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 17 C151
15A
(A13)
F39 18PK/LG
C102
WITH FOG LAMPS
F39 18PK LG
F39 16PK LG
PARK LAMP RELAY (8W-50-9)
(16) C106
FUSED B(+)
GROUND
GROUND
CCD BUS(+)
CCD BUS(-)
SCI RECEIVE
SCI TRANSMIT
AUTO TRANS DIAG
DATA LINK CONNECTOR
(5)
(4)
(3)
(11)
(6)
(7)
(15)
C106
Z11 16BK WT
Z12 16BK TN
G108
8W-15-5
WITH 4.0L ENG AUTO TRANS
T137 16YL BK
C132
C4 AUTO TRANS DIAG
TRANSMISSION CONTROL MODULE
S119
8W-70-7
D1 18VT BR
D2 18WT BK
D20 20LG
D21 20PK
D21 20PK
C170
A3 SCI TRANSMIT
CONTROLLER ANTI-LOCK BRAKE
Z12 14BK TN
Z12 10BK TN
Z12 14BK TN
G107
8W-15-5
C100
C165
A31 GROUND
A32 GROUND
C30 CCD BUS(+)
C28 CCD BUS(-)
C29 SCI RECEIVE
C27 SCI TRANSMIT
POWERTRAIN CONTROL MODULE


VEHICLE SPEED SENSOR
(3)
(1)
(2)
C404
G7 18WT OR
K7 18OR
K4 18BK LB
WITH 2.5L ENG AUTO TRANS
C167
C134
G7 20WT OR
K7 18OR
K4 18BK LB
S109
8W-70-4
S118
8W-70-6
C114
DAYTIME RUNNING LAMP MODULE CAVITY 7 (8W-50-11)
INSTRUMENT CLUSTER (8W-40-7)
C101
C100
B27 VSS SIGNAL
B31 5 VOLT SUPPLY
A4 SENSOR GROUND
POWERTRAIN CONTROL MODULE

8W-31 TRANSMISSION CONTROL SYSTEM

DESCRIPTION AND OPERATION

TORQUE CONVERTER CLUTCH (TCC) SOLENOID

The TCC solenoid is only used on 2.5L engines with the three-speed automatic transmissions. Circuit T22 from fuse 21 in the Power Distribution Center (PDC) powers the TCC solenoid. The Powertrain Control Module (PCM) provides ground for the solenoid on circuit K54. Circuit K54 connects to cavity B11 of the PCM.

FOUR-WHEEL DRIVE (4WD) SWITCH

When the 4WD switch CLOSES, circuit Z1 provides ground for the 4WD indicator lamp in the instrument cluster. Circuit F87 connects to the instrument cluster and supplies battery voltage to the 4WD indicator lamp. Circuit G107 connects the indicator lamp to the 4WD switch.

On vehicles equipped with the 4.0L engine and an automatic transmission, circuit G107 connects to the solenoid assembly in the transmission. Circuit G106 from the solenoid assembly provides ground during 4WD Full Time operation.

SHIFT INTERLOCK

The shift interlock prevents the operator from shifting the vehicle out of PARK unless the brake pedal is pressed. When the ignition switch is in the START or RUN position, circuit A21 feeds circuit F87 through fuse 17 in the fuse block. Circuit F87 splices to power the shift interlock.

When the brake pedal is not depressed, the stop lamp switch provides ground for interlock by connecting circuit K29 to ground circuit Z1. When grounded, the interlock prevents shifting the transmission out of PARK. When the brake pedal is pressed, the stop lamp switch disconnects circuits K29 and Z1, removing ground from the shift interlock.

TRANSMISSION CONTROL MODULE—4.0L ENGINE ONLY

Vehicles equipped with the 4.0L engine have electronically controlled solenoids in the automatic transmission valve body.

The Transmission Control Module (TCM) receives inputs from the Throttle Position Sensor (TPS) on circuit K22 and the stop lamp switch on circuit K29. Circuit K4 connects to the TCM to provide ground for the TPS signal. The TCM receives the transmission output speed sensor signal on circuit T505. Circuit A14 from fuse 6 in the Power Distribution Center (PDC) supplies battery voltage to the TCM. Circuit Z1 provides ground for the TCM.

The TCM powers the S1 solenoid on circuit T510, the S2 solenoid on circuit T509, and the S3 solenoid on circuit T508. Circuit Z1 provides ground for the S1, S2, and S3 solenoids.

SCHEMATICS AND DIAGRAMS

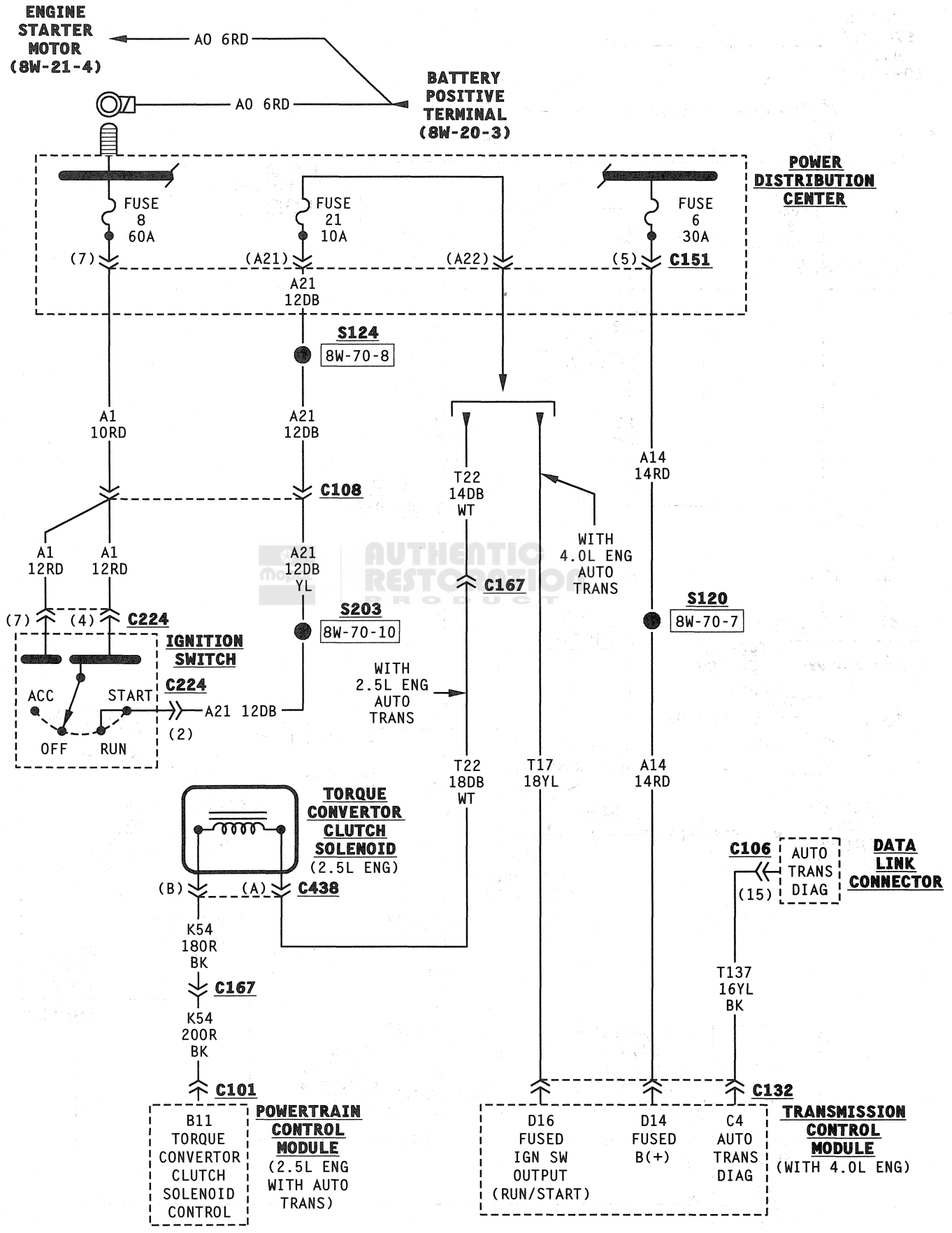
WIRING DIAGRAM INDEX

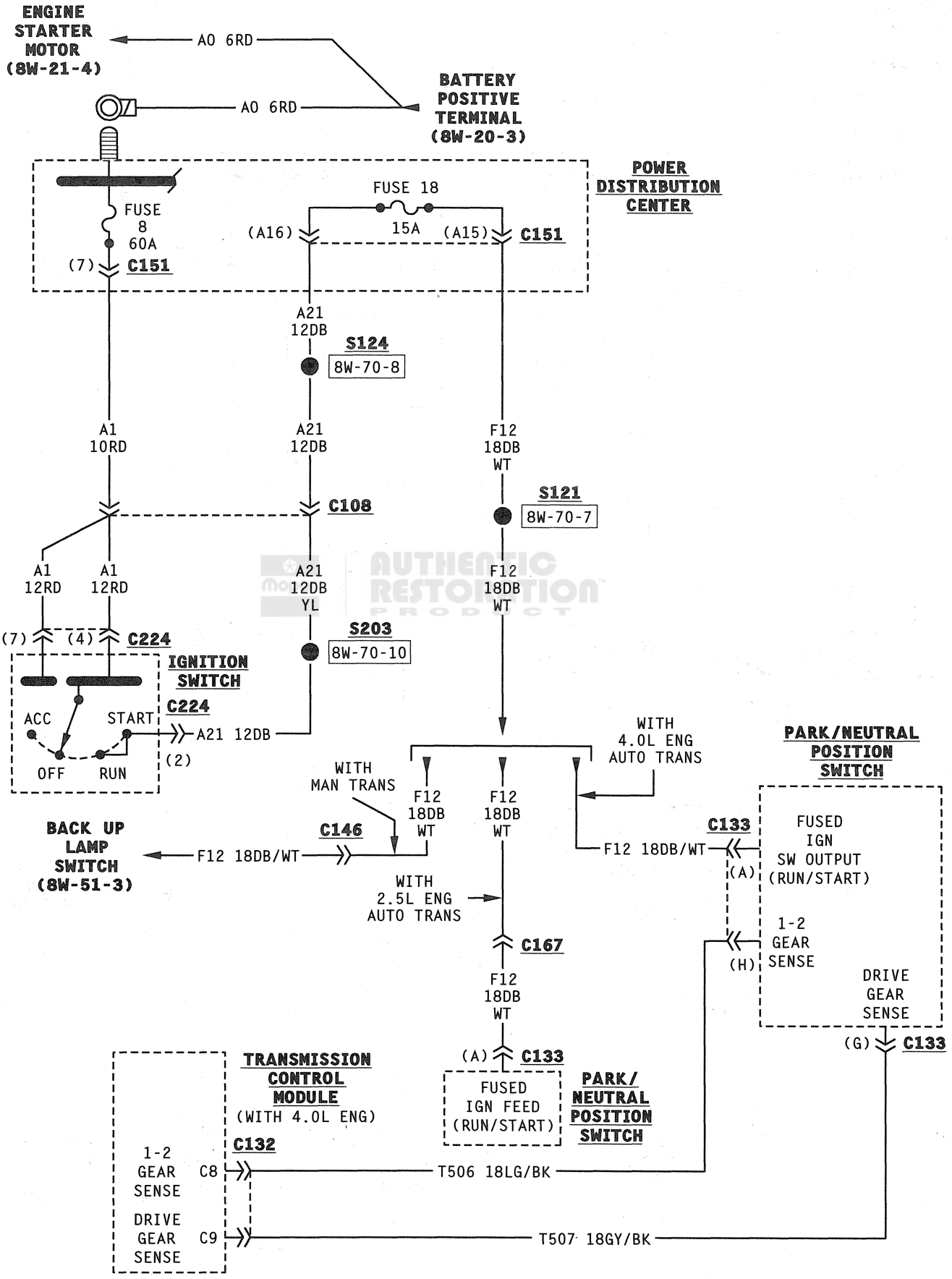
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

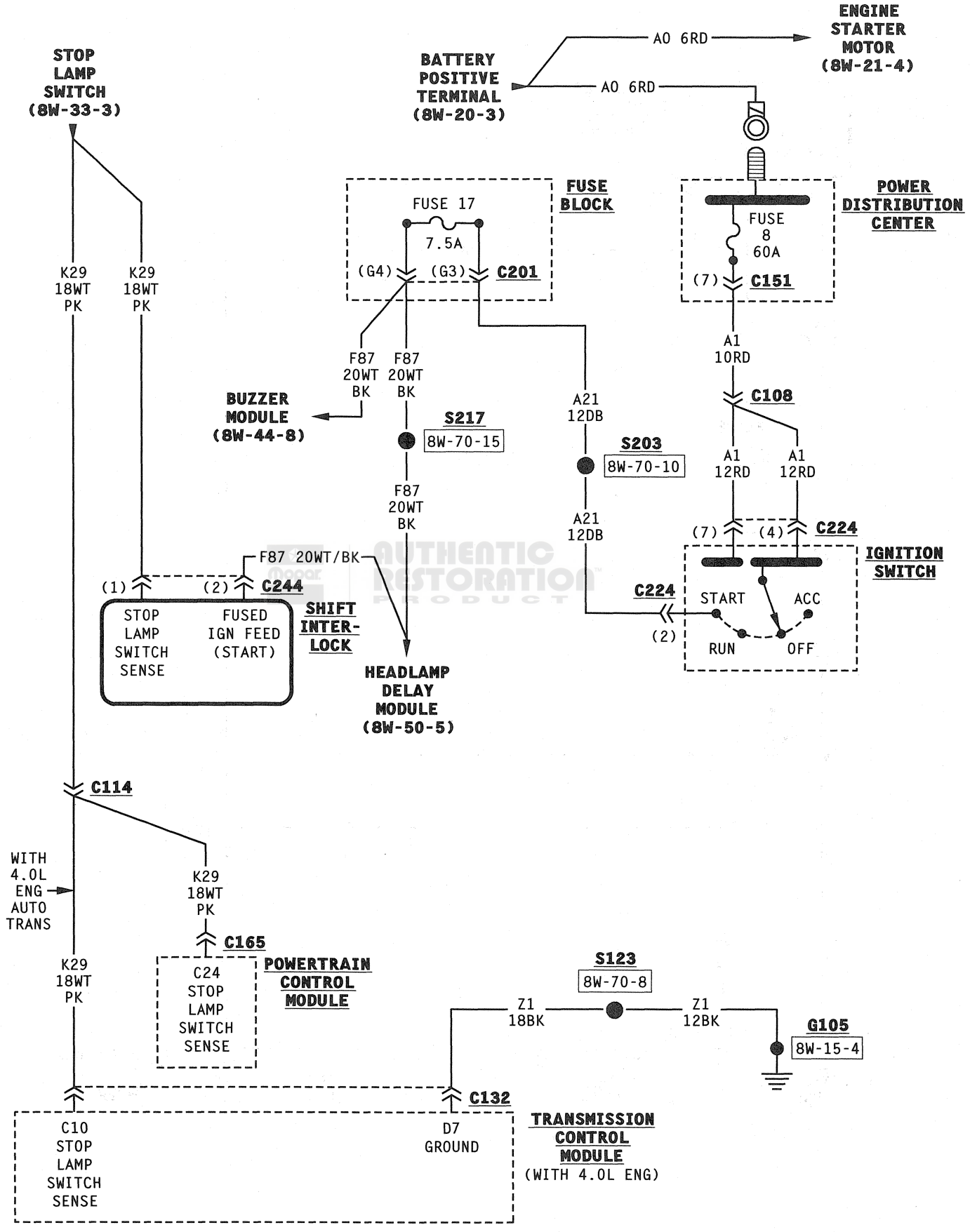
DIAGRAM INDEX

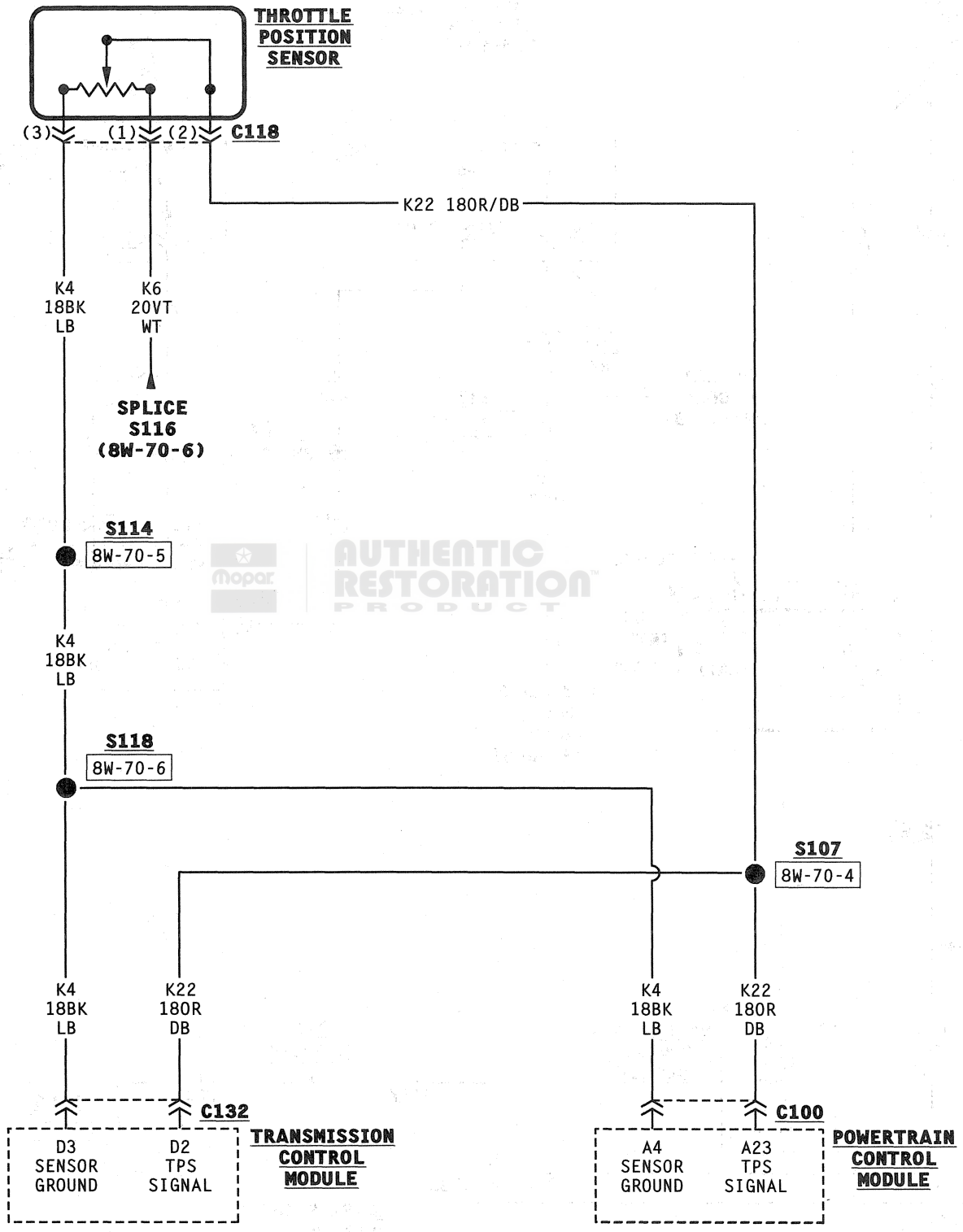
Component	Page
4WD Switch	8W-31-7
Data Link Connector	8W-31-3
Fuse 6 (PDC)	8W-31-3, 7
Fuse 8 (PDC)	8W-31-3, 4, 5
Fuse 17	8W-31-5
Fuse 18 (PDC)	8W-31-4
Fuse 21 (PDC)	8W-31-3
Ignition Switch	8W-31-3, 4, 5
Powertrain Control Module	8W-31-3, 5, 6
Park/Neutral Position Switch	8W-31-4
Shift Interlock	8W-31-5
Telltale Connector	8W-31-7
TCC Solenoid	8W-31-3
Throttle Position Sensor	8W-31-6
Transmission Control Module	8W-31-3, 4, 5, 6, 7
Valve Body Solenoids	8W-31-7

Mopar AUTHENTIC RESTORATION PRODUCT

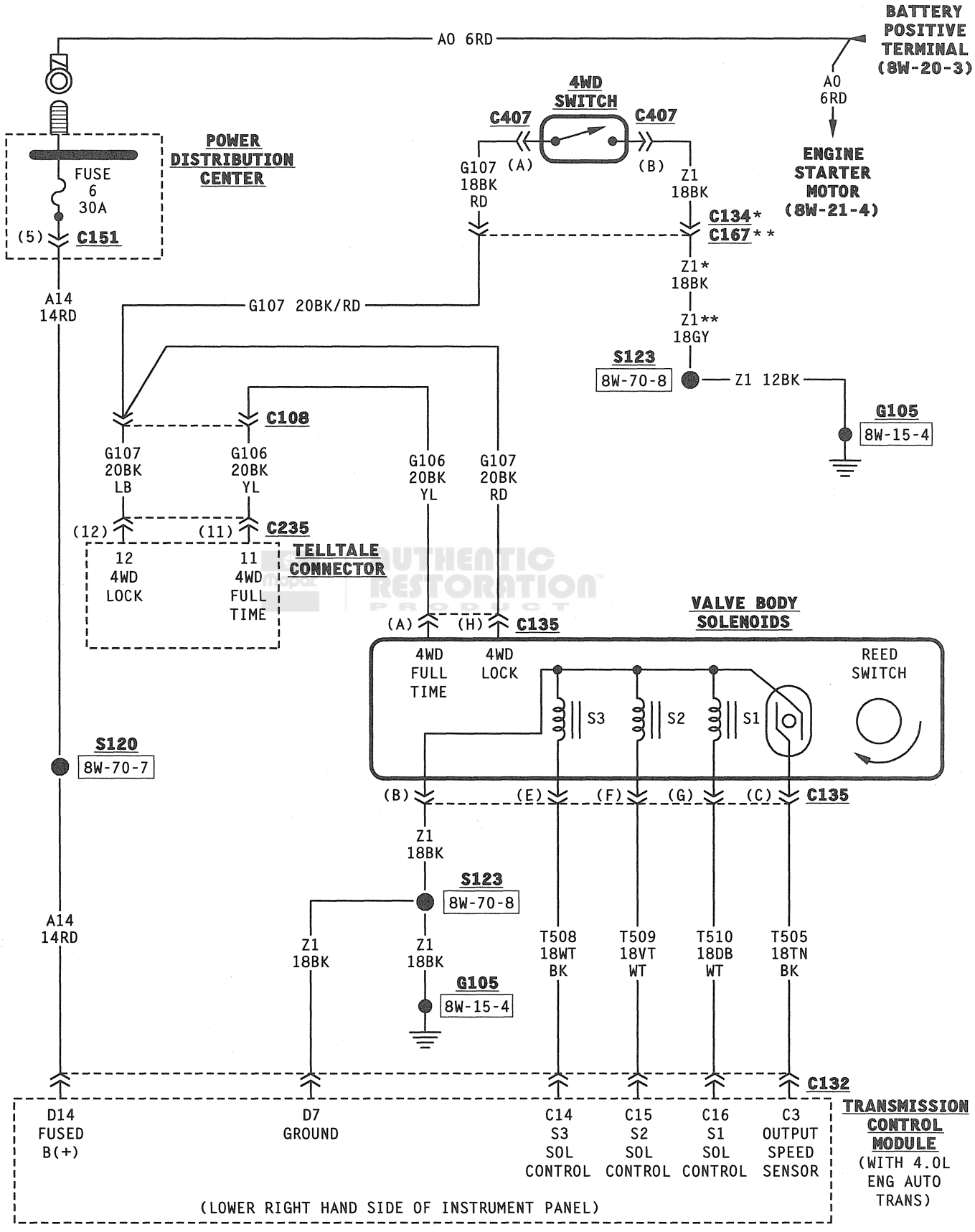

ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
POWER DISTRIBUTION CENTER
FUSE 8 60A
FUSE 21 10A
FUSE 6 30A
(7)
(A21)
(A22)
(5)
C151
A21 12DB
S124
8W-70-8
A1 10RD
A21 12DB
C108
T22 14DB WT
A14 14RD
WITH 4.0L ENG AUTO TRANS
A1 12RD
A1 12RD
A21 12DB YL
S203
8W-70-10
C167
S120
8W-70-7
(7)
(4)
C224
IGNITION SWITCH
ACC
START
OFF
RUN
C224
A21 12DB
(2)
WITH 2.5L ENG AUTO TRANS
T22 18DB WT
T17 18YL
A14 14RD
TORQUE CONVERTOR CLUTCH SOLENOID (2.5L ENG)
(B)
(A)
C438
C106
AUTO TRANS DIAG
(15)
DATA LINK CONNECTOR
K54 180R BK
C167
K54 200R BK
T137 16YL BK
C101
C132
B11 TORQUE CONVERTOR CLUTCH SOLENOID CONTROL
POWERTRAIN CONTROL MODULE (2.5L ENG WITH AUTO TRANS)
D16 FUSED IGN SW OUTPUT (RUN/START)
D14 FUSED B(+)
C4 AUTO TRANS DIAG
TRANSMISSION CONTROL MODULE (WITH 4.0L ENG)


ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
FUSE 18
15A
(A16)
(A15) C151
A21 12DB
S124
8W-70-8
A1 10RD
A21 12DB
F12 18DB WT
C108
S121
8W-70-7
A1 12RD
A1 12RD
A21 12DB YL
F12 18DB WT
S203
8W-70-10
(7) (4) C224
IGNITION SWITCH
C224
ACC
START
OFF
RUN
(2)
A21 12DB
WITH 4.0L ENG AUTO TRANS
WITH MAN TRANS
F12 18DB WT
F12 18DB WT
PARK/NEUTRAL POSITION SWITCH
BACK UP LAMP SWITCH (8W-51-3)
C146
F12 18DB/WT
F12 18DB/WT
C133
(A)
FUSED IGN SW OUTPUT (RUN/START)
WITH 2.5L ENG AUTO TRANS
C167
1-2 GEAR SENSE
(H)
F12 18DB WT
DRIVE GEAR SENSE
(G) C133
(A) C133
TRANSMISSION CONTROL MODULE (WITH 4.0L ENG)
FUSED IGN FEED (RUN/START)
PARK/ NEUTRAL POSITION SWITCH
C132
1-2 GEAR SENSE C8
T506 18LG/BK
DRIVE GEAR SENSE C9
T507 18GY/BK


ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
STOP LAMP SWITCH (8W-33-3)
FUSE BLOCK
FUSE 17
7.5A
(G4)
(G3)
C201
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7)
C151
K29 18WT PK
K29 18WT PK
F87 20WT BK
F87 20WT BK
BUZZER MODULE (8W-44-8)
S217
8W-70-15
F87 20WT BK
A21 12DB
S203
8W-70-10
A21 12DB
A1 10RD
C108
A1 12RD
A1 12RD
(7)
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
C224
(2)
F87 20WT/BK
(1)
(2)
C244
STOP LAMP SWITCH SENSE
FUSED IGN FEED (START)
SHIFT INTER-LOCK
HEADLAMP DELAY MODULE (8W-50-5)
C114
WITH 4.0L ENG AUTO TRANS
K29 18WT PK
C165
K29 18WT PK
C24 STOP LAMP SWITCH SENSE
POWERTRAIN CONTROL MODULE
S123
8W-70-8
Z1 18BK
Z1 12BK
G105
8W-15-4
C132
C10 STOP LAMP SWITCH SENSE
D7 GROUND
TRANSMISSION CONTROL MODULE (WITH 4.0L ENG)



Mopar AUTHENTIC RESTORATION PRODUCT



*WITH 4.0L ENG AUTO TRANS
**WITH 2.5L ENG

8W-33 VEHICLE SPEED CONTROL

DESCRIPTION AND OPERATION

VEHICLE SPEED CONTROL

The Powertrain Control Module (PCM) operates the vehicle speed control system. The vehicle speed control switches are located in the steering wheel.

Circuit V32 from cavity C11 of the PCM supplies 12 volts to the Light Emitting Diode (LED) used for the speed control indicator lamp and the speed control switches. Circuit V32 also connects to circuit V30 through the stop lamp switch. Circuit V30 powers the vehicle speed control servo.

Circuit V33 from PCM cavity C32 connects to the vehicle speed control switches. The switches are wired in parallel and each contains a separate resistor. The voltage level present on circuit V33 (at PCM cavity C32) depends on which speed control switch is selected. Circuit K4 from PCM cavity A4 supplies ground for the speed control switches.

- When the ON/OFF switch is open, the voltage level on circuit V33 at PCM cavity C32 has a nominal value of 5.0 volts with a range from 4.8 to 5.0 volts.
- When the ON/OFF switch closes, the voltage level on circuit V33 at PCM cavity C32 has nominal value of 1.51 volts with a range from 1.31 to 1.61 volts.
- When the SET/COAST switch closes, the voltage level on circuit V33 at PCM cavity C32 has nominal value of 3.8 volts with a range from 3.6 to 3.9 volts.
- When the RESUME/ACCEL switch closes, the voltage level on circuit V33 at PCM cavity C32 has nominal value of 4.4 volts with a range from 4.2 to 4.5 volts.

The PCM controls the vent and vacuum functions of the vehicle speed control servo on circuits V35 and V36. Depending on the signal it receives from vehicle speed control switches, the PCM either applies vacuum to or vents vacuum from the servo. Circuit V36 from cavity C4 of the PCM sends the vacuum signal to the servo. Circuit V35 from cavity C5 sends the vent signal.

Circuit K29 provides the stop lamp switch sense input to the PCM at cavity C24. The stop lamp switch connects circuit K29 to ground on circuit Z1. When the brake pedal is depressed, the stop lamp switch opens and disconnects circuits K29 and Z1, and circuits V32 and V30. When the stop lamp switch disconnects circuits V32 and V30, power is removed from the speed control servo.

HELPFUL INFORMATION

Circuit K4 also provides ground for some of the engine control sensors that provide inputs to the PCM.

SCHEMATICS AND DIAGRAMS

WIRING DIAGRAM INDEX

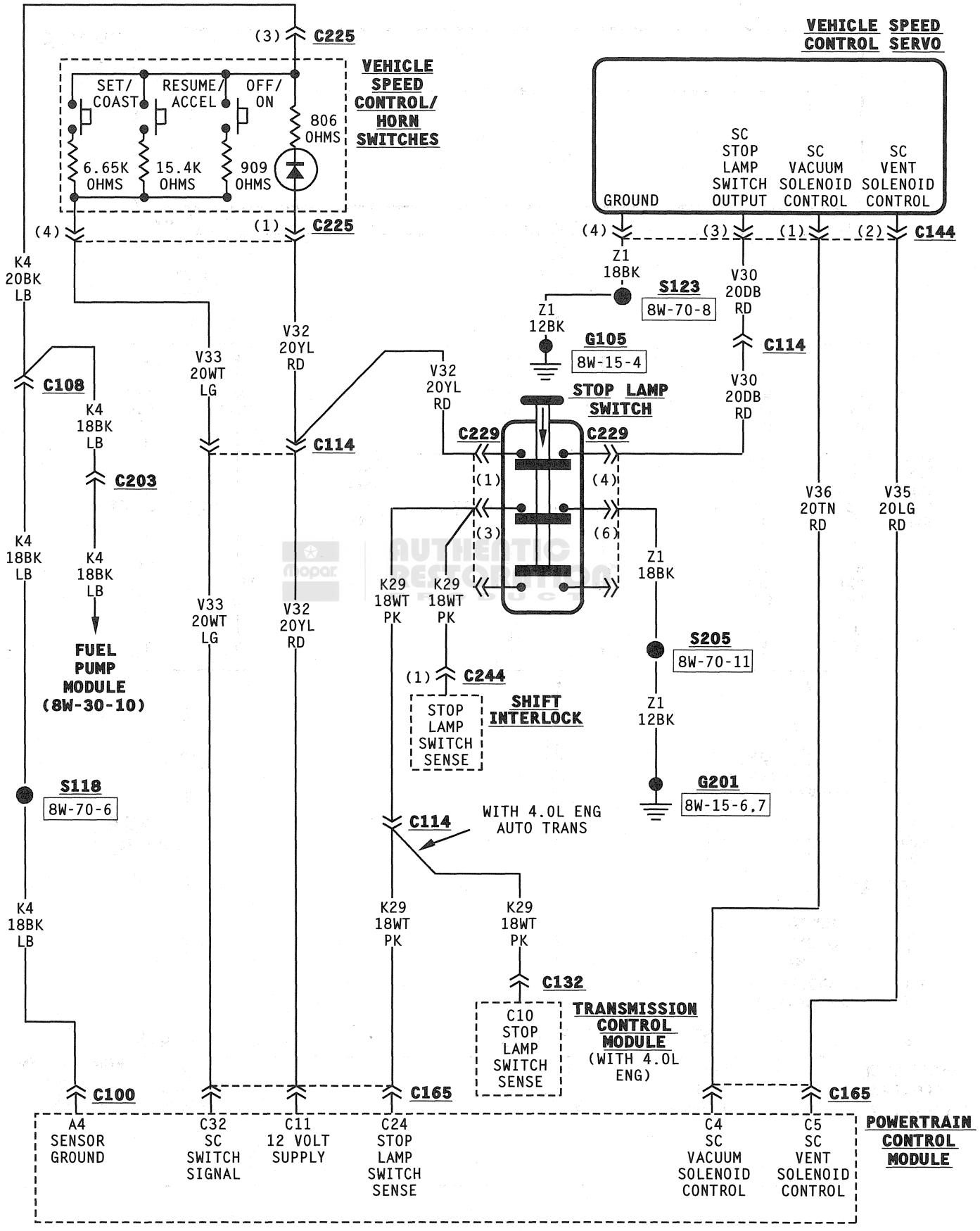
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

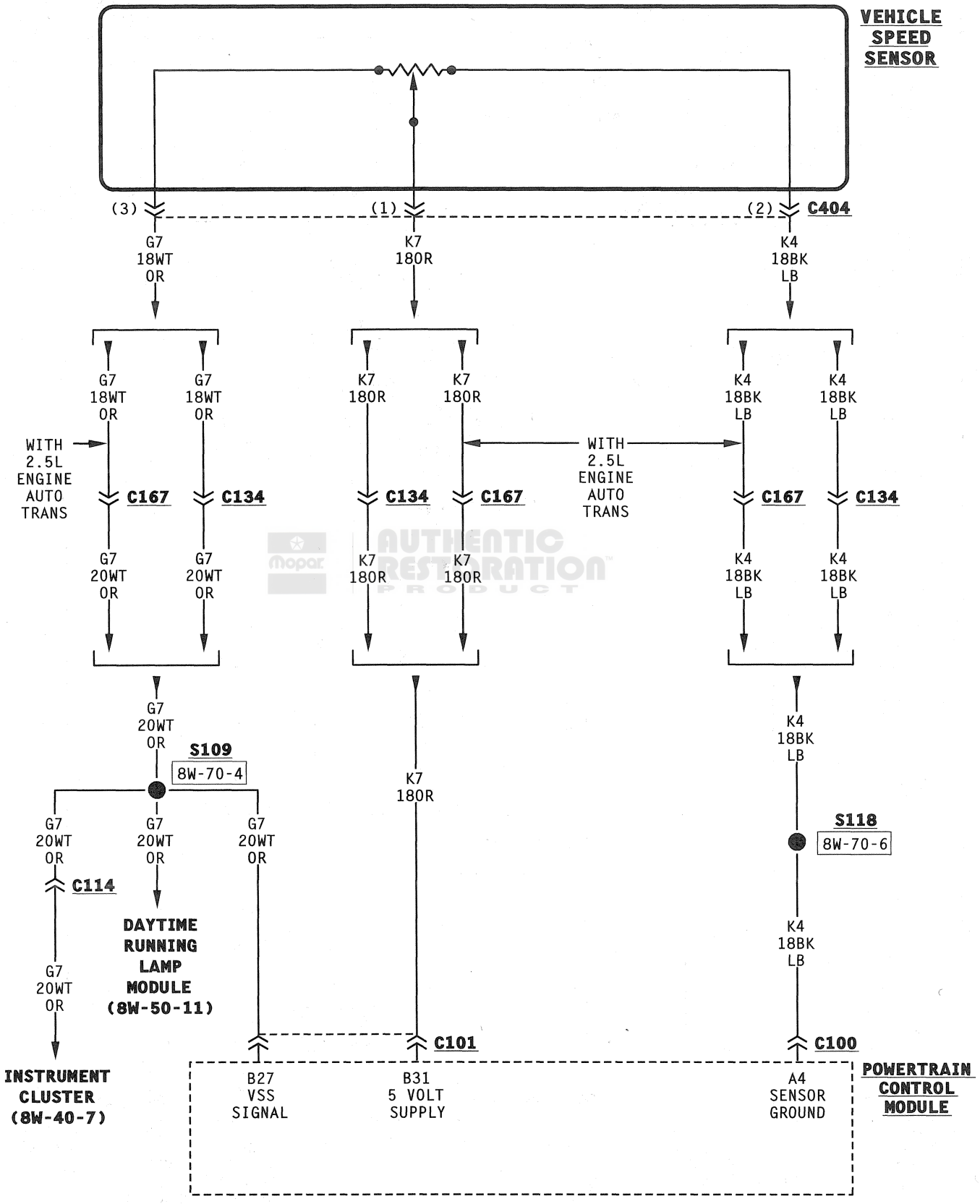
DIAGRAM INDEX

Component	Page
Powertrain Control Module	8W-33-3, 4
Shift Interlock	8W-33-3
Stop Lamp Switch	8W-33-3
Transmission Control Module	8W-33-3

Component	
Vehicle Speed Control Servo	8
Vehicle Speed Control Switches	8
Vehicle Speed Sensor	8

Mopar AUTHENTIC RESTORATION PRODUCT


VEHICLE SPEED CONTROL SERVO
GROUND
SC STOP LAMP SWITCH OUTPUT
SC VACUUM SOLENOID CONTROL
SC VENT SOLENOID CONTROL
C144
VEHICLE SPEED CONTROL/ HORN SWITCHES
SET/ COAST
RESUME/ ACCEL
OFF/ ON
806 OHMS
6.65K OHMS
15.4K OHMS
909 OHMS
C225
S123
8W-70-8
G105
8W-15-4
STOP LAMP SWITCH
C229
C114
C108
C203
C244
STOP LAMP SWITCH SENSE
SHIFT INTERLOCK
S205
8W-70-11
G201
8W-15-6,7
S118
8W-70-6
FUEL PUMP MODULE (8W-30-10)
WITH 4.0L ENG AUTO TRANS
C132
C10 STOP LAMP SWITCH SENSE
TRANSMISSION CONTROL MODULE (WITH 4.0L ENG)
C100
C165
A4 SENSOR GROUND
C32 SC SWITCH SIGNAL
C11 12 VOLT SUPPLY
C24 STOP LAMP SWITCH SENSE
C4 SC VACUUM SOLENOID CONTROL
C5 SC VENT SOLENOID CONTROL
POWERTRAIN CONTROL MODULE
K4 20BK LB
K4 18BK LB
V32 20YL RD
V33 20WT LG
V30 20DB RD
Z1 18BK
Z1 12BK
K29 18WT PK
V36 20TN RD
V35 20LG RD



Mopar AUTHENTIC RESTORATION PRODUCT

8W-35 ALL-WHEEL ANTI-LOCK BRAKES

INDEX

page

DESCRIPTION AND OPERATION
- ABS MAIN RELAY 1
- ABS PUMP MOTOR RELAY 1
- ABS WARNING LAMP 2
- DATA LINK CONNECTOR 2
- G-SWITCH 1
- HYDRAULIC CONTROL UNIT 2
- INTRODUCTION 1
- STOP LAMP SWITCH INPUT 2
- WHEEL SPEED SENSORS 1

SCHEMATICS AND DIAGRAMS
- WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

INTRODUCTION

Four fuses supply power for the Anti-Lock Brake System (ABS); fuses 5, 8 and 14 in the Power Distribution Center (PDC) and fuse 18 in the fuse block. Fuses 5, 8 and 14 in the PDC are connected directly to battery voltage and are HOT all times. Fuse 18 in the fuse block is HOT when the ignition switch is the RUN Position.

In the RUN position, the ignition switch connects circuit A1 from fuse 8 in the PDC with circuit A38. Circuit A38 connects to a bus bar in the fuse block. The bus bar feeds circuit B236 through fuse 18. Fuse 18 is a 2 amp fuse.

Circuit B236 connects to the coil side of the ABS main relay and the Controller, Anti-Lock Brakes (CAB).

Circuit Z1 provides ground for the CAB. Circuit Z1 connects to cavities B14 and B13 of the CAB.

Refer to group 5, Brakes for operational descriptions of ABS system components.

WHEEL SPEED SENSORS

The all wheel anti-lock system uses four wheel speed sensors; one for each wheel. Each sensor converts wheel speed into an electrical signal that it transmits to the Controller, Anti-Lock Brakes (CAB). A pair of twisted wires connect to each sensor to provide signals to the CAB.

Circuits B6 and B7 provide signals to the CAB from the right front wheel speed sensor. Circuit B6 which provides the LOW signal connects to cavity B2 of the CAB. Circuit B7 connects to cavity B1 of the CAB and provides the HIGH signal.

Circuits B8 and B9 provide signals to the CAB from the left front wheel speed sensor. Circuit B8, which provides the LOW signal, connects to cavity B10 of the CAB. Circuit B9 connects to cavity B9 of the CAB and provides the HIGH signal.

Circuits B1 and B2 provide signals to the CAB from right rear wheel speed sensor. Circuit B1 which provides the LOW signal connects to cavity A12 of the CAB. Circuit B2 connects to cavity A11 and provides the HIGH signal.

Circuits B4 and B3 provide signals to the CAB from the left rear wheel speed sensor. Circuit B3, which provides the LOW signal, connects to cavity A9 of the CAB. Circuit B4 connects to cavity A10 and provides the HIGH signal.

G-SWITCH

During four-wheel drive operation, the G-switch provides deceleration data to the Controller, Anti-Lock Brakes (CAB). Refer to Group 5, Brakes for additional information.

Circuits B515, B516, and B517 connect the acceleration switch to the CAB. Circuits B515 and B516 provide switch states while circuit B517 provides ground. At the CAB, circuit B515 connects to cavity A6, circuit B516 connects to cavity A7 and circuit B517 connects to cavity A2.

ABS MAIN RELAY

The ABS main relay is located in the Power Distribution Center (PDC). When the Controller, Anti-Lock Brakes (CAB) grounds the ABS main relay on circuit B207, the relay switches to connect circuit A20 from PDC fuse 14 to circuit B235. Circuit B236 from fuse 7 in the fuse block splices to feed the coil side of the ABS main relay. Circuit B207 connects to cavity B11 of the CAB.

Circuit B235 is double crimped at the ABS main relay. One branch of circuit B235 supplies power to the coil side of the ABS pump motor relay. The other branch of circuit B235 splices to cavity A1 of the CAB and to the hydraulic control unit.

ABS PUMP MOTOR RELAY

The ABS pump motor relay in the power distribution center (PDC) supplies voltage to the ABS pump motor. When the ABS main relay energizes, circuit B235 supplies battery voltage to the coil side of the ABS pump motor relay. The Controller, Anti-Lock

DESCRIPTION AND OPERATION (Continued)

Brakes (CAB) provides ground for the relay on circuit B116. Circuit B116 connects to cavity B7 of the CAB.

When the ABS pump motor energizes, it connects circuit A10 from PDC fuse 5 to circuit B233. Circuit B233 supplies battery voltage to the pump motor. Circuit Z12 provides ground for the pump motor.

HYDRAULIC CONTROL UNIT

When the ABS main relay energizes, two branches of circuit B235 splice to supply voltage to the isolation and dump solenoids in the hydraulic control unit. The hydraulic control unit contains three separate isolation solenoids and three separate dump solenoids. The Controller, Anti-Lock Brakes (CAB) activates the dump and isolation solenoids by providing separate ground paths for each.

The CAB provides a ground path for the rear isolation solenoid on circuit B251. Circuit B251 connects to cavity B4 of the CAB.

For the right front isolation solenoid, the CAB provides a ground path on circuit B249. Circuit B249 connects to cavity B15 of the CAB.

On circuit B245, the CAB provides ground for the left front isolation solenoid. Circuit B245 connects to cavity B18 of the CAB.

The CAB provides a ground path for the rear dump solenoid on circuit B254. Circuit B254 connects to cavity B12 of the CAB.

For the right front dump solenoid, the CAB provides a ground path on circuit B248. Circuit B248 connects to cavity B6 of the CAB.

On circuit B243, the CAB provides ground for the left dump solenoid. Circuit B243 connects to cavity B8 of the CAB.

ABS WARNING LAMP

Circuit F87 provides power for the ABS warning lamp at the instrument cluster. Ground for the ABS warning lamp is provided by either the Controller, Anti-Lock Brakes (CAB) or by the ABS main relay when the relay is not energized. The CAB illuminates the lamp by providing ground on circuit B205.

Circuit B205 splices to connect to circuit B235 through a diode. When the ABS main relay is not energized, it connects circuit B235 to circuit Z12. The ground path for the warning lamp is through the diode to circuit B235, through the ABS main relay to ground on circuit Z12.

The diode between circuit B205 and B235 prevents voltage from flowing to the CAB when the ABS main relay switches to supply power on circuit B235.

STOP LAMP SWITCH INPUT

Circuit L50 from the stop lamp switch provides the brake switch input to the Controller, Anti-Lock Brakes (CAB). When the brake pedal is depressed, the stop lamp switch closes to supply battery voltage from circuit L9 to circuit L50. Circuit L50 connects to cavity A8 of the CAB. Circuit L9 originates at fuse 2 in the Power Distribution Center (PDC).

DATA LINK CONNECTOR

Circuit D21 from cavity A3 of the Controller, Anti-Lock Brakes (CAB) transmits data to the DRB scan tool through the data link connector. Circuit D21 is double crimped at the data link connector and connects to cavity C27 of the Powertrain Control Module (PCM).

Through the data link connector, circuits Z11 and Z12 provide ground for the DRB scan tool.

Circuit F39 from fuse 17 in the Power Distribution Center (PDC) powers supplies battery voltage to the scan tool through the diagnostic connector.

SCHEMATICS AND DIAGRAMS

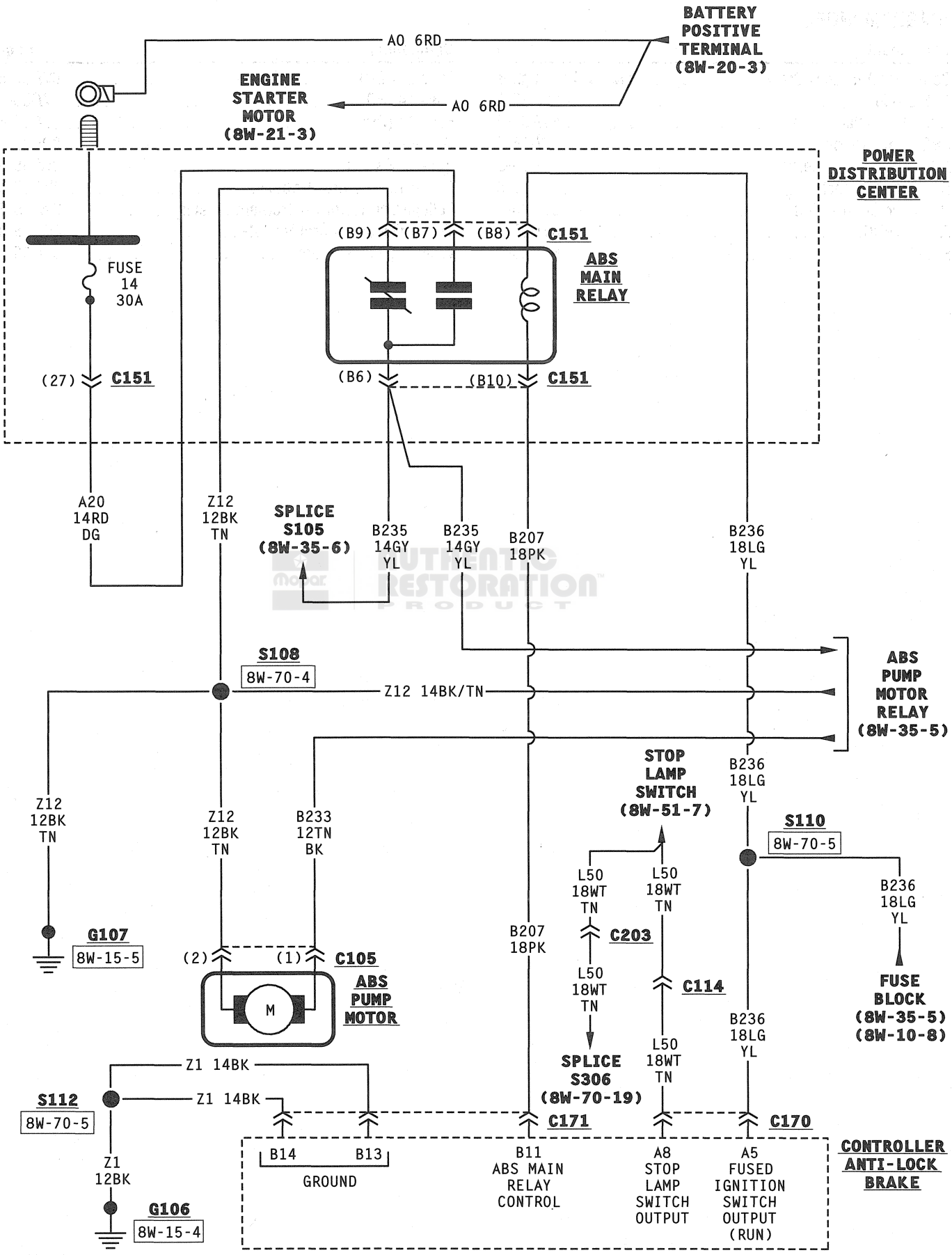
WIRING DIAGRAM INDEX

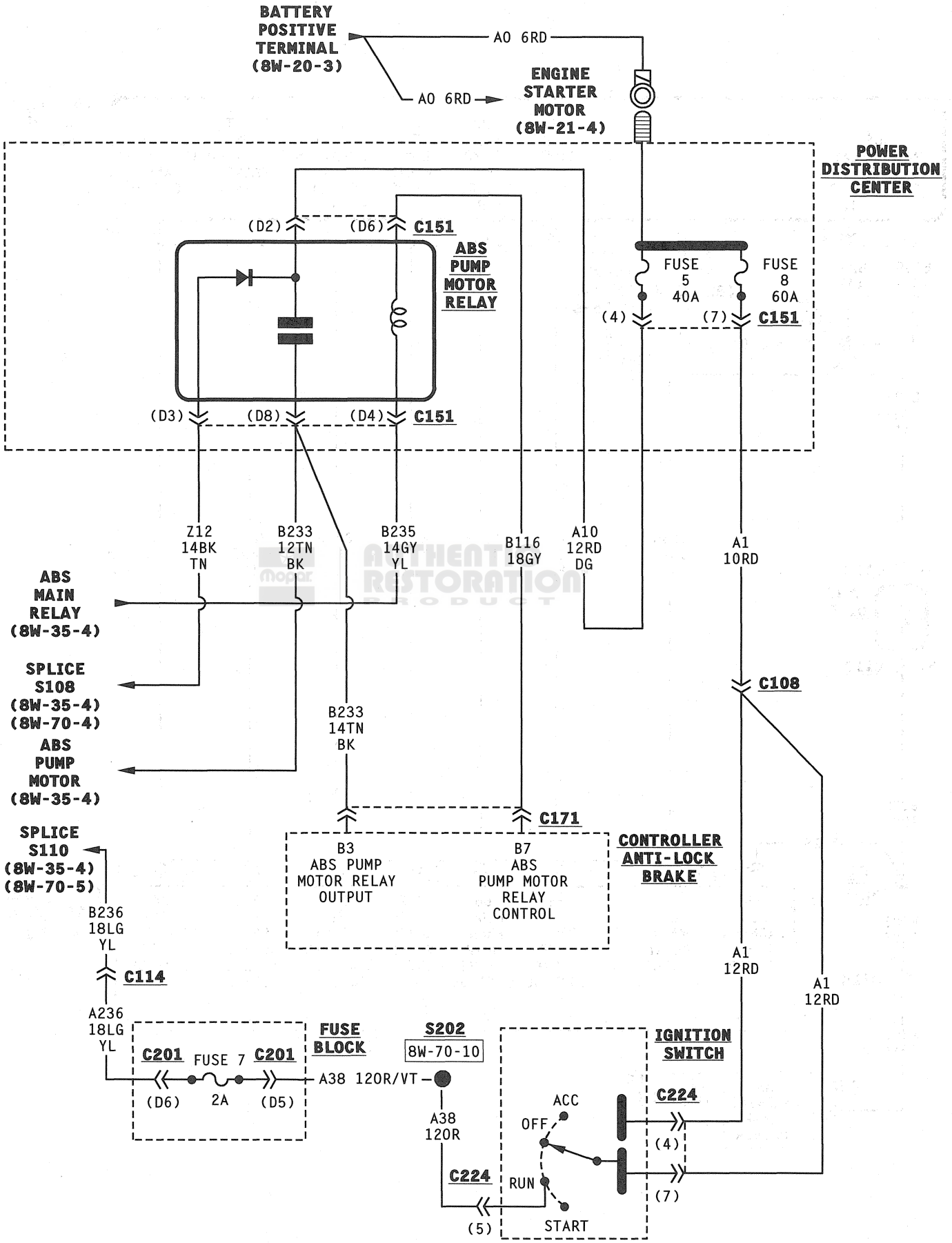
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

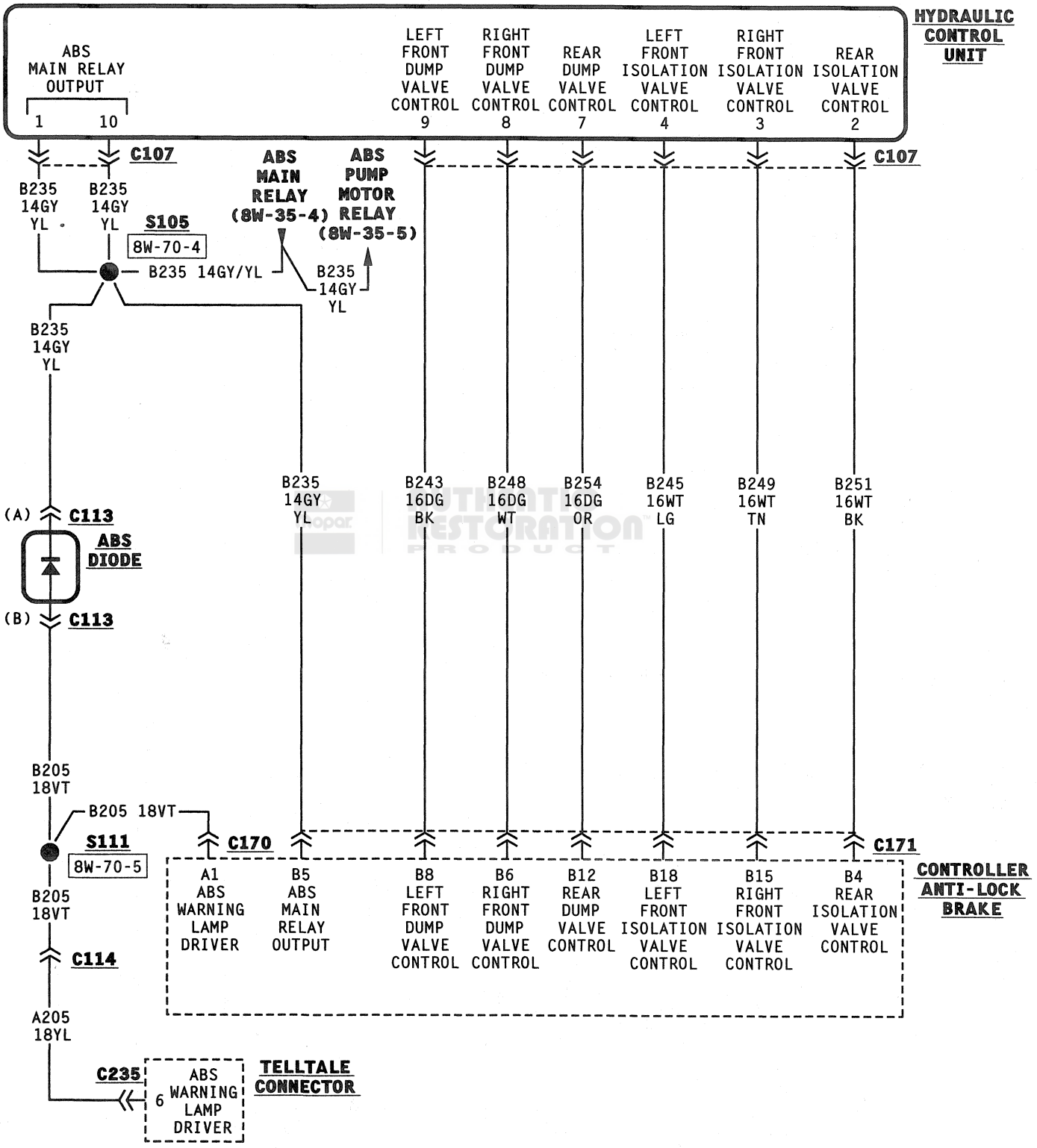
DIAGRAM INDEX

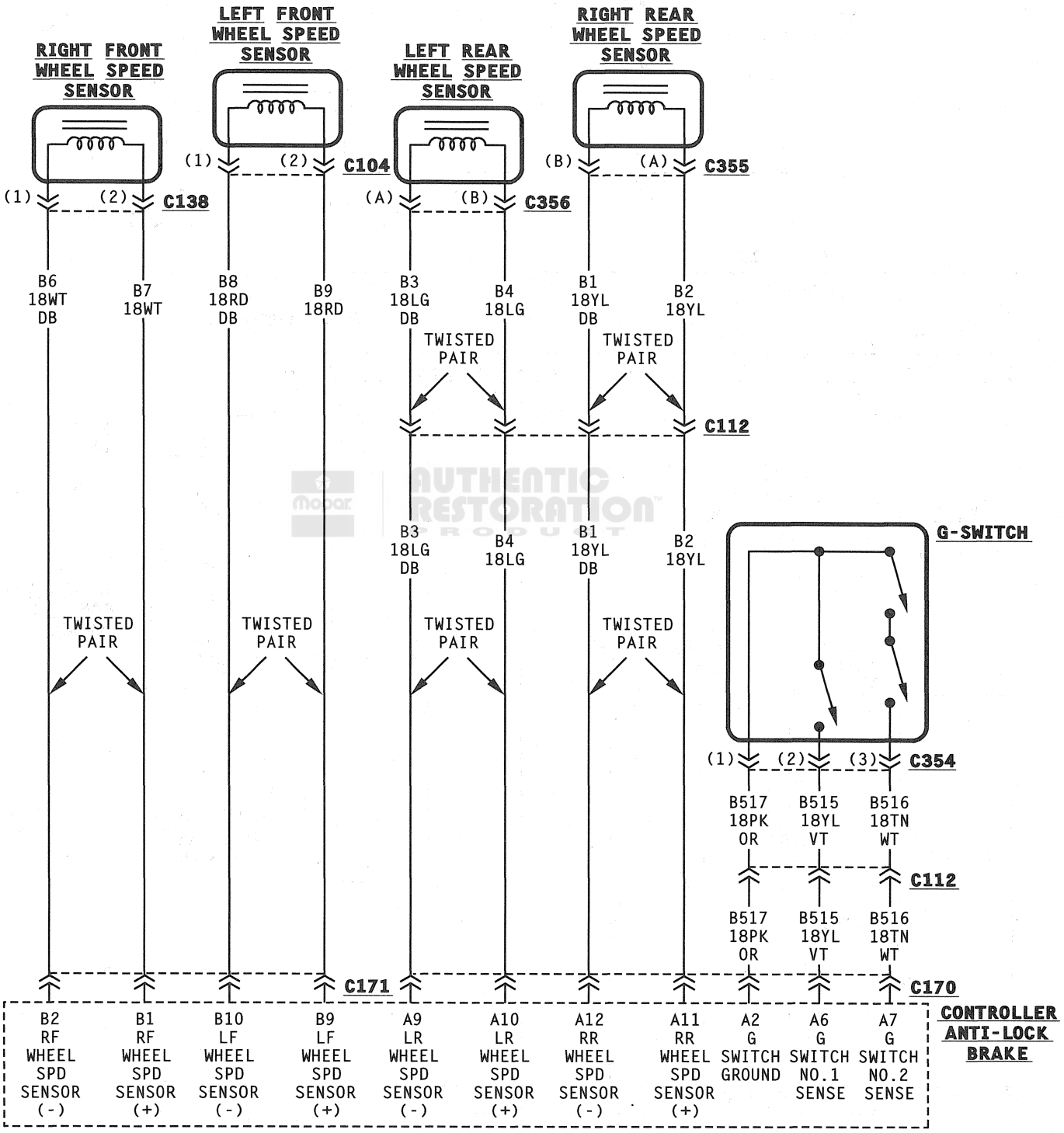
Component	Page
Controller Anti-Lock Brake	8W-35-4 through 8
ABS Diode	8W-35-6
ABS Main Relay	8W-35-4
ABS Pump Motor	8W-35-4
ABS Pump Motor Relay	8W-35-5
Data Link Connector	8W-35-8
Hydraulic Control Unit	8W-35-6
Fuse 5 (PDC)	8W-35-5
Fuse 7	8W-35-5
Fuse 8 (PDC)	8W-35-5
Fuse 14 (PDC)	8W-35-4
Fuse 17 (PDC)	8W-35-8
G-Switch	8W-35-7
Ignition Switch	8W-35-5
Powertrain Control Module	8W-35-8
Telltale Connector (Instrument Cluster)	8W-35-6
Transmission Control Module	8W-35-8
Wheel Speed Sensors	8W-35-7

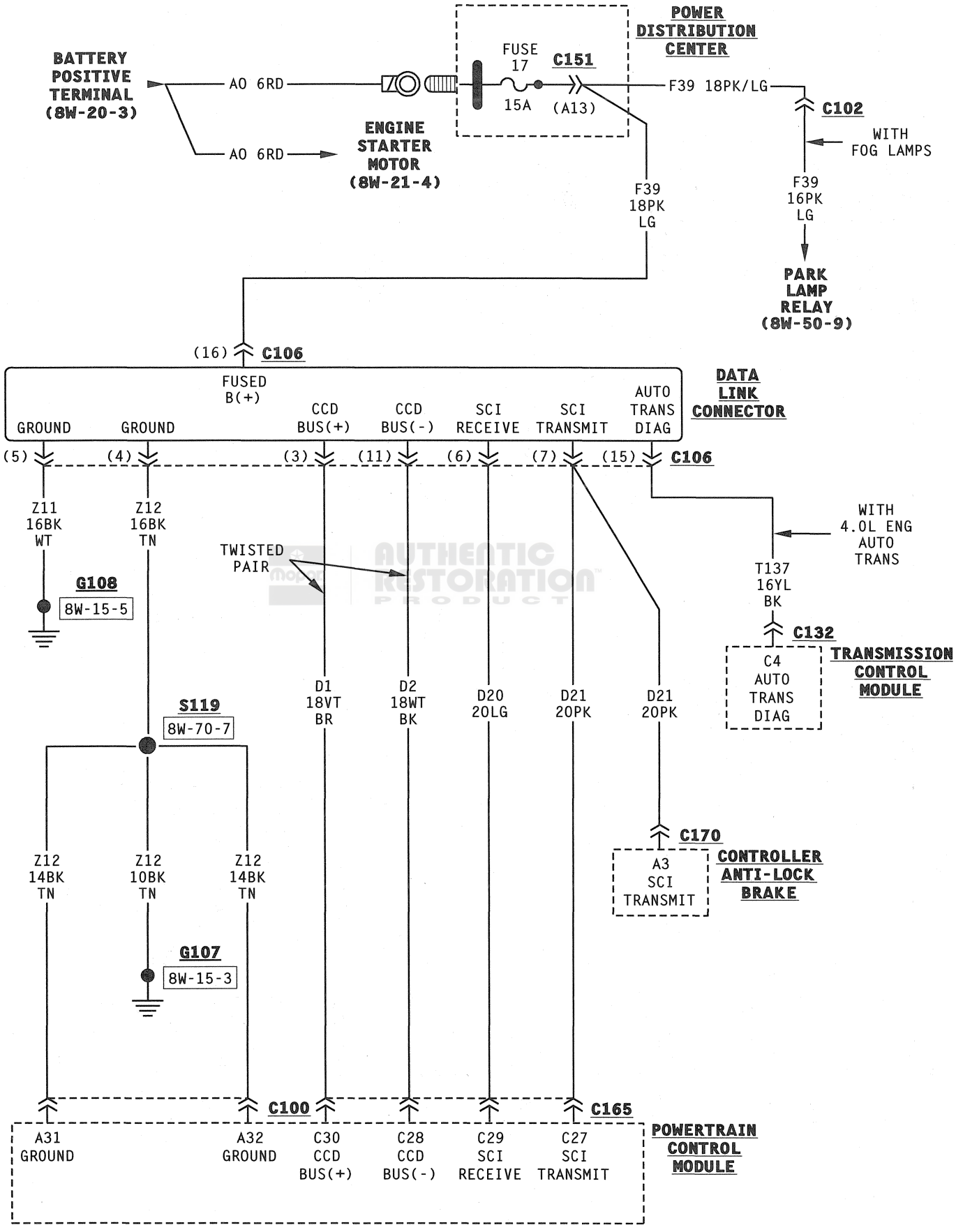
Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
(B9) (B7) (B8) C151
ABS MAIN RELAY
FUSE 14 30A
(27) C151
(B6) (B10) C151
A20 14RD DG
Z12 12BK TN
SPLICE S105 (8W-35-6)
B235 14GY YL
B235 14GY YL
B207 18PK
B236 18LG YL
S108 8W-70-4
Z12 14BK/TN
ABS PUMP MOTOR RELAY (8W-35-5)
STOP LAMP SWITCH (8W-51-7)
B236 18LG YL
S110 8W-70-5
Z12 12BK TN
Z12 12BK TN
B233 12TN BK
L50 18WT TN
L50 18WT TN
B236 18LG YL
G107 8W-15-5
(2) (1) C105
ABS PUMP MOTOR
M
B207 18PK
C203
L50 18WT TN
C114
FUSE BLOCK (8W-35-5) (8W-10-8)
B236 18LG YL
Z1 14BK
S112 8W-70-5
Z1 14BK
SPLICE S306 (8W-70-19)
L50 18WT TN
C171
C170
CONTROLLER ANTI-LOCK BRAKE
Z1 12BK
G106 8W-15-4
B14 B13
GROUND
B11 ABS MAIN RELAY CONTROL
A8 STOP LAMP SWITCH OUTPUT
A5 FUSED IGNITION SWITCH OUTPUT (RUN)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
(D2)
(D6)
C151
ABS PUMP MOTOR RELAY
FUSE 5 40A
FUSE 8 60A
(4)
(7)
C151
(D3)
(D8)
(D4)
C151
Z12 14BK TN
B233 12TN BK
B235 14GY YL
B116 18GY
A10 12RD DG
A1 10RD
ABS MAIN RELAY (8W-35-4)
SPLICE S108 (8W-35-4) (8W-70-4)
ABS PUMP MOTOR (8W-35-4)
B233 14TN BK
C108
C171
SPLICE S110 (8W-35-4) (8W-70-5)
B3 ABS PUMP MOTOR RELAY OUTPUT
B7 ABS PUMP MOTOR RELAY CONTROL
CONTROLLER ANTI-LOCK BRAKE
B236 18LG YL
C114
A1 12RD
A1 12RD
A236 18LG YL
C201
FUSE 7
C201
(D6)
2A
(D5)
FUSE BLOCK
S202
8W-70-10
A38 120R/VT
A38 120R
IGNITION SWITCH
ACC
OFF
RUN
START
C224
(4)
(7)
C224
(5)


HYDRAULIC CONTROL UNIT
ABS MAIN RELAY OUTPUT
1
10
LEFT FRONT DUMP VALVE CONTROL 9
RIGHT FRONT DUMP VALVE CONTROL 8
REAR DUMP VALVE CONTROL 7
LEFT FRONT ISOLATION VALVE CONTROL 4
RIGHT FRONT ISOLATION VALVE CONTROL 3
REAR ISOLATION VALVE CONTROL 2
C107
B235 14GY YL
B235 14GY YL
S105
8W-70-4
B235 14GY/YL
ABS MAIN RELAY (8W-35-4)
ABS PUMP MOTOR RELAY (8W-35-5)
B235 14GY YL
B235 14GY YL
B235 14GY YL
B243 16DG BK
B248 16DG WT
B254 16DG OR
B245 16WT LG
B249 16WT TN
B251 16WT BK
(A)
C113
ABS DIODE
(B)
C113
B205 18VT
B205 18VT
S111
8W-70-5
C170
C171
A1 ABS WARNING LAMP DRIVER
B5 ABS MAIN RELAY OUTPUT
B8 LEFT FRONT DUMP VALVE CONTROL
B6 RIGHT FRONT DUMP VALVE CONTROL
B12 REAR DUMP VALVE CONTROL
B18 LEFT FRONT ISOLATION VALVE CONTROL
B15 RIGHT FRONT ISOLATION VALVE CONTROL
B4 REAR ISOLATION VALVE CONTROL
CONTROLLER ANTI-LOCK BRAKE
B205 18VT
C114
A205 18YL
C235
6
ABS WARNING LAMP DRIVER
TELLTALE CONNECTOR


RIGHT FRONT WHEEL SPEED SENSOR
LEFT FRONT WHEEL SPEED SENSOR
LEFT REAR WHEEL SPEED SENSOR
RIGHT REAR WHEEL SPEED SENSOR
(1) (2) C138
(1) (2) C104
(A) (B) C356
(B) (A) C355
B6 18WT DB
B7 18WT
B8 18RD DB
B9 18RD
B3 18LG DB
B4 18LG
B1 18YL DB
B2 18YL
TWISTED PAIR
C112
G-SWITCH
(1) (2) (3) C354
B517 18PK OR
B515 18YL VT
B516 18TN WT
C171
C170
B2 RF WHEEL SPD SENSOR (-)
B1 RF WHEEL SPD SENSOR (+)
B10 LF WHEEL SPD SENSOR (-)
B9 LF WHEEL SPD SENSOR (+)
A9 LR WHEEL SPD SENSOR (-)
A10 LR WHEEL SPD SENSOR (+)
A12 RR WHEEL SPD SENSOR (-)
A11 RR WHEEL SPD SENSOR (+)
A2 G SWITCH GROUND
A6 G SWITCH NO.1 SENSE
A7 G SWITCH NO.2 SENSE
CONTROLLER ANTI-LOCK BRAKE



AUTHENTIC RESTORATION PRODUCT

8W-40 INSTRUMENT CLUSTER

INDEX

page

DESCRIPTION AND OPERATION
- ABS WARNING LAMP 2
- BRAKE WARNING LAMP 3
- CHARGING SYSTEM INDICATOR LAMP 3
- CLUSTER GROUND 3
- ENGINE COOLANT TEMPERATURE GAUGE 2
- ENGINE COOLANT TEMPERATURE WARNING LAMP 2
- FOUR-WHEEL DRIVE (4WD) SWITCH 3
- FUEL GAUGE 1
- HELPFUL INFORMATION 3
- HIGH-BEAM INDICATOR LAMP 3
- INSTRUMENT CLUSTER 1
- LOW FUEL WARNING LAMP 1
- LOW WASHER FLUID WARNING LAMP 2
- MALFUNCTION INDICATOR LAMP (MIL) 2
- MANUAL TRANSMISSION UP-SHIFT LAMP 3
- OIL PRESSURE GAUGE 2
- OIL PRESSURE WARNING LAMP 2
- SEAT BELT INDICATOR WARNING LAMP 2
- SPEEDOMETER 1
- TACHOMETER 1
- TURN SIGNAL INDICATOR LAMPS 3

SCHEMATICS AND DIAGRAMS
- WIRING DIAGRAM INDEX 3

DESCRIPTION AND OPERATION

INSTRUMENT CLUSTER

The instrument cluster contains the gauges and warning lamps. All gauges have magnetic movements.

When the ignition switch is in the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 feeds circuit F87 through fuse 17 in the fuse block. Circuit A1 is HOT at all times.

Circuit F87 connects to the cluster connector to power the gauges and to the telltale connector to power the warning lamps.

Circuit E2 from fuse 19 in the fuse block feeds the illumination lamps. Circuit E2 originates at the headlamp switch and continues through fuse 19. The headlamp switch powers circuit E2 when the parking lamps or headlamp are ON.

Circuit Z2 provides ground for the indicator lamps and illumination lamps.

SPEEDOMETER

The speedometer and odometer receive a signal from the vehicle speed sensor on circuit G7. Circuit G7 also connects to the Powertrain Control Module (PCM) at cavity B27.

TACHOMETER

The tachometer module in the instrument cluster operates the tachometer. The Powertrain Control Module (PCM) supplies the signal for the tachometer on circuit G21. Circuit G21 connects to cavity C31 of the PCM.

FUEL GAUGE

The fuel level sensor is a variable resistor. Circuit G4 connects the fuel level sensor to the fuel gauge in the instrument cluster. Circuit F87 from fuse 17 in the fuse block supplies voltage to the fuel gauge. The fuel level sensor draws voltage from circuit F87 through the fuel gauge on circuit G4. Circuit G4 connects to the fuel level sensor. Circuit Z1 provides the ground path for the fuel level sensor.

As current flows through the coils in the fuel gauge, it creates a magnetic field. One of the coils in the gauge receives fixed current. The other coil is connected to the level sensor. The magnetic field controls the position of the fuel gauge pointer.

The fuel level sensor contains a variable resistor. As the position of the float arm on the fuel level sensor changes, the resistor changes the current flow through second coil in the fuel gauge. A change in current flow alters the magnetic field in the fuel gauge, which changes the pointer position.

HELPFUL INFORMATION

A separate branch of circuit G4 from the fuel level sensor connects to cavity C26 of the Powertrain Control Module (PCM).

LOW FUEL WARNING LAMP

Circuit G4 connects the fuel level sensor to the fuel gauge. The low fuel level module at the rear of the gauge monitors resistance in circuit G4. The low fuel level module powers an light emitting diode (LED) when the resistance in circuit G4 reaches a calibrated level. The LED illuminates the Low Fuel indicator. Refer to Group 8E for additional information.

DESCRIPTION AND OPERATION (Continued)

ENGINE COOLANT TEMPERATURE GAUGE

Circuit G20 connects the engine coolant temperature gauge to the engine coolant temperature sensor. The sensor is a variable resistor and case grounded to the engine. Circuit F87 connects to the instrument cluster connector and supplies voltage for the gauge.

As current flows through the coils in the gauge, it creates a magnetic field. One of the coils in the gauge receives fixed voltage. The other coil connects to the engine coolant temperature sending unit. The magnetic field controls the position of the engine coolant temperature gauge pointer.

The engine coolant temperature sending unit is a variable resistor. A change in coolant temperature changes the resistance in the sending unit which alters the current flow through the second coil in the gauge. A change in current flow alters the magnetic field in the gauge, which changes pointer position.

ENGINE COOLANT TEMPERATURE WARNING LAMP

Circuit G20 connects the engine coolant temperature warning lamp to the engine coolant temperature switch. When the switch closes, battery voltage from circuit F87 flows through the lamp to ground through the switch on circuit G20. The engine coolant temperature switch is case grounded to the engine. Circuit F87 connects to the instrument cluster connector and supplies voltage for the lamp.

MALFUNCTION INDICATOR LAMP (MIL)

The Powertrain Control Module (PCM) provides ground for the instrument cluster malfunction indicator lamp on circuit G3. Circuit G3 connects to cavity C17 of the PCM. Circuit F87 provides voltage for the lamp. The MIL displays the message CHECK ENGINE when illuminated.

For information regarding diagnostic trouble code access using the MIL lamp, refer to Group 14, Fuel Systems.

ABS WARNING LAMP

Circuit F87 provides power for the ABS warning lamp at the instrument cluster. Ground for the ABS warning lamp is provided by either the Controller, Anti-Lock Brakes (CAB) or by the ABS main relay when the relay is not energized. The CAB illuminates the lamp by providing ground on circuit B205.

Circuit B205 splices to connect to circuit B235 through a diode. When the ABS main relay is not energized, it connects circuit B235 to circuit Z12. The ground path for the warning lamp is through the diode to circuit B235, through the ABS main relay to ground on circuit Z12.

The diode between circuit B205 and B235 prevents voltage from flowing to the CAB when the ABS main relay switches to supply power on circuit B235.

OIL PRESSURE GAUGE

The case grounded oil pressure sensor is a variable resistor that connects to circuit G6. Circuit G6 connects to the oil pressure gauge.

Circuit F87 connects to the instrument cluster connector and supplies battery voltage to oil pressure gauge. The gauge uses two coils. As current flows through the coils in the gauge, it creates a magnetic field. One of the coils in the gauge receives fixed voltage. The other coil connects to the engine coolant temperature sending unit. The magnetic field controls the position of the engine coolant temperature gauge pointer.

The oil pressure sensor is a variable resistor. A change in engine oil pressure changes the resistance in the sending unit which alters the current flow through the second coil in the gauge. A change in current flow alters the magnetic field in the gauge, which changes pointer position.

OIL PRESSURE WARNING LAMP

The case grounded oil pressure switch connects to circuit G6. Circuit G6 connects to the oil pressure warning lamp. Circuit F87 connects to the instrument cluster connector and supplies battery voltage to oil pressure lamp.

When the oil pressure switch closes, battery voltage flows through the warning lamp to ground through the switch, illuminating the lamp.

LOW WASHER FLUID WARNING LAMP

Circuit G29 connects the low washer fluid switch to the warning lamp in the instrument cluster. Circuit F12 supplies battery voltage to the switch.

When the low washer fluid switch closes, it connects circuits G29 and F12. Battery voltage from circuit F12 powers the low washer fluid lamp. Circuit Z1 at the instrument cluster provides ground to illuminate the warning lamp.

SEAT BELT INDICATOR WARNING LAMP

The seat belt indicator warning lamp is activated by the buzzer module on circuit G11. Circuit G11 supplies power to instrument cluster for the lamp. Circuit Z1 provides ground for the lamp at the cluster.

The buzzer module powers circuit G11 after it receives an input on circuit G10 indicating the seat belt switch is open.

DESCRIPTION AND OPERATION (Continued)

HIGH-BEAM INDICATOR LAMP

Circuit L3 supplies power for the high-beam indicator lamp. The ground path for the lamp is through circuit Z1. If the vehicle has Daytime Running Lamps (DRL), the DRL module powers circuit L3 through circuit G465. On vehicles not equipped with DRL, the headlamp switch powers circuit L3.

Circuit Z1 provides ground for the indicator lamp at the cluster.

TURN SIGNAL INDICATOR LAMPS

Circuits L61 and L60 power for the turn signal indicator lamps. Circuit L61 powers the left indicator lamp. Circuit L60 powers the right indicator lamp. Circuit Z1 provides ground for the lamps.

BRAKE WARNING LAMP

Circuit F87 supplies power to the park brake lamp. Ground for the park brake lamp is supplied through the case grounded park brake switch or brake warning switch on circuit G9. Circuit G9 Connects to circuit A203. Circuit A203 connects to the brake warning lamp at the instrument cluster.

MANUAL TRANSMISSION UP-SHIFT LAMP

Circuit F87 supplies power for the manual transmission up-shift lamp. The lamp illuminates when the Powertrain Control Module (PCM) provides ground for the lamp on circuit K54. Circuit K54 connects to cavity B11 of the PCM.

CHARGING SYSTEM INDICATOR LAMP

The Powertrain Control Module (PCM) illuminates the charging system indicator lamp by providing ground for the lamp on circuit G14. Circuit G14 connects to cavity C16 of the PCM. Circuit F87 supplies battery voltage to the lamp.

FOUR-WHEEL DRIVE (4WD) SWITCH

When the 4WD switch CLOSES, circuit Z1 provides ground for the 4WD indicator lamp in the instrument cluster. Circuit F87 connects to the instrument cluster and supplies battery voltage to the 4WD indicator lamp. Circuit G107 connects the indicator lamp to the 4WD switch.

On vehicles equipped with the 4.0L engine and an automatic transmission, circuit G107 connects to the solenoid assembly in the transmission. Circuit G106 from the solenoid assembly provides ground during 4WD Full Time operation.

CLUSTER GROUND

Circuits Z1 and Z2 from the instrument cluster provide ground for the illumination lamps and indicator lamps.

HELPFUL INFORMATION

- If the warning lamps don't operate, check fuse 17 in the fuse block.
- Inspect the ground at the instrument panel lower right reinforcement support.

SCHEMATICS AND DIAGRAMS

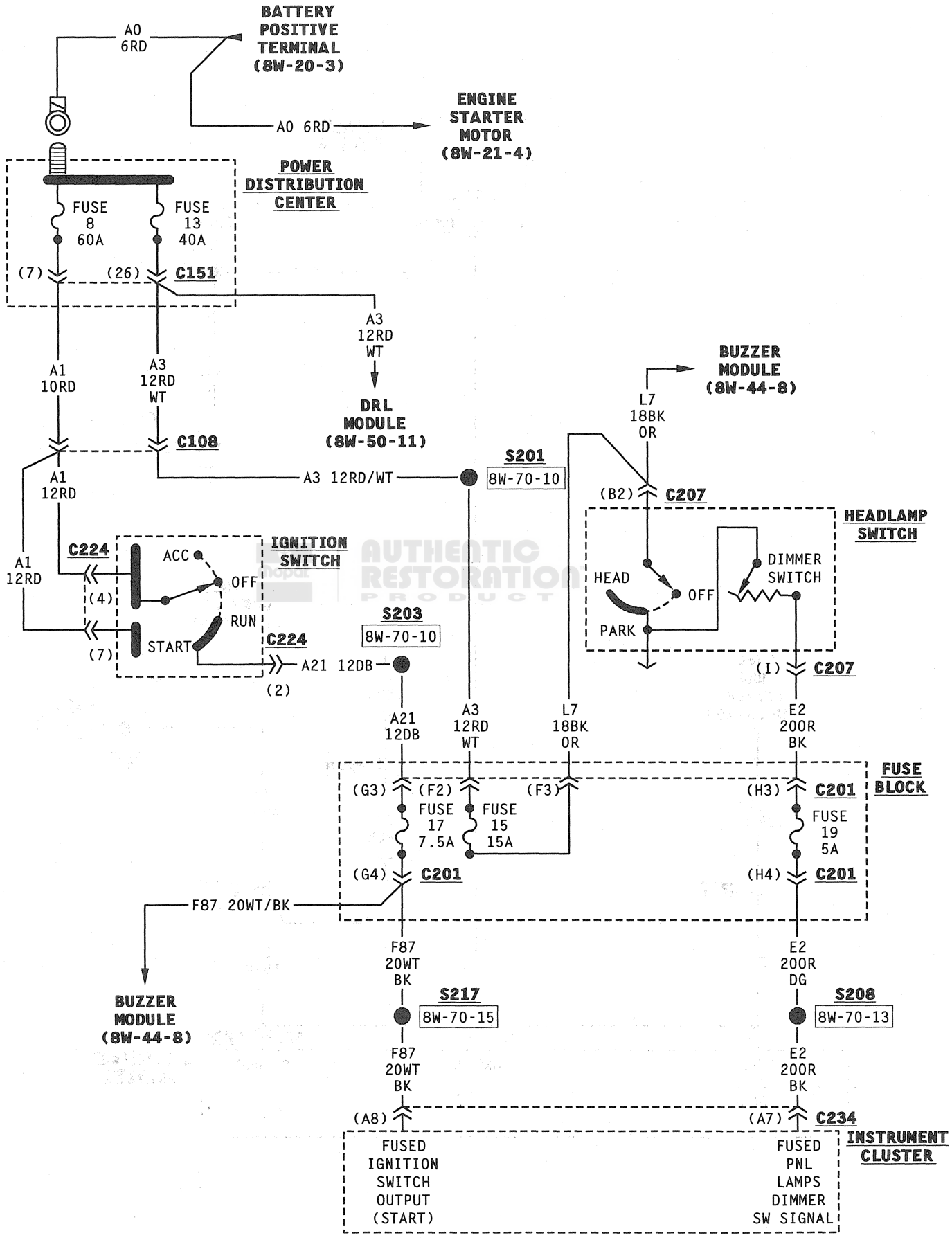
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

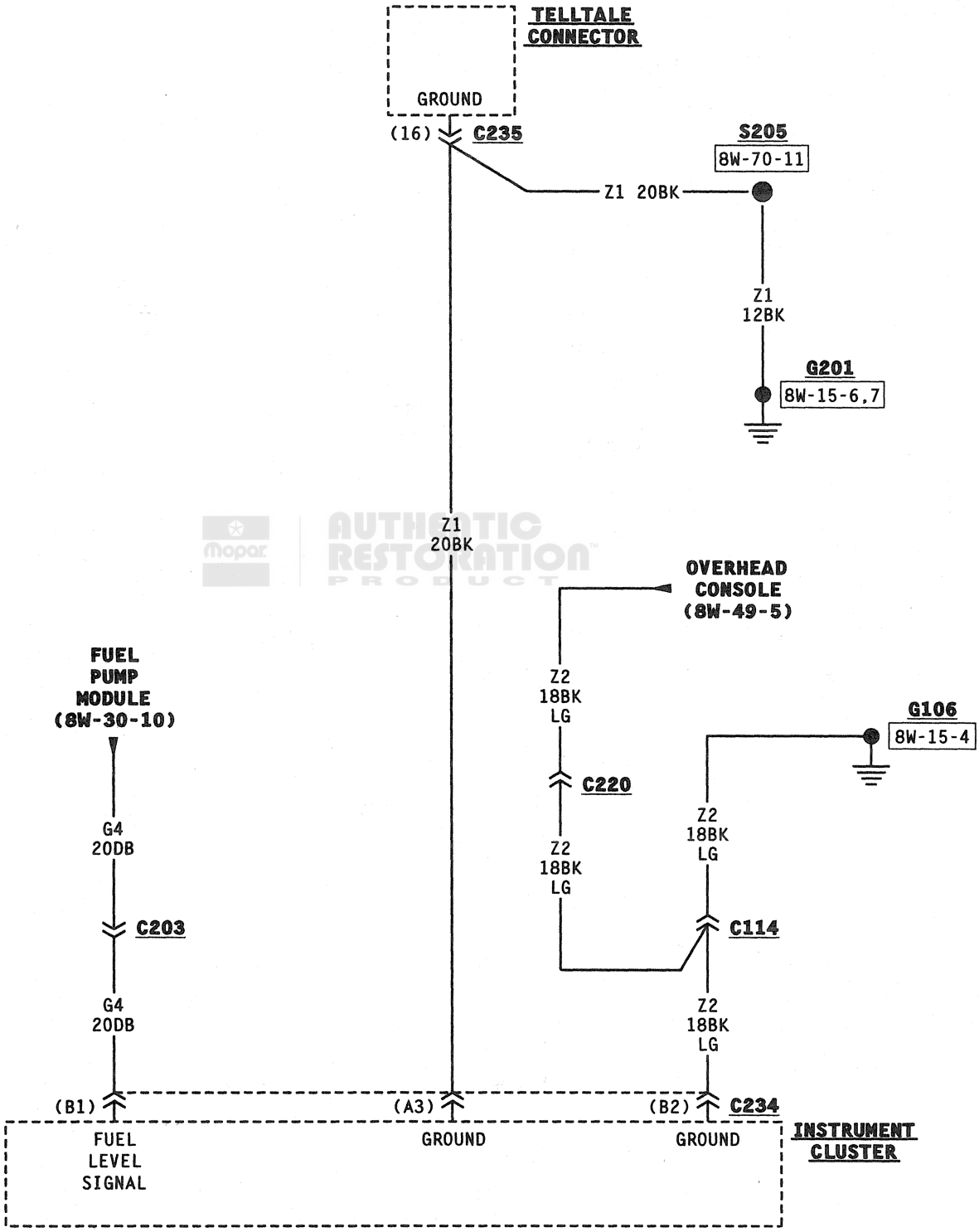
DIAGRAM INDEX

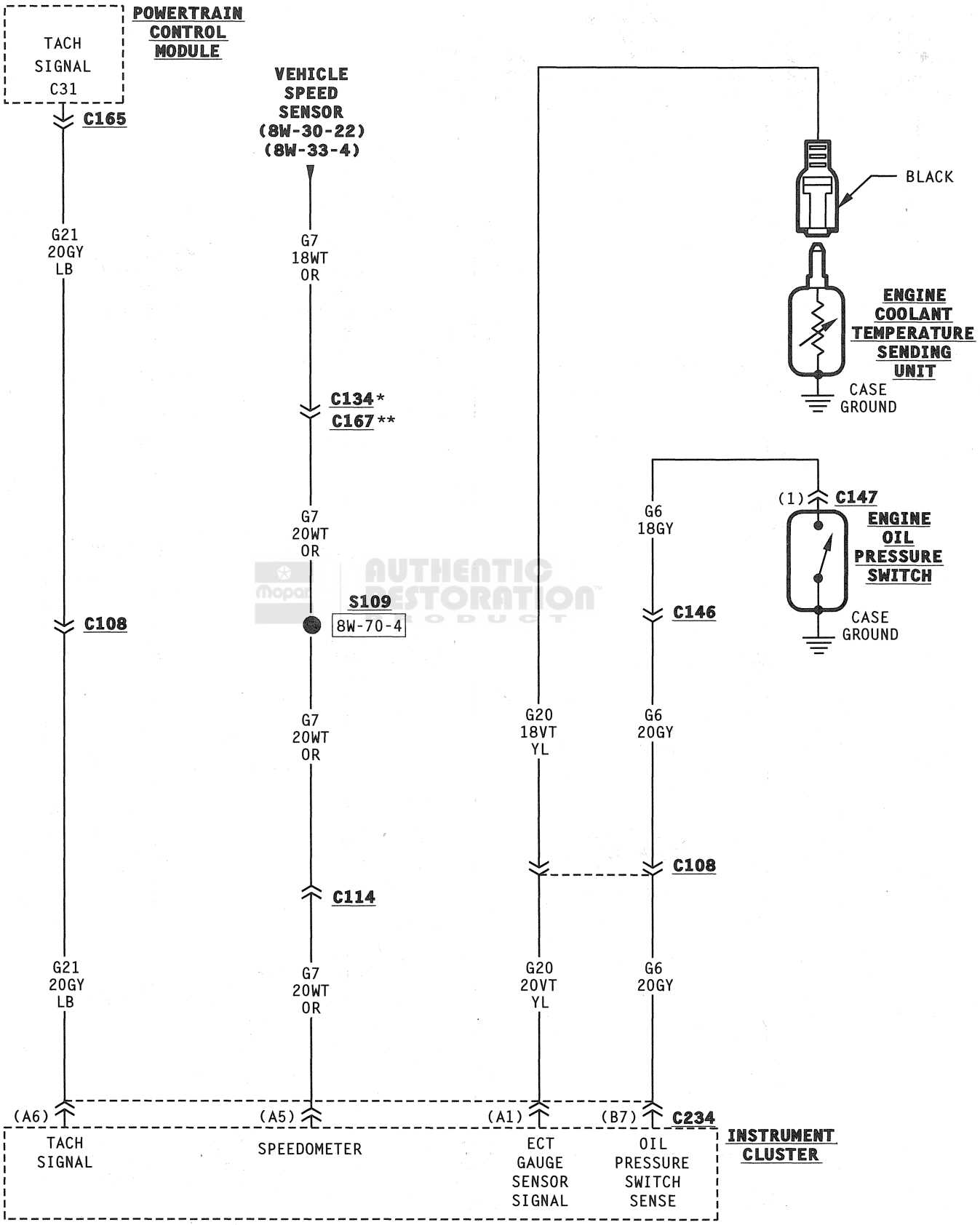
Component	Page
4WD Switch	8W-40-10
ABS Diode	8W-40-10
Brake Warning Lamp Switch	8W-40-11
Buzzer Module	8W-40-11
Controller Anti-Lock Brake	8W-40-10
Engine Coolant Temperature Sending Unit	8W-40-7
Engine Oil Pressure Switch	8W-40-7
Fuse 8 (PDC)	8W-40-5, 9
Fuse 13 (PDC)	8W-40-5
Fuse 15	8W-40-5
Fuse 17	8W-40-5, 9
Fuse 18 (PDC)	8W-40-9
Fuse 19	8W-40-5
Headlamp Switch	8W-40-5
Ignition Switch	8W-40-5, 9, 11
Instrument Cluster	8W-40-5, 6, 7, 8
Low Washer Fluid Level Switch	8W-40-9
Park Brake Switch	8W-40-11
Powertrain Control Module	8W-40-7, 11
Telltale Connector (Instrument Cluster)	8W-40-6, 9, 10, 11
Valve Body Solenoids	8W-40-10

Mopar AUTHENTIC RESTORATION PRODUCT

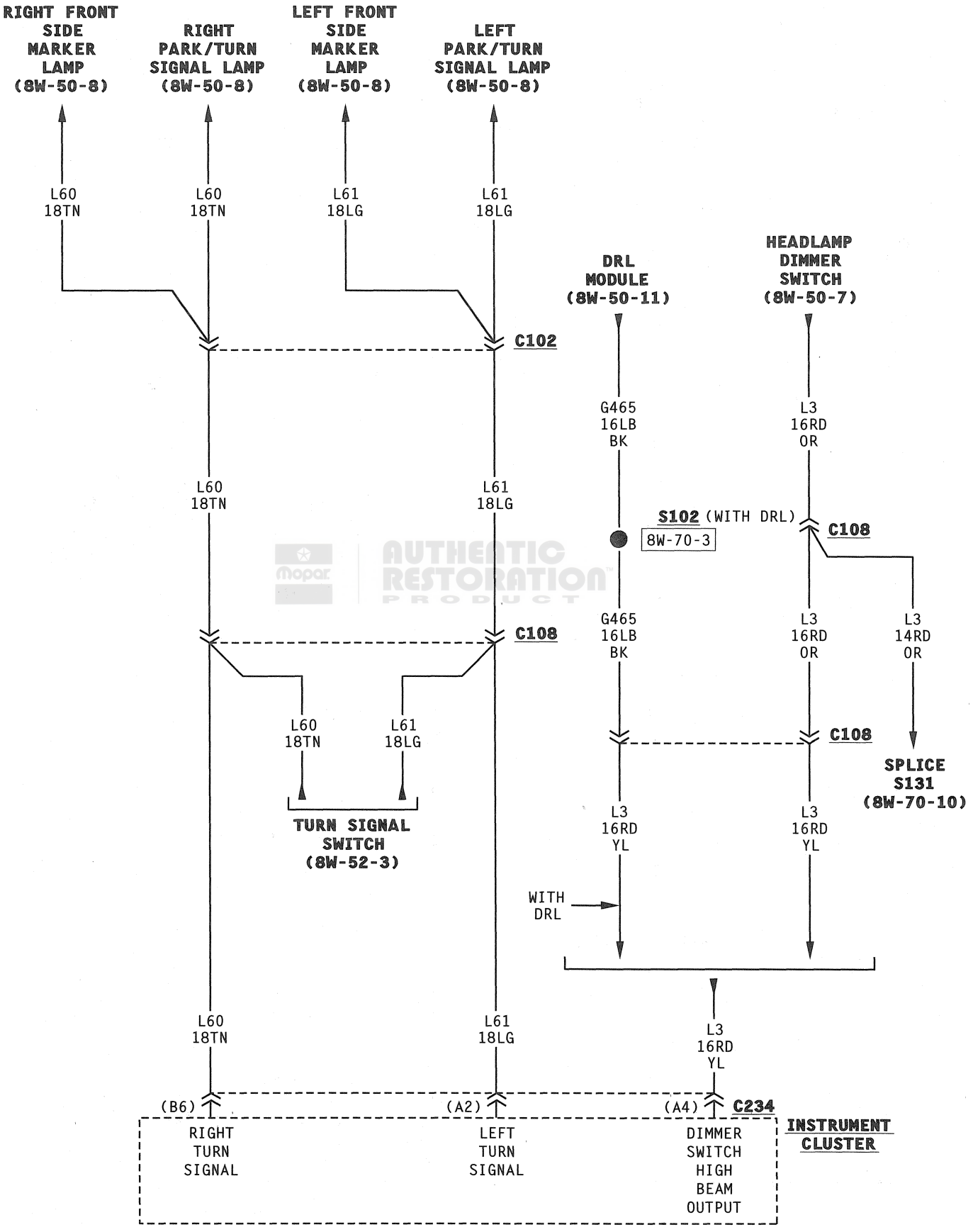


AUTHENTIC RESTORATION PRODUCT

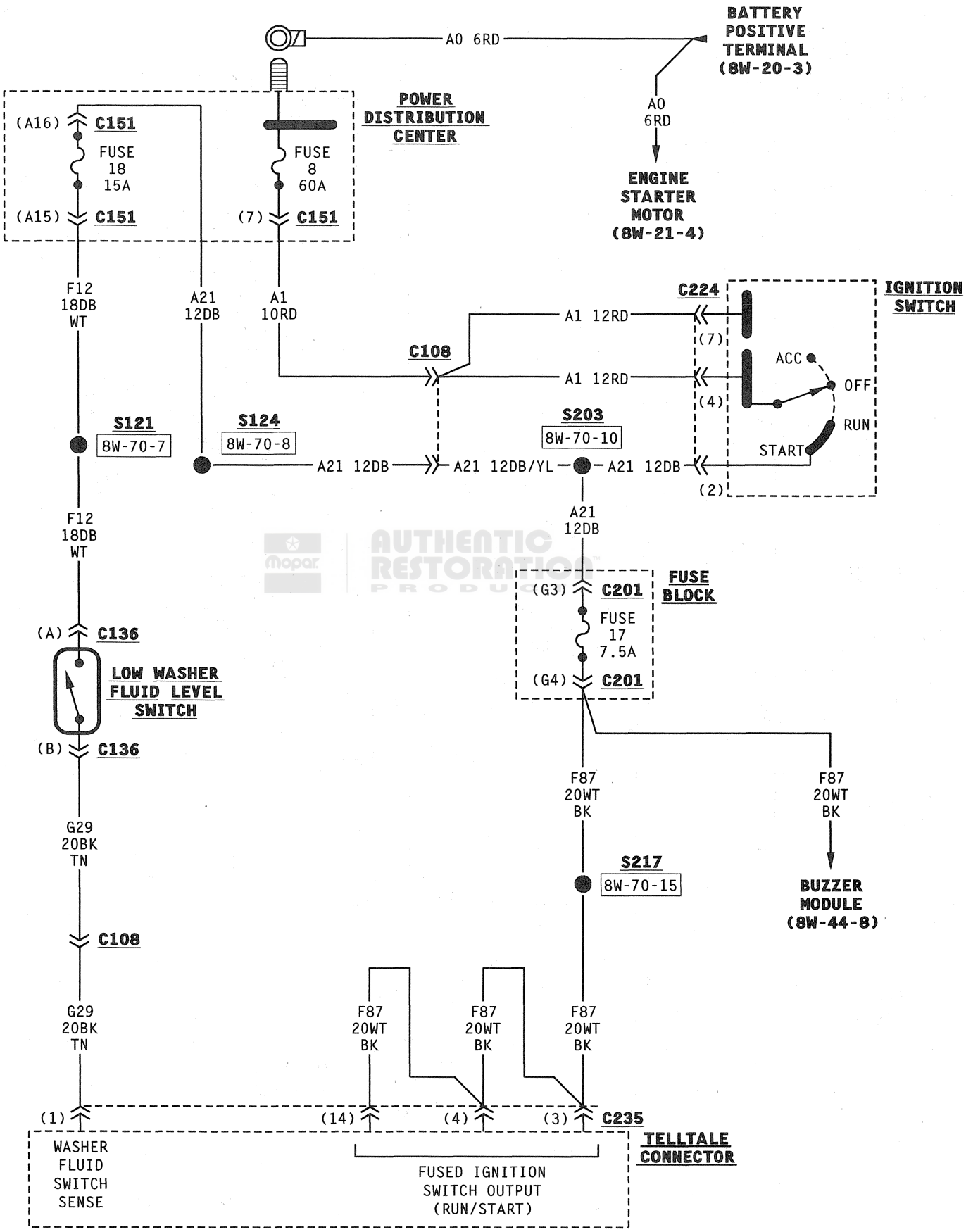

TELLTALE CONNECTOR
GROUND
(16) C235
S205
8W-70-11
Z1 20BK
Z1 12BK
G201
8W-15-6,7
Z1 20BK
OVERHEAD CONSOLE (8W-49-5)
Z2 18BK LG
C220
Z2 18BK LG
G106
8W-15-4
Z2 18BK LG
C114
Z2 18BK LG
FUEL PUMP MODULE (8W-30-10)
G4 20DB
C203
G4 20DB
(B1)
(A3)
(B2)
C234
FUEL LEVEL SIGNAL
GROUND
GROUND
INSTRUMENT CLUSTER



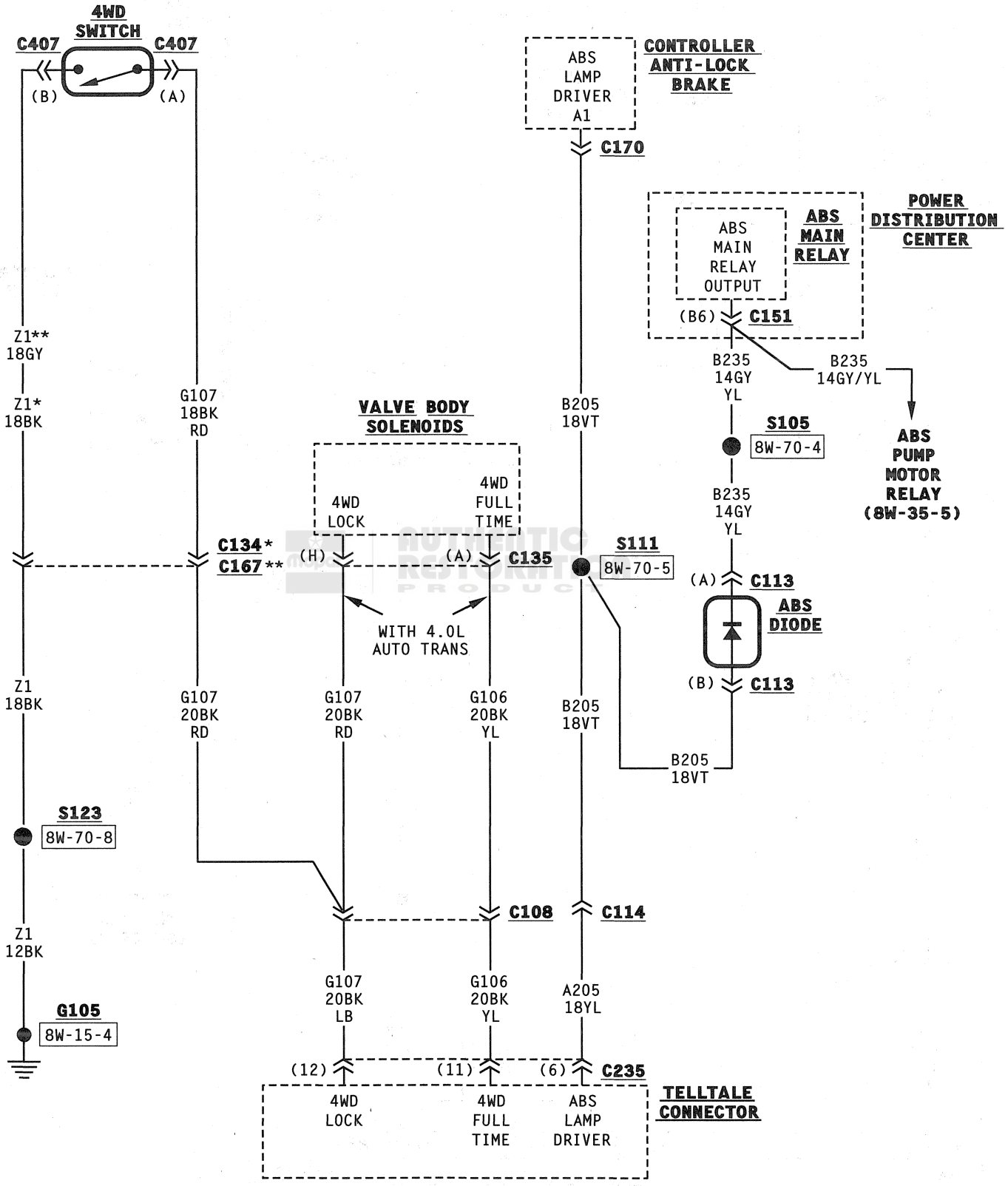
*WITH MAN TRANS AND 4.0L ENG
**WITH 2.5L ENG AUTO TRANS



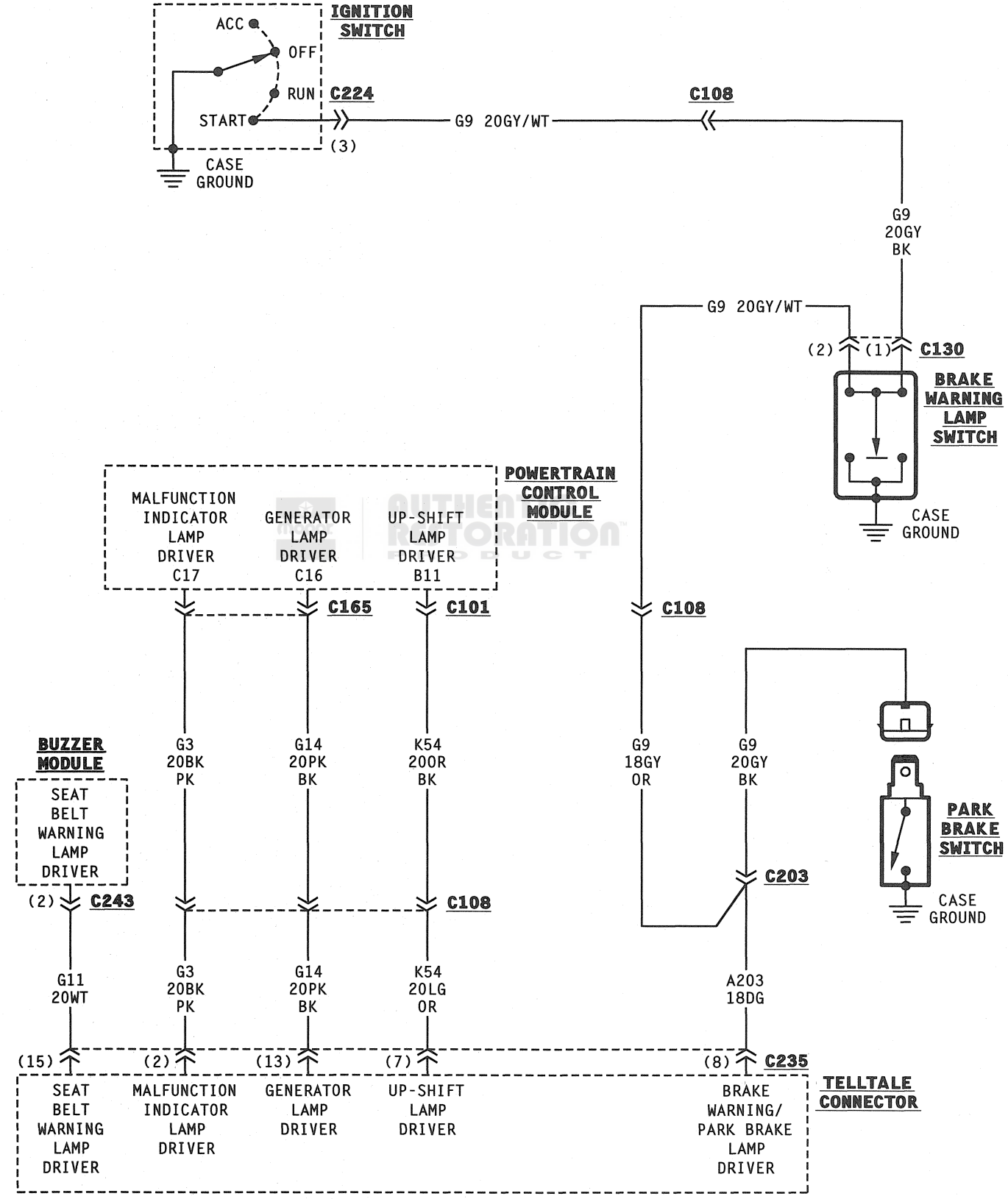
Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCTS



*WITH 2.5L MANUAL AND 4.0L
**WITH 2.5L AUTO TRANS ONLY


IGNITION SWITCH
ACC
OFF
RUN
START
C224
(3)
CASE GROUND
G9 20GY/WT
C108
G9 20GY BK
G9 20GY/WT
(2)
(1)
C130
BRAKE WARNING LAMP SWITCH
CASE GROUND
POWERTRAIN CONTROL MODULE
MALFUNCTION INDICATOR LAMP DRIVER C17
GENERATOR LAMP DRIVER C16
UP-SHIFT LAMP DRIVER B11
C165
C101
C108
BUZZER MODULE
SEAT BELT WARNING LAMP DRIVER
(2)
C243
G3 20BK PK
G14 20PK BK
K54 200R BK
C108
G9 18GY OR
G9 20GY BK
C203
PARK BRAKE SWITCH
CASE GROUND
G11 20WT
G3 20BK PK
G14 20PK BK
K54 20LG OR
A203 18DG
(15)
(2)
(13)
(7)
(8)
C235
TELLTALE CONNECTOR
SEAT BELT WARNING LAMP DRIVER
MALFUNCTION INDICATOR LAMP DRIVER
GENERATOR LAMP DRIVER
UP-SHIFT LAMP DRIVER
BRAKE WARNING/ PARK BRAKE LAMP DRIVER

8W-41 HORN/CIGAR LIGHTER

DESCRIPTION AND OPERATION

HORN

The horn system uses two switches and horn relay. The horn switches are on the steering wheel.

Circuit A7 from fuse 4 in the Power Distribution Center (PDC) feeds a fuse block bus bar that powers circuit X4 through fuse 11 in the fuse block. Circuit X4 is HOT at all times and powers the coil and contact sides of the horn relay.

When the case grounded horn switch is depressed, circuit X3 provides ground for the coil side of the relay and the contacts CLOSE. When the contacts CLOSE, circuit X2 supplies voltage to the case grounded horns.

HELPFUL INFORMATION

- The horn switches are grounded to the steering wheel.
- Circuit X4 is double crimped at the coil side of the horn relay.
- Check fuse 4 in the PDC and fuse 11 in the fuse block.

CIGAR LIGHTER

In the ACCESSORY or RUN position, the ignition switch supplies voltage to fuse 2 in the fuse block on circuit A48. Fuse 2 feeds circuit F85 which connects to the cigar lighter. When the lighter is depressed, the contacts inside of the lighter element close and voltage flows to ground on circuit Z1.

HELPFUL INFORMATION

- In the ACCESSORY or RUN position, the ignition switch connects circuit A1 from fuse 8 in the PDC with circuit A48.
- Circuit F85 also powers the radio and LCD relay.

SCHEMATICS AND DIAGRAMS

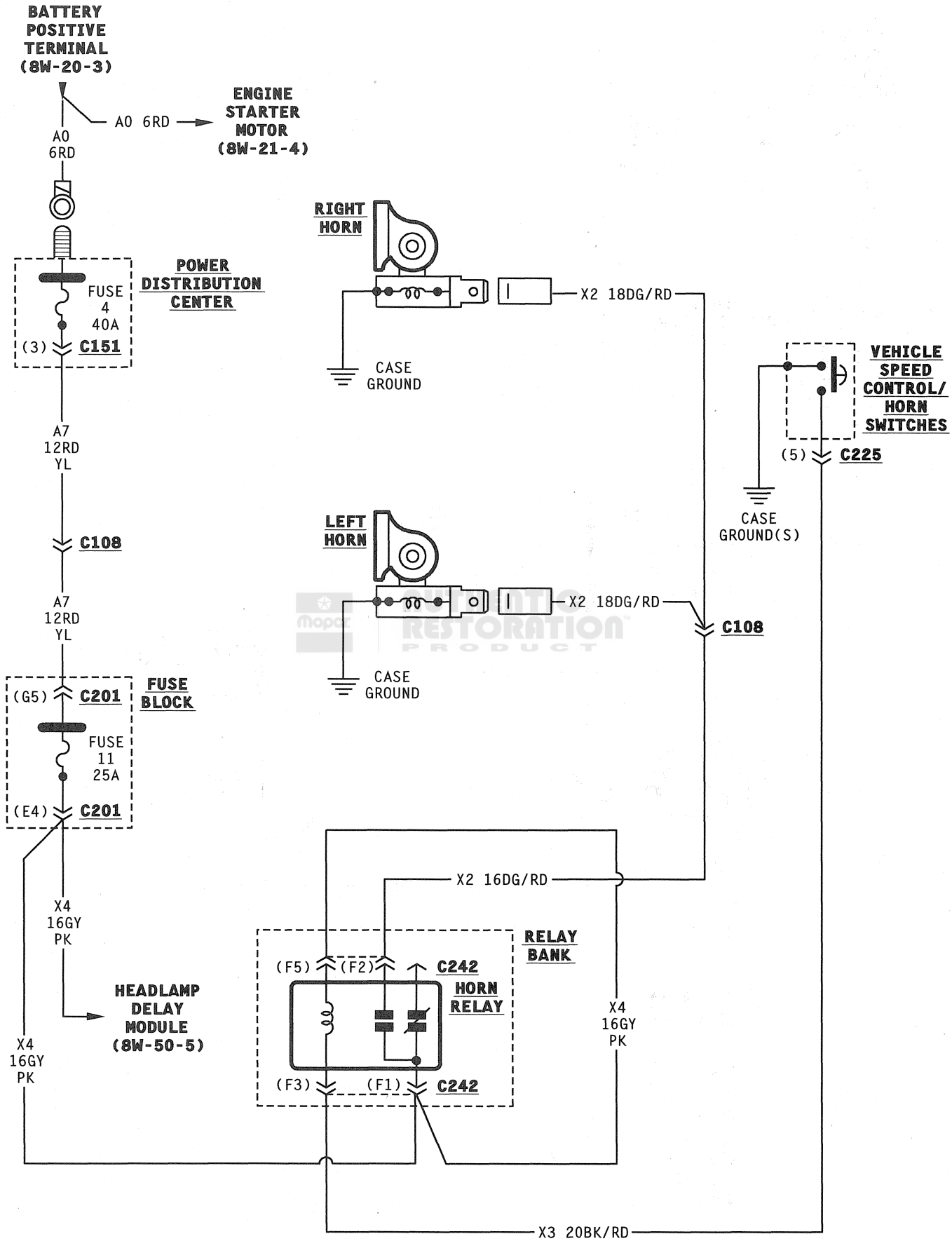
WIRING DIAGRAM INDEX

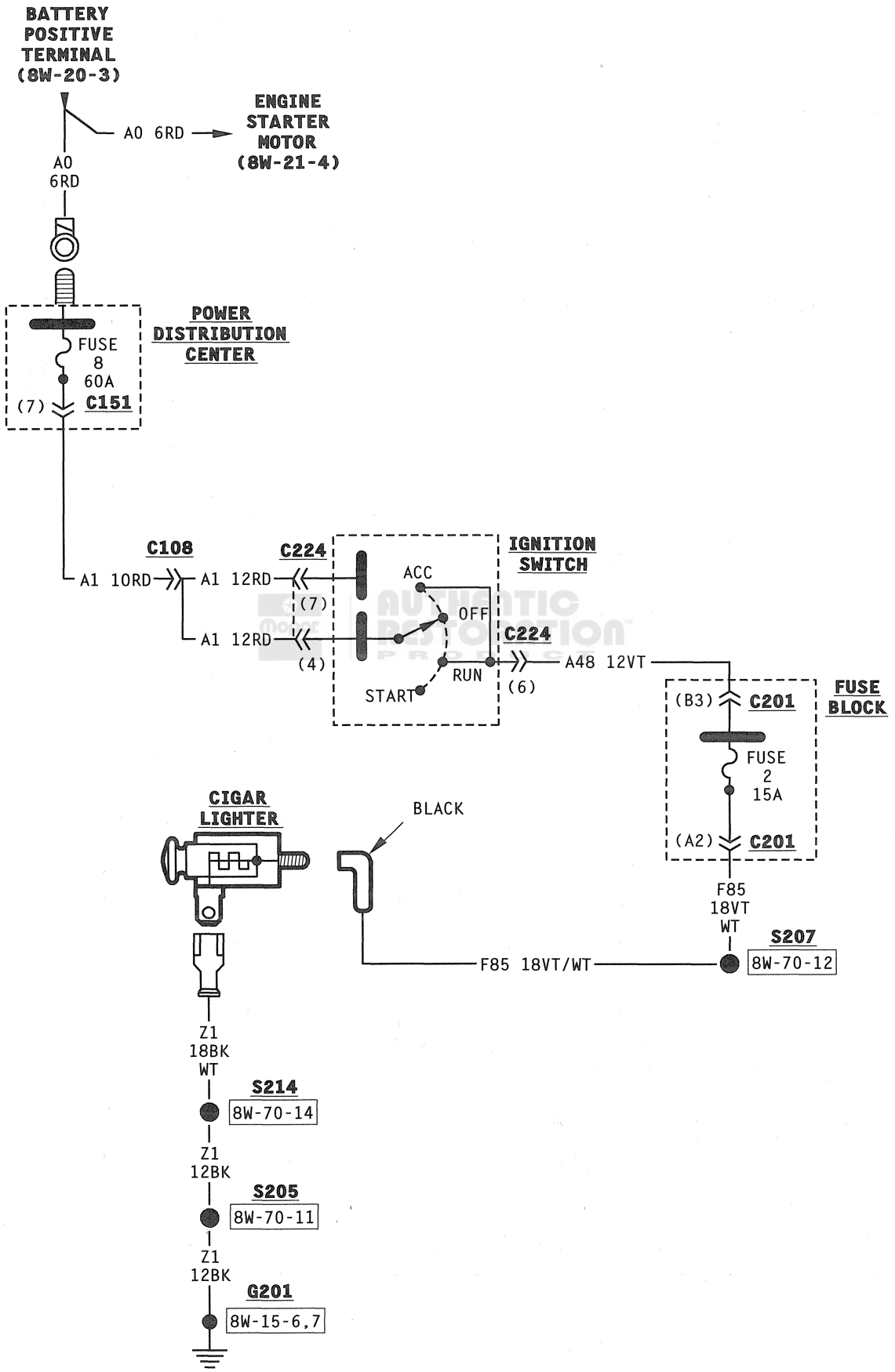
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Cigar Lighter	8W-41-4
Fuse 2	8W-41-4
Fuse 4 (PDC)	8W-41-3
Fuse 8 (PDC)	8W-41-4
Fuse 11	8W-41-3
Horn Relay	8W-41-3
Ignition Switch	8W-41-4
Left Horn	8W-41-3
Power Distribution Center	8W-41-3, 4
Relay Bank	8W-41-3
Right Horn	8W-41-3
Horn Switch	8W-41-3

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3) C151
A7 12RD YL
C108
A7 12RD YL
FUSE BLOCK
(G5) C201
FUSE 11 25A
(E4) C201
X4 16GY PK
HEADLAMP DELAY MODULE (8W-50-5)
X4 16GY PK
RIGHT HORN
X2 18DG/RD
CASE GROUND
LEFT HORN
X2 18DG/RD
CASE GROUND
C108
VEHICLE SPEED CONTROL/ HORN SWITCHES
(5) C225
CASE GROUND(S)
X2 16DG/RD
RELAY BANK
(F5) (F2) C242
HORN RELAY
(F3) (F1) C242
X4 16GY PK
X3 20BK/RD


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
C108
A1 10RD
C224
A1 12RD
(7)
A1 12RD
(4)
IGNITION SWITCH
ACC
OFF
RUN
START
C224
(6)
A48 12VT
FUSE BLOCK
(B3) C201
FUSE 2 15A
(A2) C201
F85 18VT WT
S207
8W-70-12
CIGAR LIGHTER
BLACK
F85 18VT/WT
Z1 18BK WT
S214
8W-70-14
Z1 12BK
S205
8W-70-11
Z1 12BK
G201
8W-15-6,7

8W-42 AIR CONDITIONING/HEATER

INDEX

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
A/C COMPRESSOR 1
BLOWER MOTOR—A/C-HEATER 1
BLOWER MOTOR—HEATER ONLY 1
RADIATOR FAN RELAY AND MOTOR 2
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

GENERAL INFORMATION

INTRODUCTION

The wiring diagrams in this section are divided into two sub-sections; Heater only, and A/C and Heater. When referring to the wiring diagrams, ensure that you use the correct sub-section.

DESCRIPTION AND OPERATION

BLOWER MOTOR—HEATER ONLY

In the RUN or ACCESSORY position, the ignition switch connects circuit A1 from fuse 8 in the PDC to circuit A48. Circuit A48 supplies battery voltage to fuse 5 in the fuse block. Fuse 5 supplies power to the heater control switch on circuit C7.

Circuit C43 from the heater control switch splices to supply voltage to the blower motor switch and the blower motor resistor block. The blower motor switch has four positions; HIGH, M1, M2, or LOW.

When the blower motor switch is in the LOW position, circuit C43 from the heater control switch supplies voltage to the resistor block. Voltage does not pass through the blower motor switch in the LOW position.

In the M1 position, the blower motor switch supplies voltage to the resistor block on circuit C4. From circuit C4, voltage passes through three resistors in the resistor block to the blower motor on circuit C1.

In the M2 position, the blower motor supplies voltage to the resistor block on circuit C6. From circuit C6 voltage flows through two resistors to the blower motor on circuit C1.

In the HIGH position, the blower motor switch connects directly to the blower motor on circuit C1. Voltage does not pass through the resistor block.

Circuit Z1 provides ground for the blower motor.

BLOWER MOTOR—A/C-HEATER

In the RUN or ACCESSORY position, the ignition switch connects circuit A1 from fuse 8 in the PDC to circuit A48. Circuit A48 supplies battery voltage to fuse 5 in the fuse block. Fuse 5 supplies power to the A/C-Heater control switch on circuit C7.

Circuit C43 from the A/C-heater switch splices to supply voltage to the blower motor switch and the blower motor resistor block. The blower motor switch has four positions; HIGH, M1, M2, or LOW.

When the blower motor switch is in the LOW position, circuit C43 from the A/C-Heater switch supplies voltage to the resistor block. Voltage does not pass through the blower motor switch in the LOW position

In the M1 position, the blower motor switch supplies voltage to the resistor block on circuit C4. From circuit C4, voltage passes through three resistors in the resistor block to the blower motor on circuit C1.

In the M2 position, the blower motor supplies voltage to the resistor block on circuit C6. From circuit C6 voltage flows through two resistors to the blower motor on circuit C1.

In the HIGH position, the blower motor switch connects directly to the blower motor on circuit C1. Voltage does not pass through the resistor block.

Circuit Z1 provides ground for the blower motor.

A/C COMPRESSOR

When the ignition switch is in the ACCESSORY or RUN position it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48. Circuit A48 powers circuit C7 through fuse 5 in the fuse block. When the A/C-heater control switch is moved to an A/C position or the defrost position, it connects circuit C7 to circuit C90. Circuit C90 provides the A/C select signal to cavity C23 of the Powertrain Control Module (PCM).

Circuit C90 also connects to the A/C cycling switch. Circuit C21 from the cycling switch connects to the low pressure switch. If the low pressure switch is closed, it completes a path from the cycling switch to the PCM on circuit C21. Circuit C21 provides the A/C request signal to cavity C22 of the PCM. Circuit Z1 provides ground for the cycling switch.

After receiving the A/C request signal, the PCM supplies ground for the A/C compressor clutch relay on circuit C13. Circuit C13 connects to cavity C1 of

DESCRIPTION AND OPERATION (Continued)

the PCM. Circuit F12 from the fuse 18 in the PDC supplies battery voltage to the coil side of the A/C compressor clutch relay when the ignition switch is in the START or RUN position. When the PCM grounds the relay, the contacts close and connect circuit A17 from fuse 10 in the PDC to circuit C3. Circuit C3 feeds the case grounded A/C compressor clutch.

Also, after receiving the A/C request signal, the PCM supplies ground for the coil side of the radiator fan relay on circuit C27 (4.0L engine). Circuit C27 connects to cavity C2 of the PCM. Circuit F12 supplies battery voltage to the coil side of the relay when the ignition switch is in the START or RUN position.

When the PCM grounds the coil side of the radiator fan relay, the contacts close and connect circuit F141 from fuse 15 in the PDC to circuit C25. Circuit C25 feeds the radiator fan motor. Circuit Z1 provides ground for the motor.

RADIATOR FAN RELAY AND MOTOR

In the START or RUN positions, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 powers a bus bar in the PDC that feeds circuit F12 through fuse 18. Circuit F12 feeds the coil side of the radiator fan relay (4.0L engine).

The Powertrain Control Module (PCM) supplies ground for the coil side of the radiator fan relay on circuit C27. Circuit C27 connects to cavity C2 of the PCM.

When the PCM grounds the coil side of the radiator fan relay, the contacts CLOSE and connect circuit F141 from fuse 15 in the PDC to circuit C25. Circuit C25 feeds the radiator fan motor. Circuit Z1 provides ground for the radiator fan motor.

SCHEMATICS AND DIAGRAMS

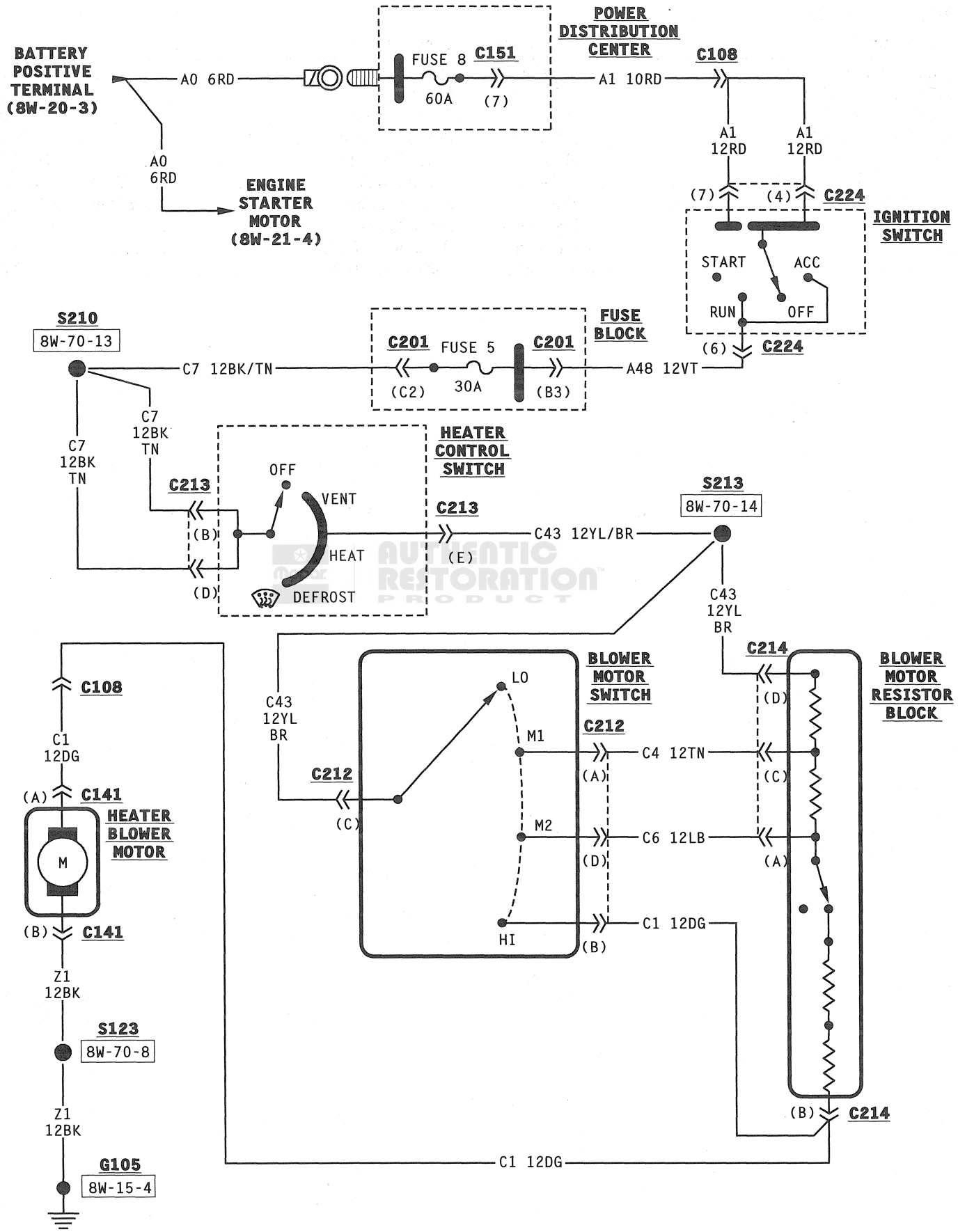
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

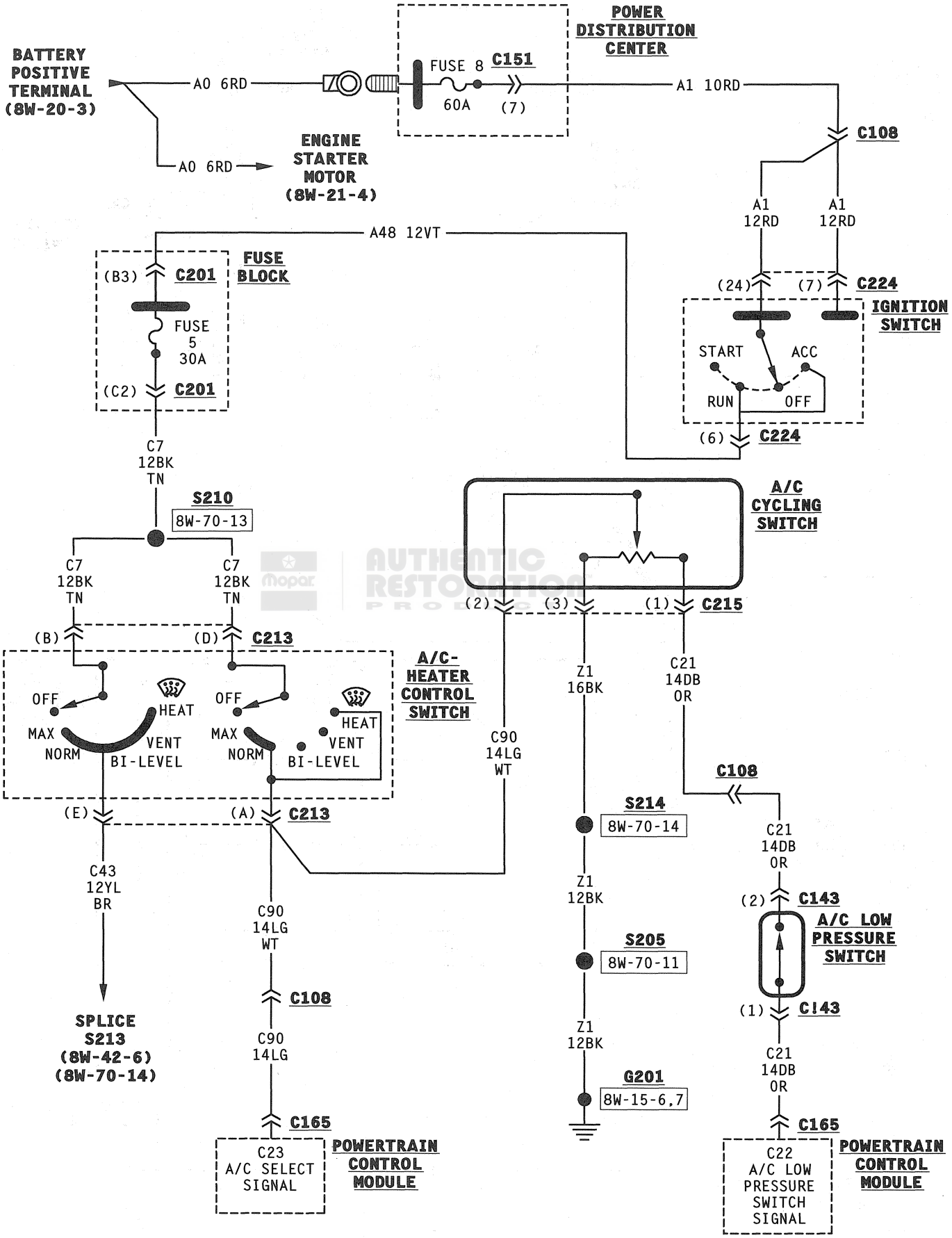
DIAGRAM INDEX

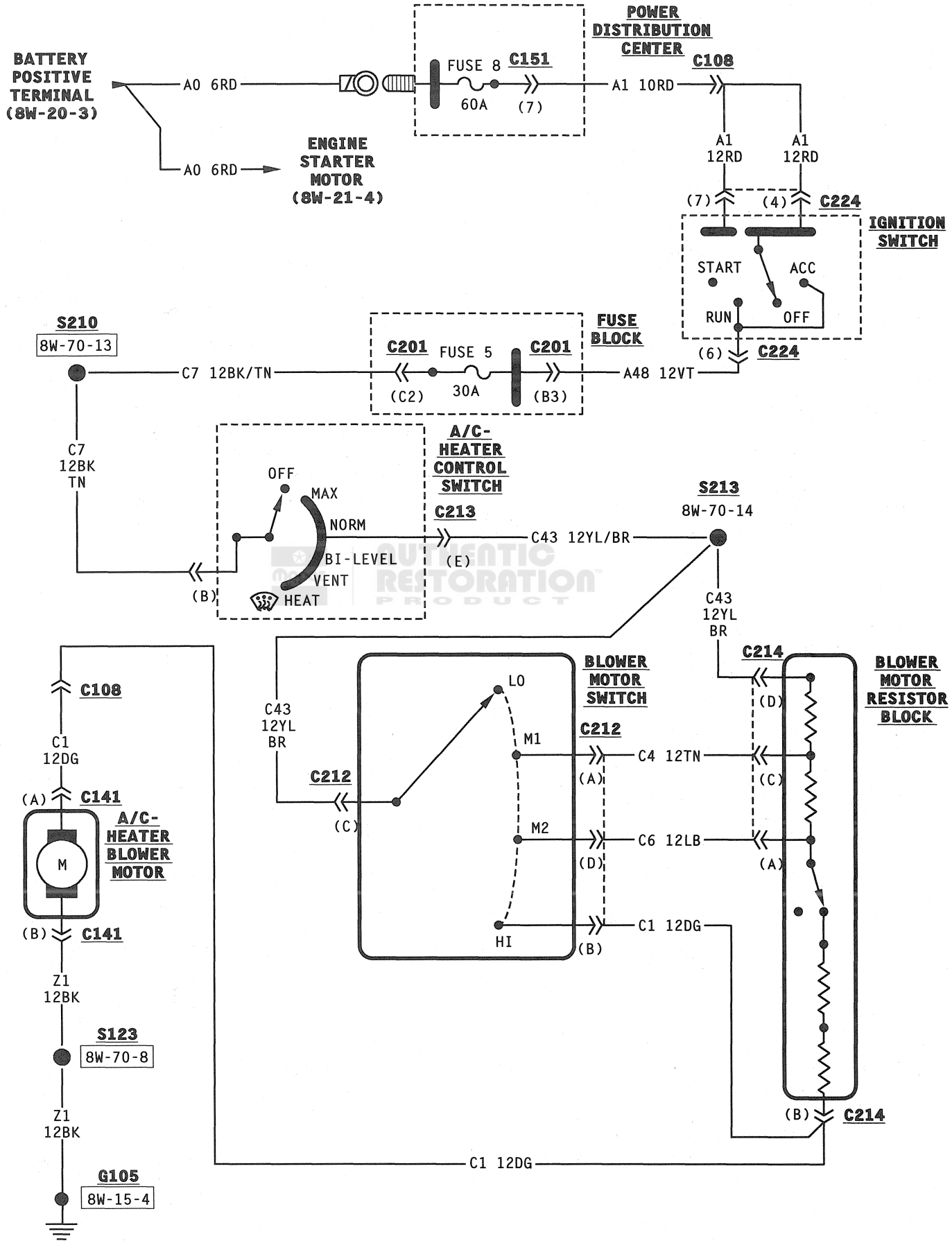
Component	Page
A/C Compressor Clutch	8W-42-7
A/C Compressor Clutch Relay	8W-42-7
A/C Cycling Switch	8W-42-5
A/C-Heater Blower Motor	8W-42-6
A/C-Heater Control Switch	8W-42-5, 6
A/C Low Pressure Switch	8W-42-5
Blower Motor Resistor Block	8W-42-4, 6
Blower Motor Switch	8W-42-4, 6
Fuse 5	8W-42-4, 5, 6
Fuse 8 (PDC)	8W-42-4, 5, 6, 7,8
Fuse 10 (PDC)	8W-42-7
Fuse 15 (PDC)	8W-42-8
Fuse 18 (PDC)	8W-42-7, 8
Heater Blower Motor	8W-42-4
Heater Control Switch	8W-42-4
Ignition Switch	8W-42-4, 5, 6, 7, 8
Power Distribution Center	8W-42-4, 5, 6, 7, 8
Powertrain Control Module	8W-42-5, 7, 8
Radiator Fan Motor	8W-42-8
Radiator Fan Relay	8W-42-8

Mopar AUTHENTIC RESTORATION PRODUCT

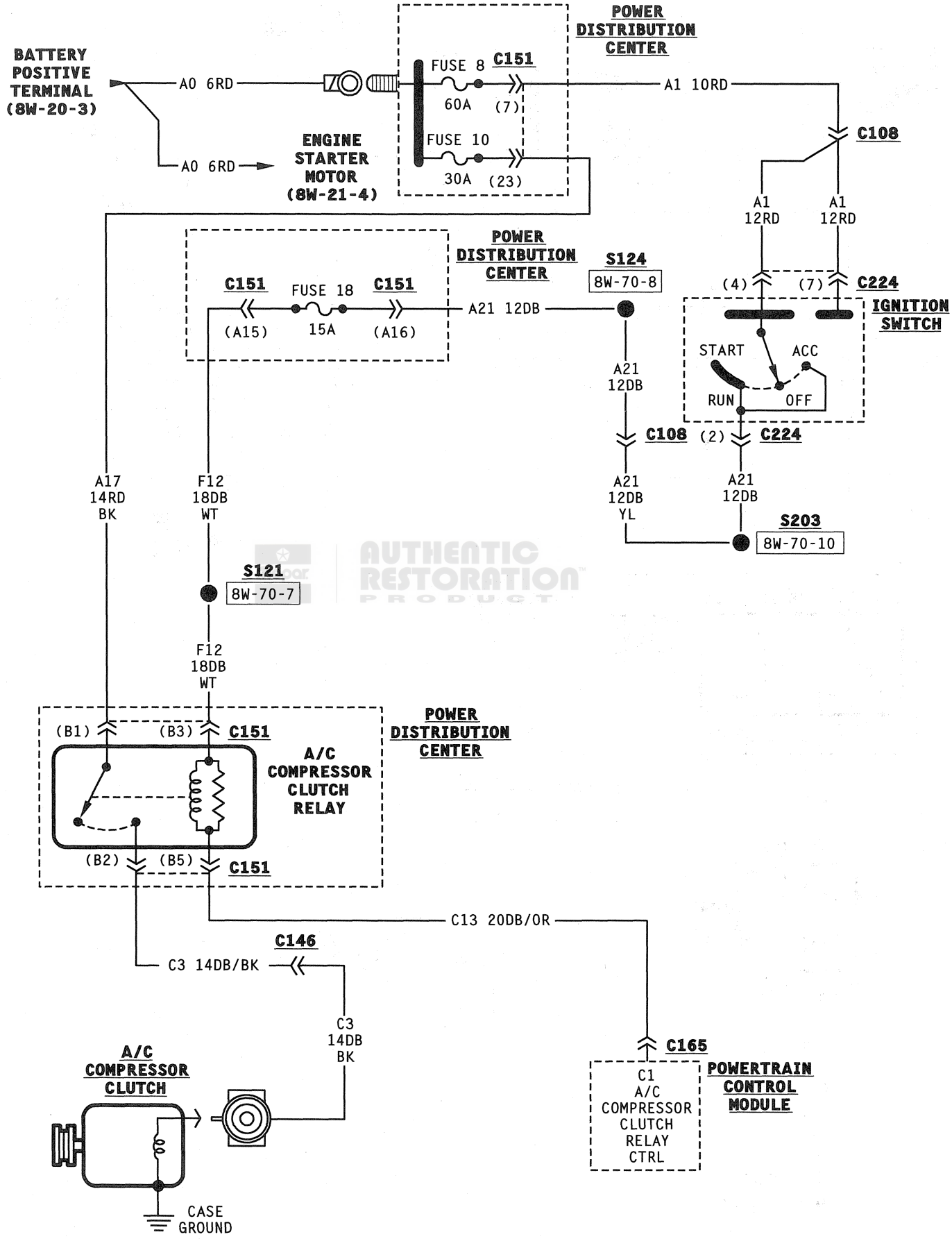


AUTHENTIC RESTORATION PRODUCT

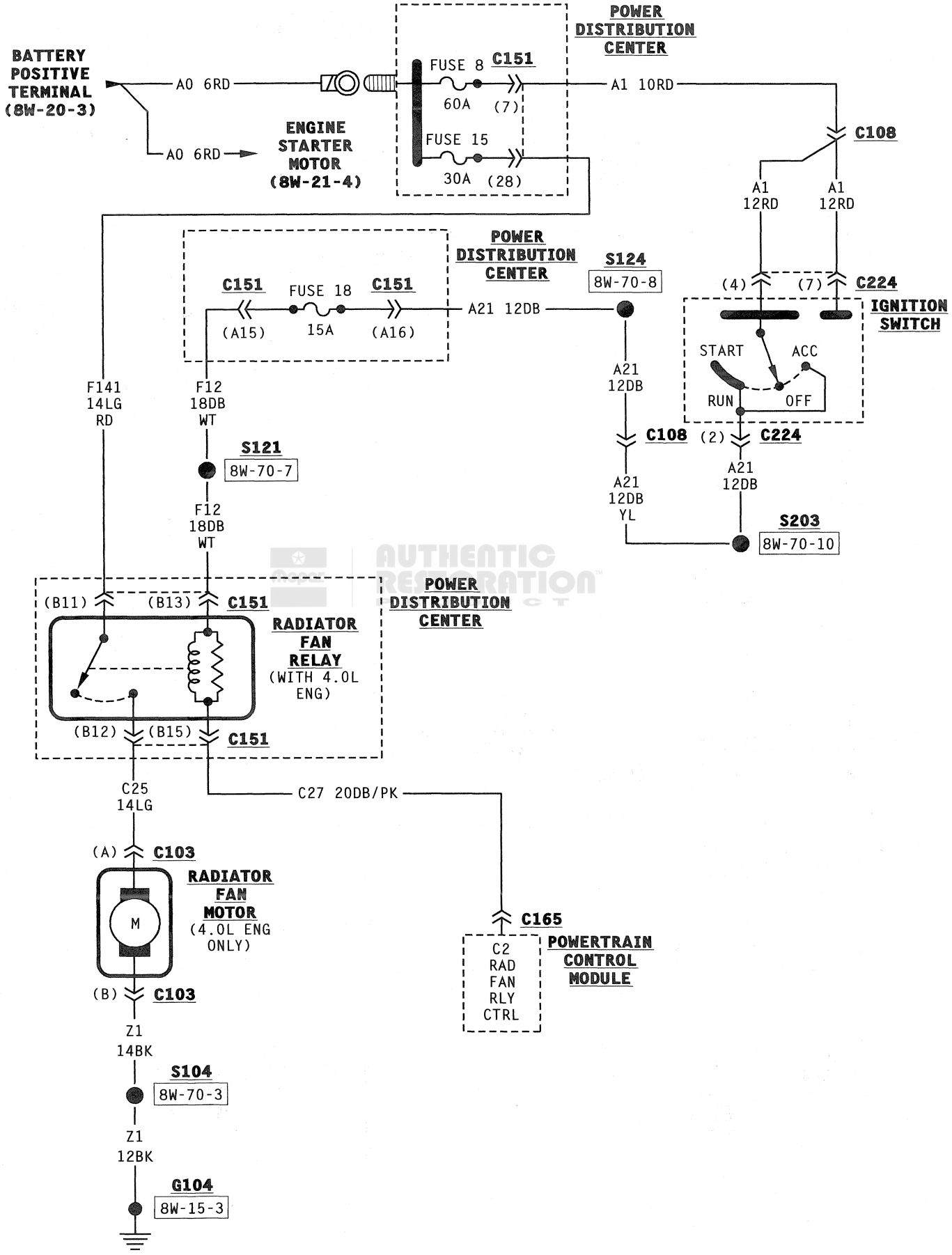

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
A1 10RD
C108
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A1 12RD
A1 12RD
A48 12VT
(B3)
C201
FUSE BLOCK
FUSE 5 30A
(C2)
C201
(24)
(7)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
(6)
C224
C7 12BK TN
S210
8W-70-13
A/C CYCLING SWITCH
C7 12BK TN
C7 12BK TN
(2)
(3)
(1)
C215
(B)
(D)
C213
A/C-HEATER CONTROL SWITCH
OFF
HEAT
MAX
NORM
VENT
BI-LEVEL
OFF
HEAT
MAX
NORM
VENT
BI-LEVEL
C90 14LG WT
Z1 16BK
C21 14DB OR
C108
(E)
(A)
C213
S214
8W-70-14
C21 14DB OR
C43 12YL BR
C90 14LG WT
Z1 12BK
(2)
C143
A/C LOW PRESSURE SWITCH
S205
8W-70-11
(1)
C143
SPLICE S213 (8W-42-6) (8W-70-14)
C108
Z1 12BK
C21 14DB OR
C90 14LG
G201
8W-15-6,7
C165
C165
C23 A/C SELECT SIGNAL
POWERTRAIN CONTROL MODULE
C22 A/C LOW PRESSURE SWITCH SIGNAL
POWERTRAIN CONTROL MODULE



AUTHENTIC RESTORATION PRODUCT



AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
FUSE 15
30A
(28)
A1 10RD
C108
A1 12RD
A1 12RD
POWER DISTRIBUTION CENTER
C151
FUSE 18
C151
(A15)
15A
(A16)
A21 12DB
S124
8W-70-8
(4)
(7)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
A21 12DB
C108
(2)
C224
A21 12DB
A21 12DB YL
S203
8W-70-10
F141 14LG RD
F12 18DB WT
S121
8W-70-7
F12 18DB WT
(B11)
(B13)
C151
RADIATOR FAN RELAY (WITH 4.0L ENG)
POWER DISTRIBUTION CENTER
(B12)
(B15)
C151
C25 14LG
C27 20DB/PK
(A)
C103
RADIATOR FAN MOTOR (4.0L ENG ONLY)
M
C165
C2 RAD FAN RLY CTRL
POWERTRAIN CONTROL MODULE
(B)
C103
Z1 14BK
S104
8W-70-3
Z1 12BK
G104
8W-15-3

8W-44 INTERIOR LIGHTING

INDEX

page

DESCRIPTION AND OPERATION
BUZZER MODULE 2
CARGO LAMP, COURTESY LAMPS AND DOME LAMP 1
GLOVE BOX LAMP 1
IGNITION SWITCH KEY-IN HALO LAMP 1
INSTRUMENT PANEL ILLUMINATION LAMPS . . . 1
INTRODUCTION 1
LAMPS 2
READING LAMPS 2
UNDERHOOD LAMP 1
VISOR VANITY MIRROR LAMPS 2
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

INTRODUCTION

Circuit M1 supplies power to the glove box lamp, left courtesy lamp, right courtesy lamp, dome lamp, cargo lamp, and visor vanity mirror lamps. The M1 circuit also connects to the remote keyless entry module. Circuit M1 is protected by the ignition off draw (IOD) fuse in cavity 9 of the fuse block.

Circuit E2 supplies power for the instrument panel illumination lamps.

IGNITION SWITCH KEY-IN HALO LAMP

The time delay relay is used to allow a time-ON function for the ignition switch key-in halo lamp. Power for the relay is received on the M1 circuit from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block.

Circuit M2 provides ground for the time delay relay through the right and left door jamb switches and the headlamp switch. When a door is opened, or the headlamp switch is moved to the dome lamp position, a ground path is provided for the relay on circuit M2. This energizes the relay, causing the contacts to CLOSE.

When the relay contacts CLOSE, power is provided through the relay to circuit M50. The M50 circuit supplies current to the ignition switch key-in halo lamp. Circuit Z1 provides ground for the lamp.

INSTRUMENT PANEL ILLUMINATION LAMPS

Circuit E2 from the headlamp switch splices to supply power to the following illumination lamps:

- A/C-Heater switch lamp
- Fog lamp switch lamp
- Rear wiper switch lamp
- Rear window defogger switch lamp
- Transmission range (PRNDL) indicator lamp
- Transfer case range indicator lamp

Fuse 19 in the fuse block protects circuit E2. Circuit Z1 provides ground for all of the illumination lamps.

HELPFUL INFORMATION

Circuit E2 also supplies power to the radio, LCD relay and the illumination lamps in the instrument cluster.

GLOVE BOX LAMP

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block powers the glove box lamp. A case grounded switch, in series after the lamp, CLOSES when the glove box door is opened. The switch completes a path to ground on circuit Z1.

UNDERHOOD LAMP

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) supplies battery voltage for the underhood lamp. A mercury switch, in series after the lamp, connects the lamp to ground on circuit Z1. When the hood is raised, mercury inside the switch moves to a position where it connects circuit M1 to ground circuit Z1, illuminating the lamp.

CARGO LAMP, COURTESY LAMPS AND DOME LAMP

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block supplies power to the cargo lamp, courtesy lamps and dome lamp. This circuit is HOT at all times. The ground path for the lamp is provided in three different ways.

One way is through the door jamb switches. Circuit M2 connects to the door jamb switches from the courtesy and dome lamps. The switches are connected to ground circuit Z1. When a door is opened, the plunger in the switch CLOSES, completing a path to ground.

The second way is through the liftgate switch. Circuit M2 connects to circuit G71 at the cargo lamp. Circuit G71 connects to circuit M4. Circuit M4 connects to ground through the liftgate switch. The liftgate switch connects to ground circuit Z1. When the lift gate opens, the plunger in the switch CLOSES, completing a path to ground.

DESCRIPTION AND OPERATION (Continued)

The third ground path is through the headlamp switch. Circuit M2 is spliced in with the headlamp switch. When the operator turns the headlamp switch to the dome lamp ON position, a ground path is provided through the switch.

VISOR VANITY MIRROR LAMPS

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block supplies power to the vanity lamps. Circuit M1 is HOT at all times. When the vanity lamps switch closes, voltage flows to vanity mirror lamps. The vanity mirror is case grounded.

READING LAMPS

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block supplies power to the reading lamps. Circuit M1 is HOT at all times. When the operator depresses the reading lamp, the reading lamp switch closes and supplies ground on circuit Z1.

LAMPS

Circuit M1 supplies voltage for the reading lamps in the overhead console. The ignition off draw (IOD) fuse in cavity 9 of the fuse block supplies voltage to circuit M1. Circuit A6 from fuse 19 in PDC feeds the IOD fuse.

BUZZER MODULE

The buzzer module sounds an audible warning tone. The tone sounds for seat belt warning and when the ignition key is in the ignition switch while the drivers door is open. The tone also sounds when the ignition key is in the ON position while the drivers side seat belt is not buckled. Lastly, the tone sounds when the headlamps are ON when the ignition is OFF. Refer to Group 8U for system operation.

When the ignition switch is in the RUN or START position, circuit F87 from fuse 17 in the fuse block supplies power to the buzzer module. Circuit A21 from the ignition switch supplies power to fuse 17.

Circuit L7 from fuse 15 in the fuse block also supplies power to the buzzer module. Circuit A3 from fuse 13 in the Power Distribution Center (PDC) powers fuse 15.

When the parking lamps or headlamps are ON, the headlamp switch connects circuit M11 from the buzzer module to circuit G26. Circuit G26 connects to the drivers side door jamb switch. Circuit G26 also connects to the key-in switch. Circuit M11 connects the key-in switch to the buzzer module and the headlamp switch.

If the headlamps are ON, and the drivers door opens, ground for the buzzer is on circuit G26 from the headlamp switch through the door jamb switch to circuit Z1.

If the headlamps are OFF with the key in the ignition while the drivers side door is open, ground for the buzzer is supplied through the key-in switch. The ground path is over circuit M11, through the closed key-in switch to circuit C26. From circuit C26, the ground path continues through the drivers door jamb switch to circuit Z1.

Circuit G11 from the buzzer powers the seat belt warning lamp in the instrument cluster. Circuit Z1 at the instrument cluster provides ground for the lamp.

Circuit G10 from the buzzer connects to the seat belt switch. When the seat belt switch closes a path to ground is completed on circuit Z1 and the tone sounds momentarily.

Circuit Z1 grounds the buzzer module.

HELPFUL INFORMATION

Circuit F87 also powers the instrument cluster and the headlamp delay module.

SCHEMATICS AND DIAGRAMS

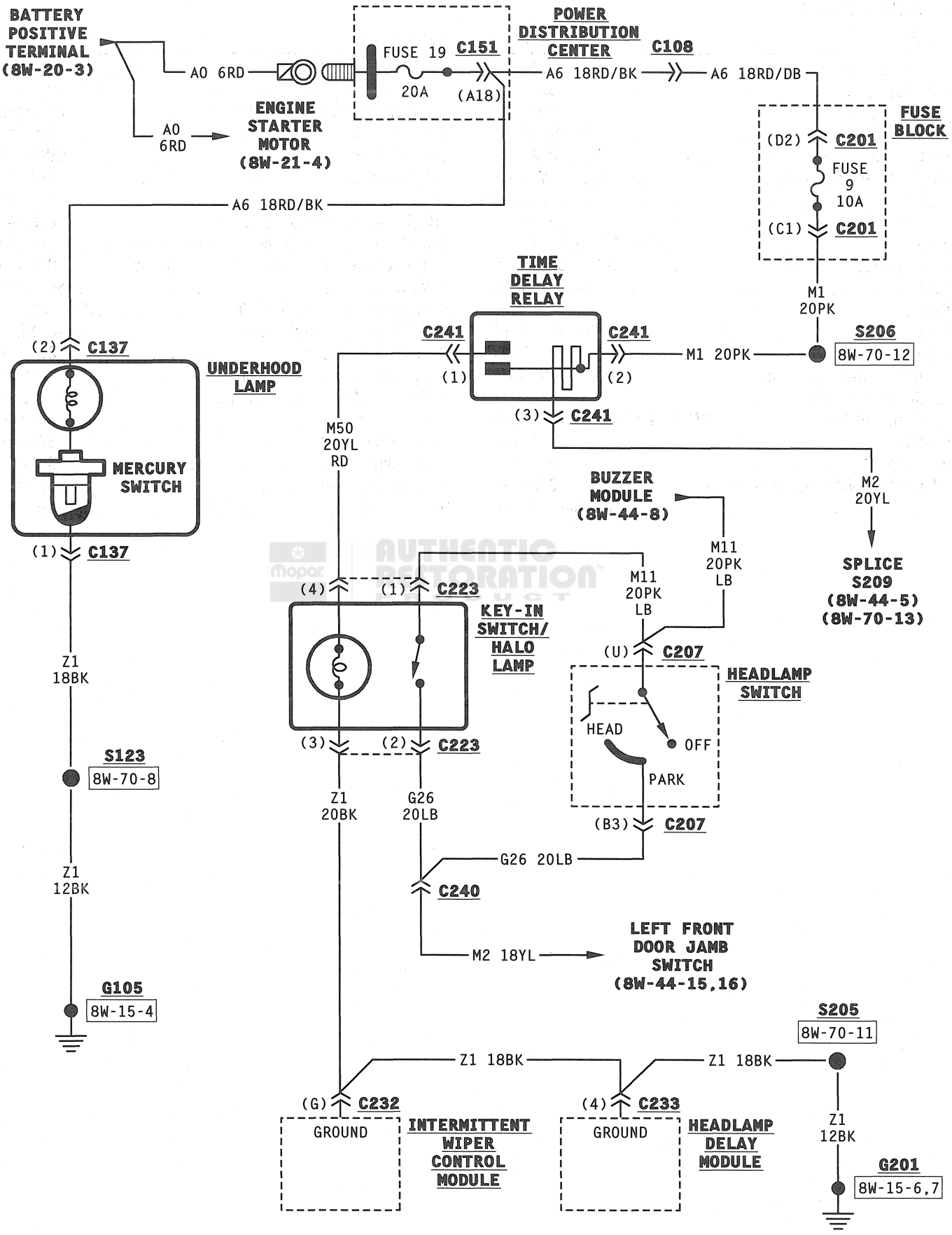
WIRING DIAGRAM INDEX

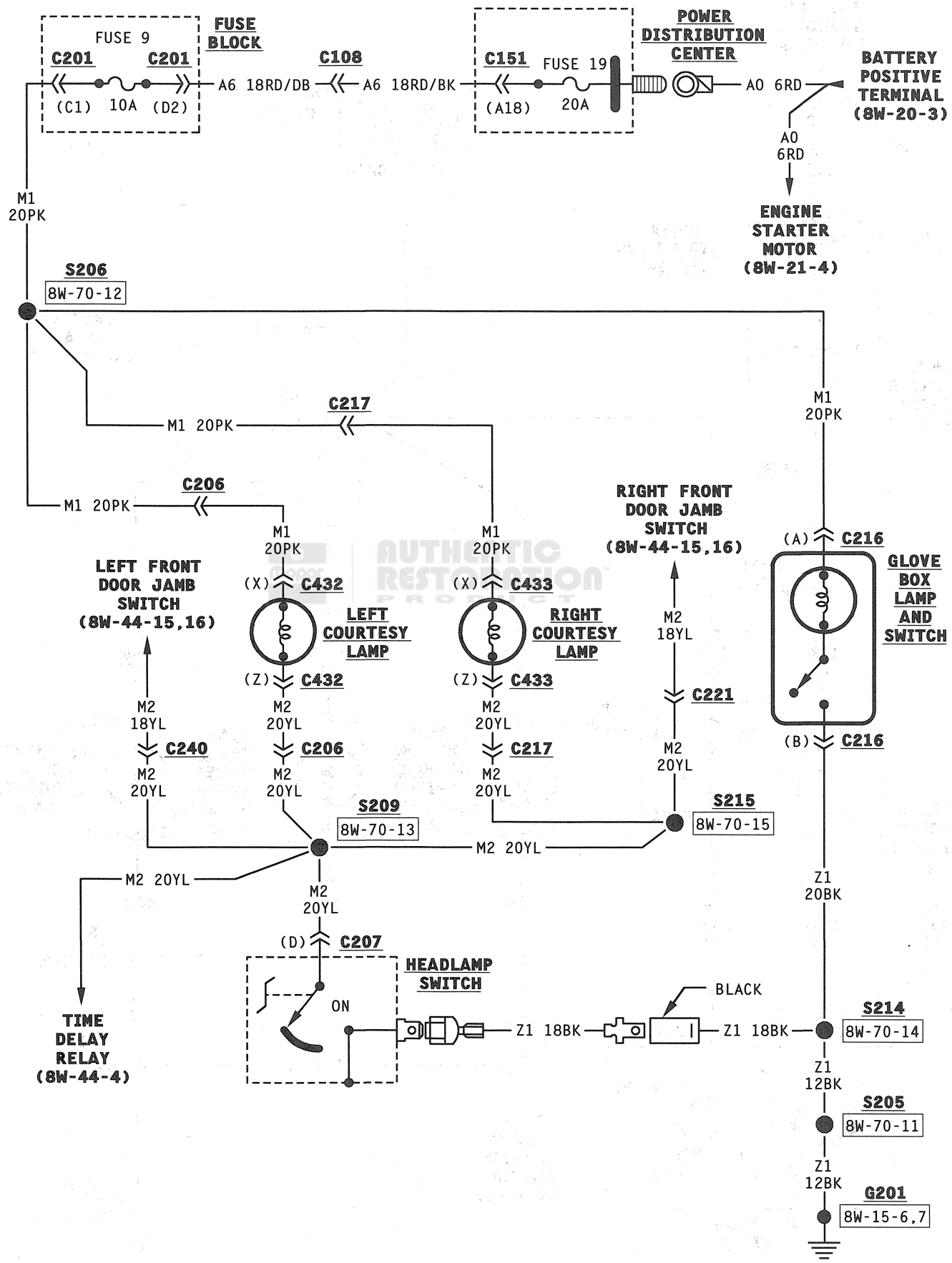
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

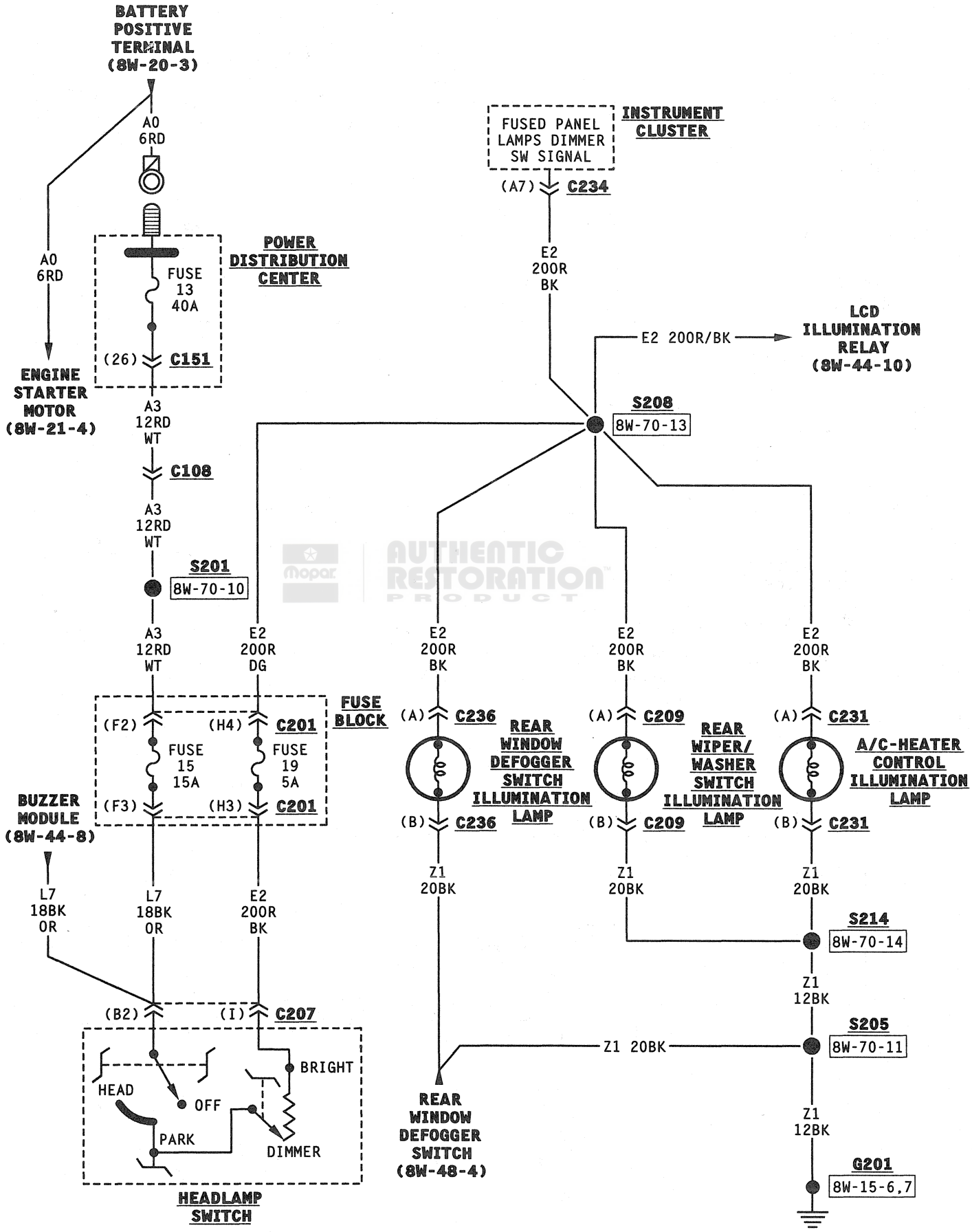
DIAGRAM INDEX

Component	Page
A/C-Heater Illumination Lamp	8W-44-6
Cargo Lamp	8W-44-9
Buzzer Module	8W-44-8
Dome/Reading Lamps	8W-44-12, 13
Extended Idle Switch Illumination Lamp	8W-44-7
Fog Lamp Switch Illumination Lamp	8W-44-7
Fuse 2	8W-44-10
Fuse 8 (PDC)	8W-44-8
Fuse 9	8W-44-4, 5, 9, 12, 13, 14
Fuse 13 (PDC)	8W-44-6, 7, 8, 10
Fuse 15	8W-44-6, 7, 8, 10
Fuse 17	8W-44-8
Fuse 19	8W-44-6, 7, 10
Fuse 19 (PDC)	8W-44-4, 5, 9, 12, 13, 14
Glove Box Lamp and Switch	8W-44-5
Headlamp Delay Module	8W-44-4
Headlamp Switch	8W-44-4, 5, 6, 7, 8, 10, 15, 16
Ignition Switch	8W-44-8
Instrument Cluster	8W-44-6, 7
Intermittent Wiper Control Module	8W-44-4
Key-In Switch	8W-44-4, 15, 16
LCD Illumination Relay	8W-44-10
Left Visor Vanity Mirror Lamp	8W-44-12, 13, 14
Left Front Door Jamb Switch	8W-44-15
Left Courtesy Lamp	8W-44-5
Left Rear Door Jamb Switch	8W-44-16
Liftgate Switch	8W-44-9
Police Wiring Provisions	8W-44-11
PRNDL Illumination Lamp	8W-44-7
Rear Window Defogger Switch Illumination Lamp	8W-44-6
Rear Wiper/Washer Switch Illumination Lamp	8W-44-6
Relay Bank	8W-44-10
Remote Keyless Entry Module	8W-44-13, 14
Right Front Door Jamb Switch	8W-44-15, 16
Right Courtesy Lamp	8W-44-5
Right Rear Door Jamb Switch	8W-44-15, 16
Right Visor Vanity Mirror Lamp	8W-44-12, 13, 14
Seat Belt Switch	8W-44-8
Telltale Connector	8W-44-8
Time Delay Relay	8W-44-4
Transfer Case Lamp	8W-44-7
Underhood Lamp	8W-44-4

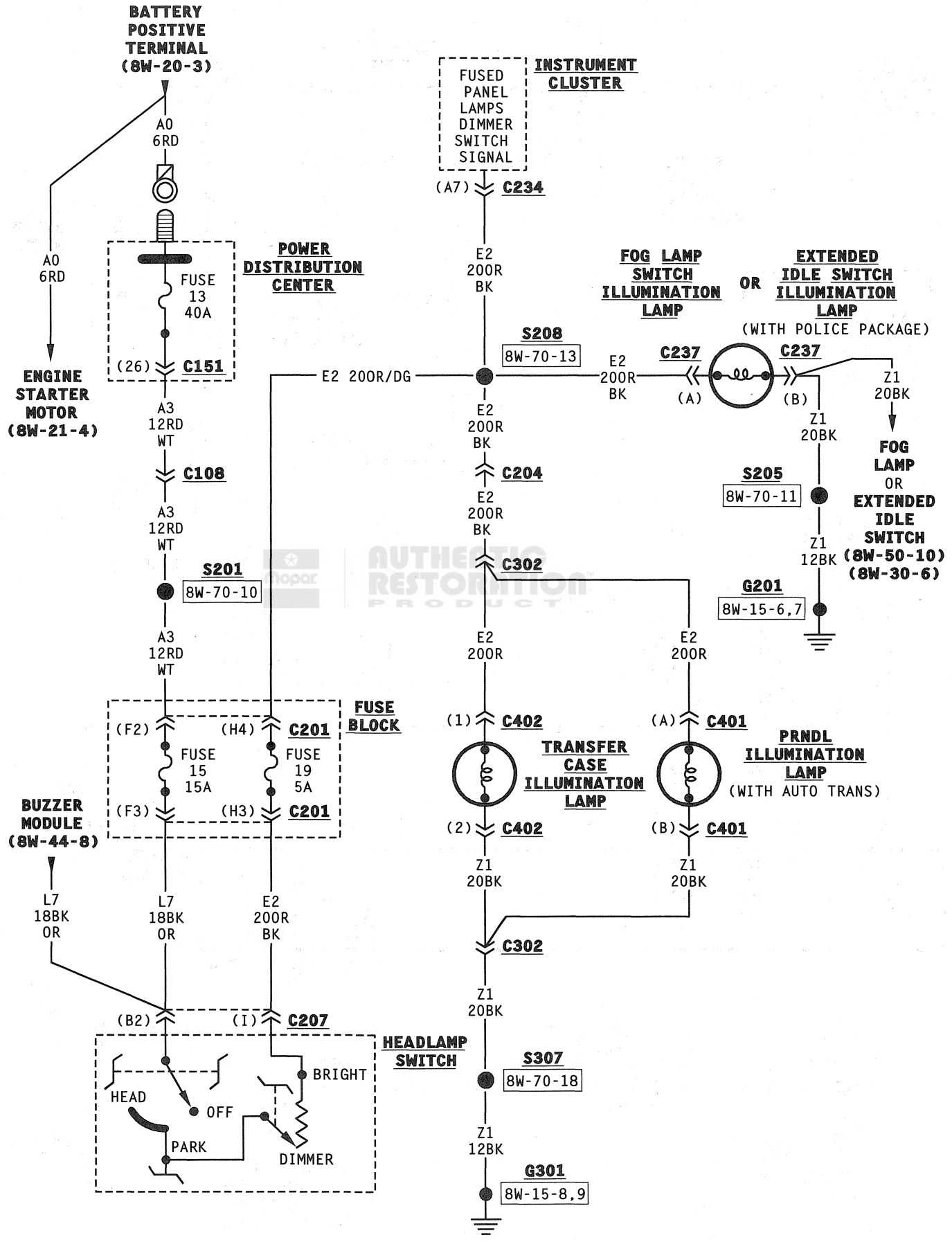
Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 19
20A
C151
(A18)
POWER DISTRIBUTION CENTER
C108
A6 18RD/BK
A6 18RD/DB
A6 18RD/BK
FUSE BLOCK
(D2)
C201
FUSE 9 10A
(C1)
C201
M1 20PK
TIME DELAY RELAY
C241
C241
(1)
(2)
(3)
C241
M1 20PK
S206
8W-70-12
(2)
C137
UNDERHOOD LAMP
MERCURY SWITCH
(1)
C137
M50 20YL RD
BUZZER MODULE (8W-44-8)
M2 20YL
SPLICE S209 (8W-44-5) (8W-70-13)
M11 20PK LB
M11 20PK LB
(4)
(1)
C223
KEY-IN SWITCH/ HALO LAMP
(3)
(2)
C223
(U)
C207
HEADLAMP SWITCH
HEAD
OFF
PARK
(B3)
C207
Z1 18BK
S123
8W-70-8
Z1 20BK
G26 20LB
G26 20LB
C240
Z1 12BK
M2 18YL
LEFT FRONT DOOR JAMB SWITCH (8W-44-15,16)
G105
8W-15-4
S205
8W-70-11
Z1 18BK
Z1 18BK
(G)
C232
GROUND
INTERMITTENT WIPER CONTROL MODULE
(4)
C233
GROUND
HEADLAMP DELAY MODULE
Z1 12BK
G201
8W-15-6,7

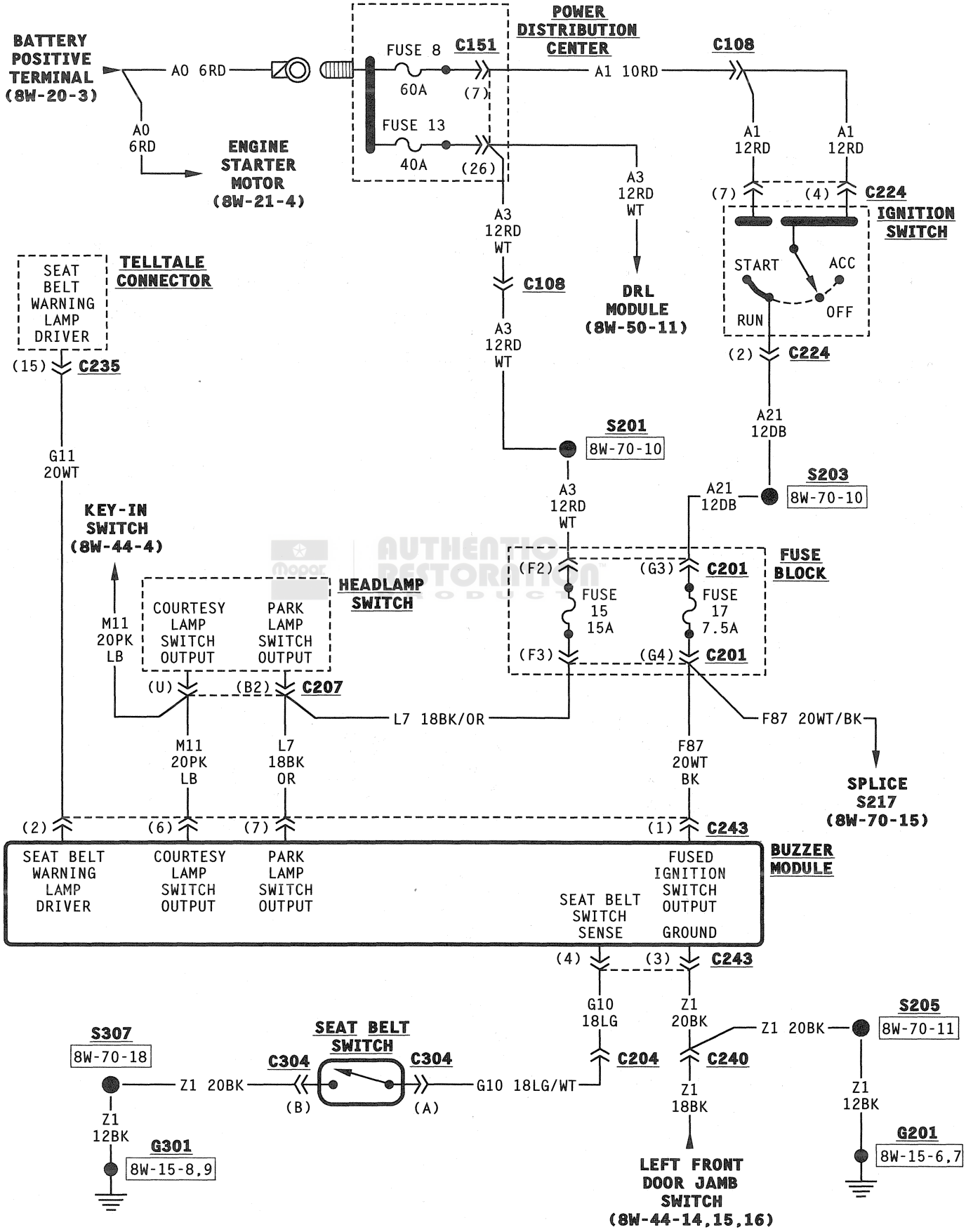

FUSE 9
C201
C201
(C1) 10A (D2)
FUSE BLOCK
A6 18RD/DB
C108
A6 18RD/BK
C151
FUSE 19
(A18) 20A
POWER DISTRIBUTION CENTER
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
M1 20PK
S206
8W-70-12
C217
M1 20PK
C206
M1 20PK
M1 20PK
M1 20PK
RIGHT FRONT DOOR JAMB SWITCH (8W-44-15,16)
(A) C216
GLOVE BOX LAMP AND SWITCH
LEFT FRONT DOOR JAMB SWITCH (8W-44-15,16)
(X) C432
LEFT COURTESY LAMP
(Z) C432
(X) C433
RIGHT COURTESY LAMP
(Z) C433
M2 18YL
C221
M2 20YL
(B) C216
M2 18YL
C240
M2 20YL
M2 20YL
C206
M2 20YL
M2 20YL
C217
M2 20YL
S209
8W-70-13
S215
8W-70-15
M2 20YL
M2 20YL
M2 20YL
Z1 20BK
(D) C207
HEADLAMP SWITCH
ON
Z1 18BK
BLACK
Z1 18BK
S214
8W-70-14
TIME DELAY RELAY (8W-44-4)
Z1 12BK
S205
8W-70-11
Z1 12BK
G201
8W-15-6,7

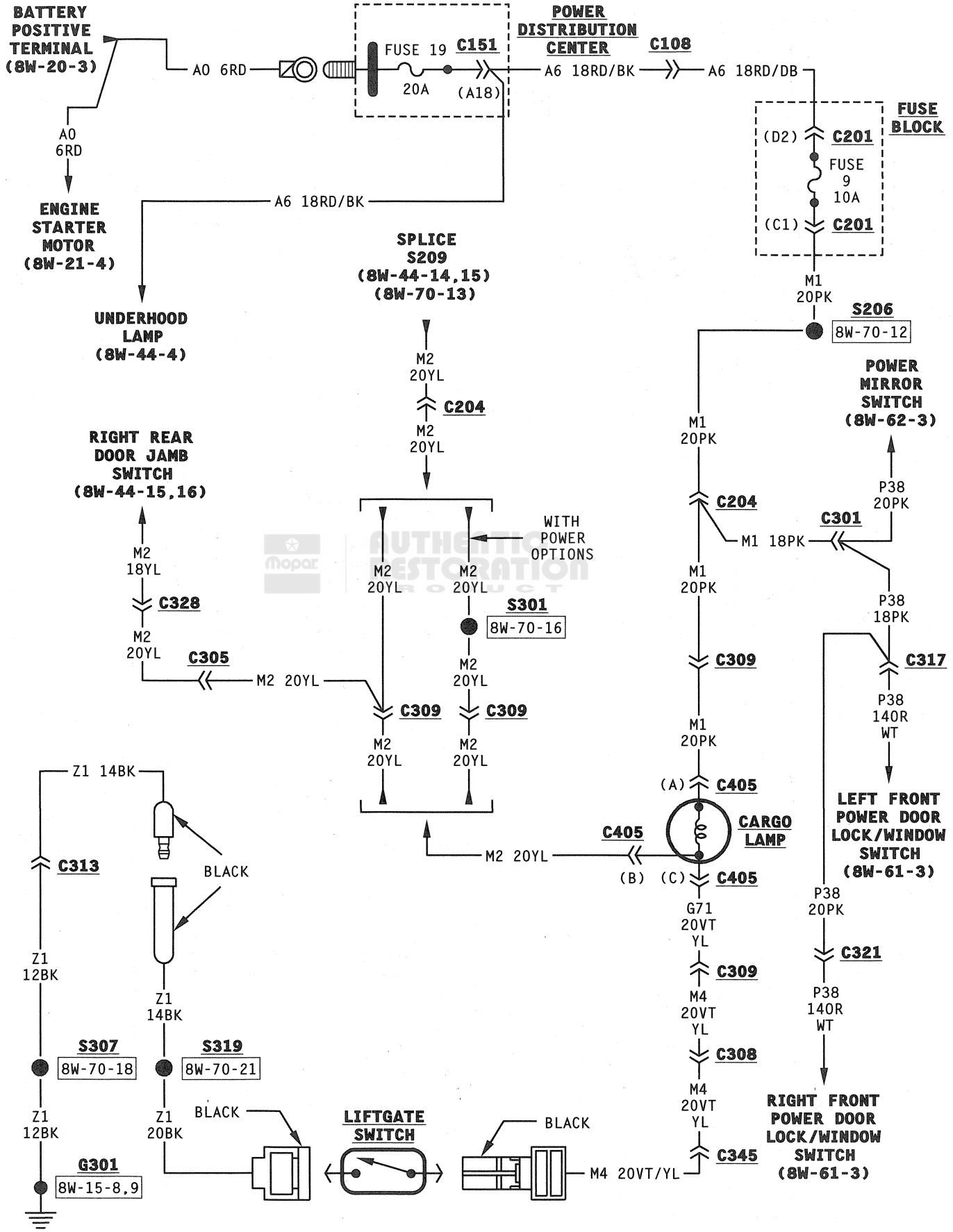


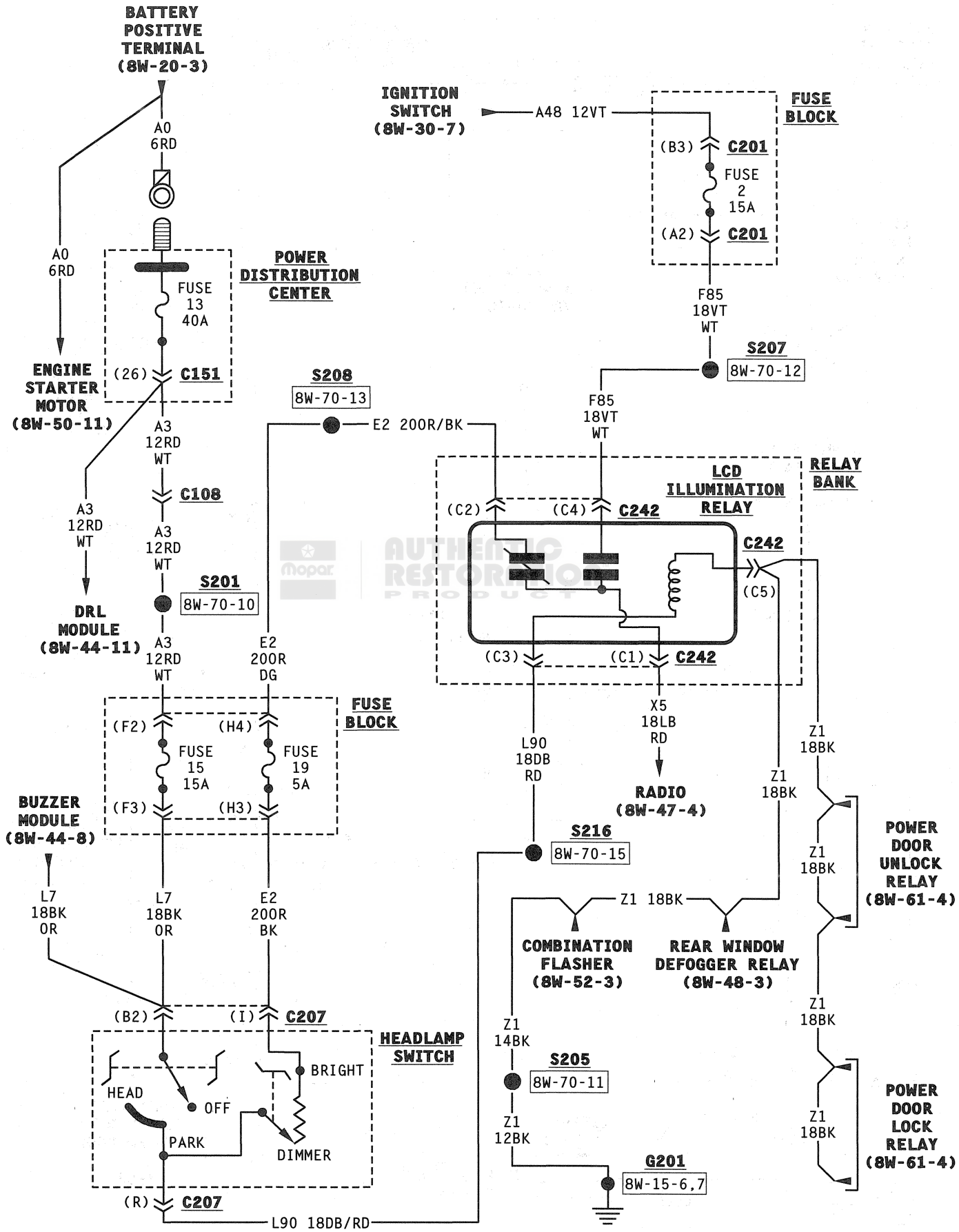
Mopar AUTHENTIC RESTORATION PRODUCT

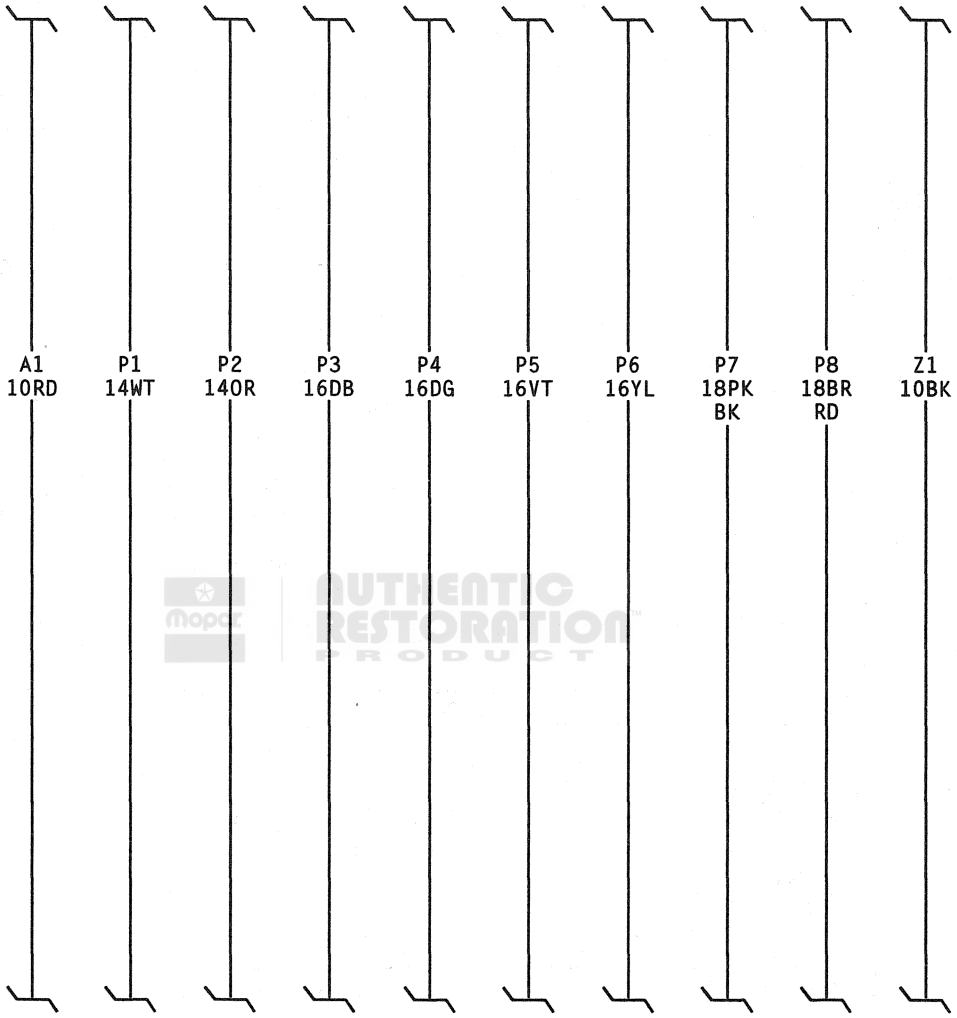


Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
FUSE 13
40A
(26)
A1 10RD
C108
A1 12RD
A1 12RD
(7)
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
(2)
C224
A3 12RD WT
A3 12RD WT
C108
A3 12RD WT
DRL MODULE (8W-50-11)
SEAT BELT WARNING LAMP DRIVER
TELLTALE CONNECTOR
(15)
C235
G11 20WT
S201
8W-70-10
A21 12DB
S203
8W-70-10
A21 12DB
A3 12RD WT
KEY-IN SWITCH (8W-44-4)
M11 20PK LB
COURTESY LAMP SWITCH OUTPUT
PARK LAMP SWITCH OUTPUT
HEADLAMP SWITCH
(U)
(B2)
C207
(F2)
(G3)
C201
FUSE 15 15A
FUSE 17 7.5A
(F3)
(G4)
C201
FUSE BLOCK
L7 18BK/OR
F87 20WT/BK
M11 20PK LB
L7 18BK OR
F87 20WT BK
SPLICE S217 (8W-70-15)
(2)
(6)
(7)
(1)
C243
SEAT BELT WARNING LAMP DRIVER
COURTESY LAMP SWITCH OUTPUT
PARK LAMP SWITCH OUTPUT
FUSED IGNITION SWITCH OUTPUT
SEAT BELT SWITCH SENSE
GROUND
BUZZER MODULE
(4)
(3)
C243
G10 18LG
Z1 20BK
S205
8W-70-11
Z1 20BK
S307
8W-70-18
SEAT BELT SWITCH
C304
C304
Z1 20BK
(B)
(A)
G10 18LG/WT
C204
C240
Z1 18BK
Z1 12BK
G301
8W-15-8,9
LEFT FRONT DOOR JAMB SWITCH (8W-44-14,15,16)
Z1 12BK
G201
8W-15-6,7

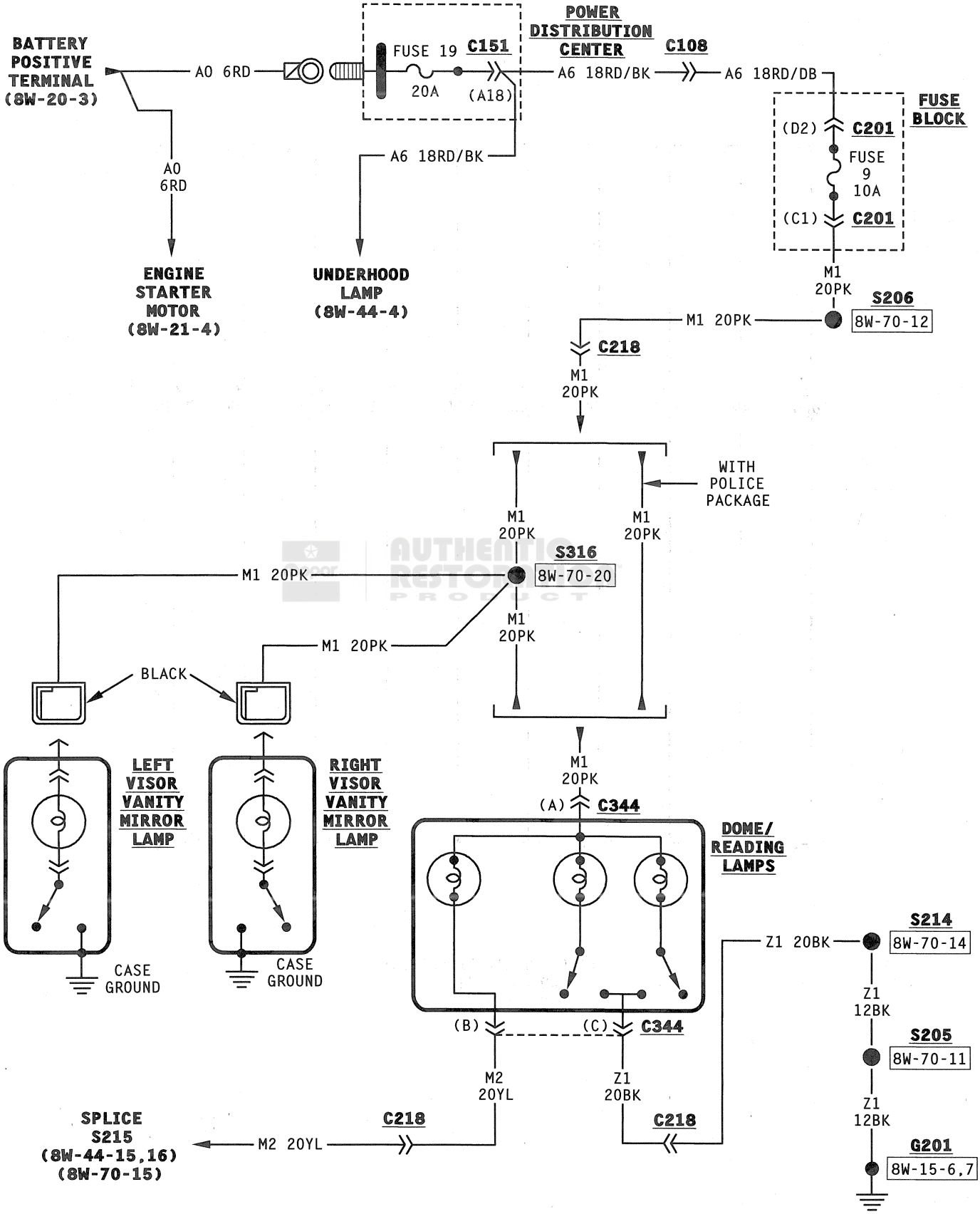

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 19
C151
20A
(A18)
POWER DISTRIBUTION CENTER
C108
A6 18RD/BK
A6 18RD/DB
FUSE BLOCK
(D2)
C201
FUSE 9 10A
(C1)
C201
M1 20PK
S206
8W-70-12
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A6 18RD/BK
UNDERHOOD LAMP (8W-44-4)
SPLICE S209 (8W-44-14,15) (8W-70-13)
M2 20YL
C204
M2 20YL
POWER MIRROR SWITCH (8W-62-3)
M1 20PK
C204
M1 18PK
C301
P38 20PK
RIGHT REAR DOOR JAMB SWITCH (8W-44-15,16)
M2 18YL
C328
M2 20YL
C305
M2 20YL
WITH POWER OPTIONS
M2 20YL
M2 20YL
S301
8W-70-16
M2 20YL
C309
C309
M2 20YL
M2 20YL
M1 20PK
C309
M1 20PK
P38 18PK
C317
P38 140R WT
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-3)
(A)
C405
CARGO LAMP
C405
M2 20YL
(B)
(C)
C405
G71 20VT YL
C309
M4 20VT YL
C308
M4 20VT YL
C345
M4 20VT/YL
P38 20PK
C321
P38 140R WT
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-3)
Z1 14BK
C313
BLACK
Z1 12BK
Z1 14BK
S307
8W-70-18
S319
8W-70-21
Z1 12BK
Z1 20BK
BLACK
LIFTGATE SWITCH
BLACK
G301
8W-15-8,9

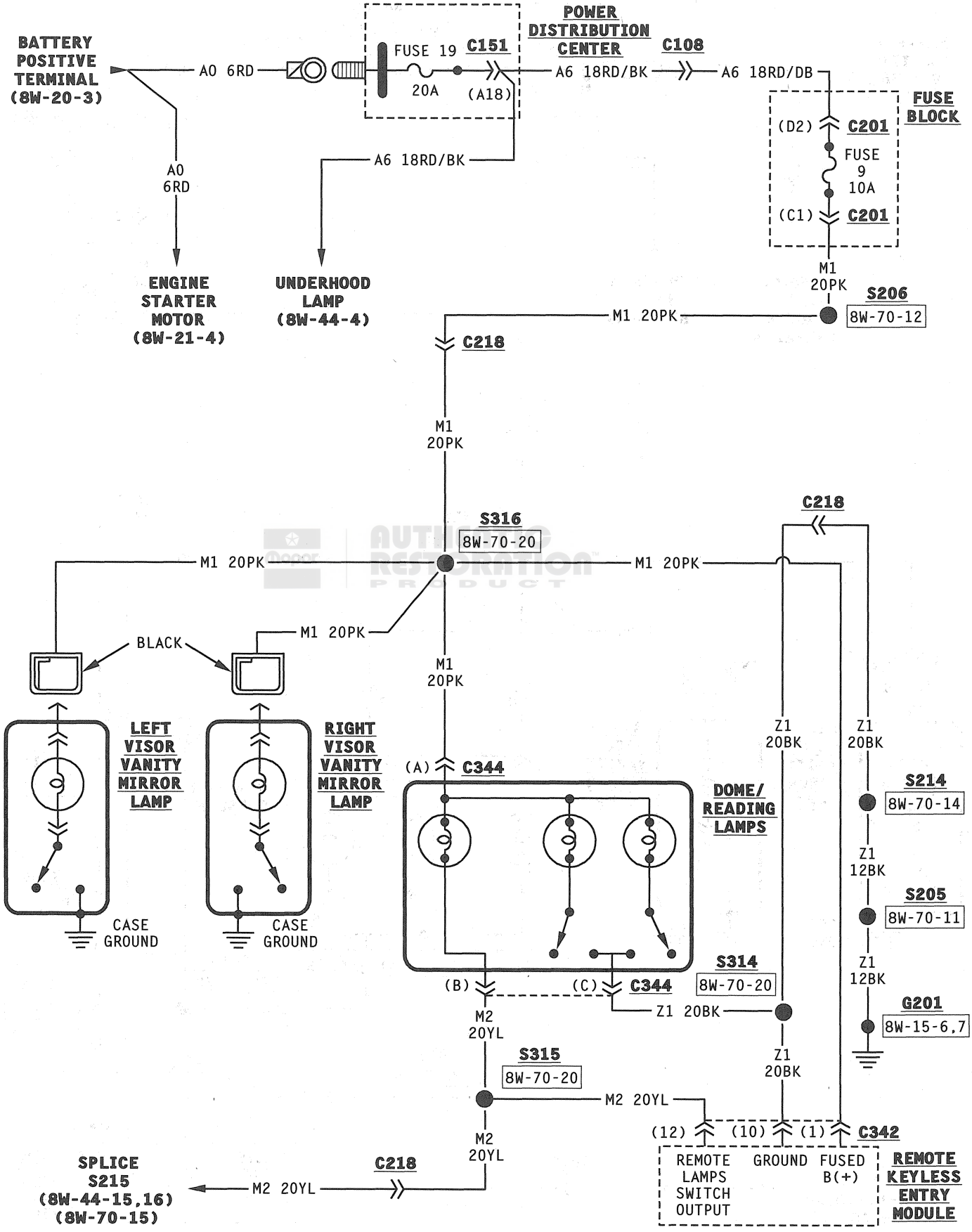

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
IGNITION SWITCH (8W-30-7)
A48 12VT
FUSE BLOCK
(B3) C201
FUSE 2 15A
(A2) C201
F85 18VT WT
S207
8W-70-12
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
ENGINE STARTER MOTOR (8W-50-11)
S208
8W-70-13
E2 200R/BK
F85 18VT WT
A3 12RD WT
C108
A3 12RD WT
A3 12RD WT
S201
8W-70-10
DRL MODULE (8W-44-11)
A3 12RD WT
E2 200R DG
RELAY BANK
LCD ILLUMINATION RELAY
(C2)
(C4)
C242
C242
(C5)
(C3)
(C1)
C242
FUSE BLOCK
(F2)
(H4)
FUSE 15 15A
FUSE 19 5A
(F3)
(H3)
BUZZER MODULE (8W-44-8)
L90 18DB RD
X5 18LB RD
RADIO (8W-47-4)
Z1 18BK
Z1 18BK
POWER DOOR UNLOCK RELAY (8W-61-4)
S216
8W-70-15
L7 18BK OR
L7 18BK OR
E2 200R BK
Z1 18BK
COMBINATION FLASHER (8W-52-3)
REAR WINDOW DEFOGGER RELAY (8W-48-3)
Z1 18BK
Z1 18BK
(B2)
(I)
C207
HEADLAMP SWITCH
Z1 14BK
S205
8W-70-11
Z1 18BK
POWER DOOR LOCK RELAY (8W-61-4)
HEAD
OFF
BRIGHT
PARK
DIMMER
Z1 12BK
G201
8W-15-6,7
(R)
C207
L90 18DB/RD



POLICE WIRING PROVISIONS
NO CONNECTIONS
NO TERMINALS

(WITHOUT REMOTE KEYLESS ENTRY)

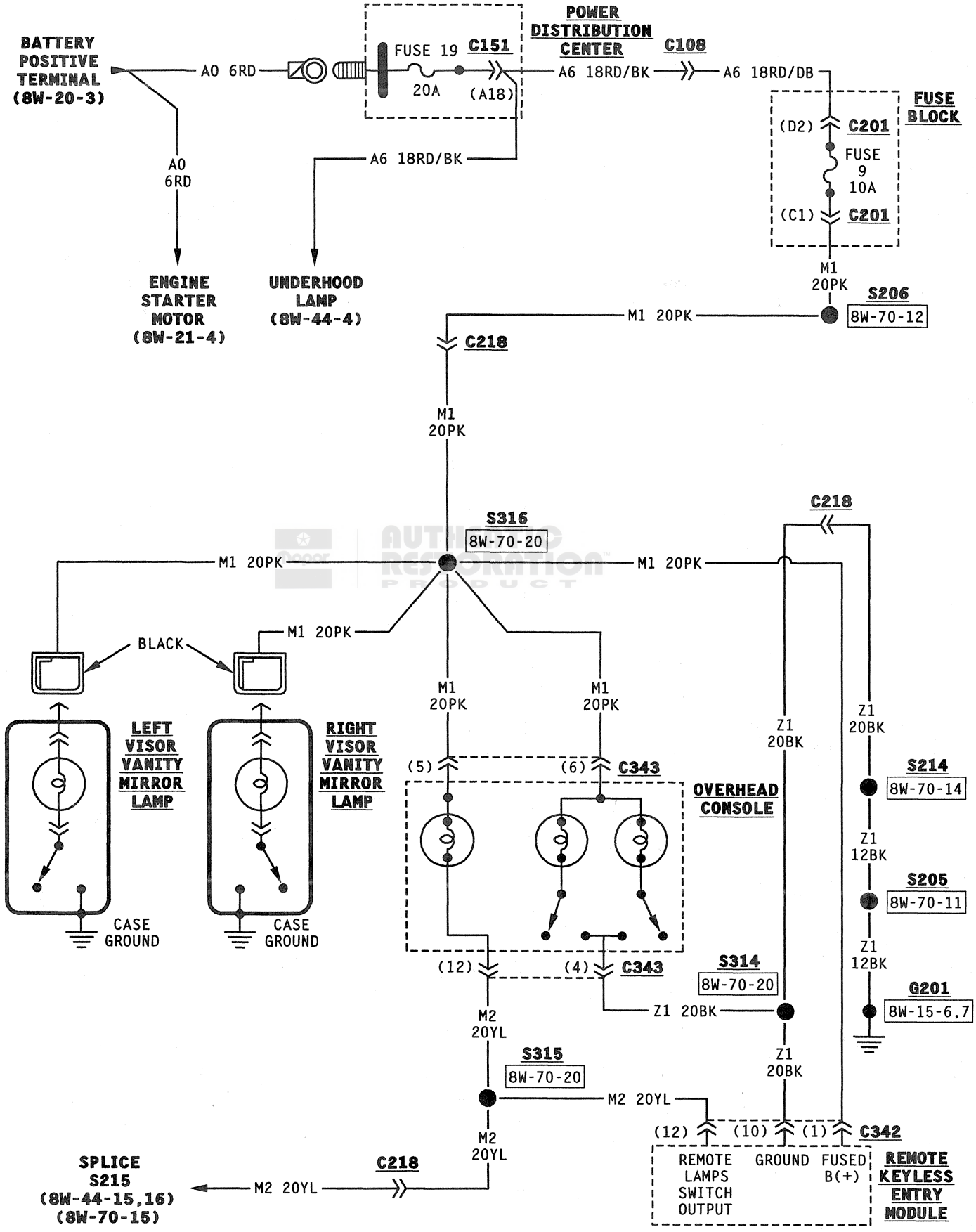


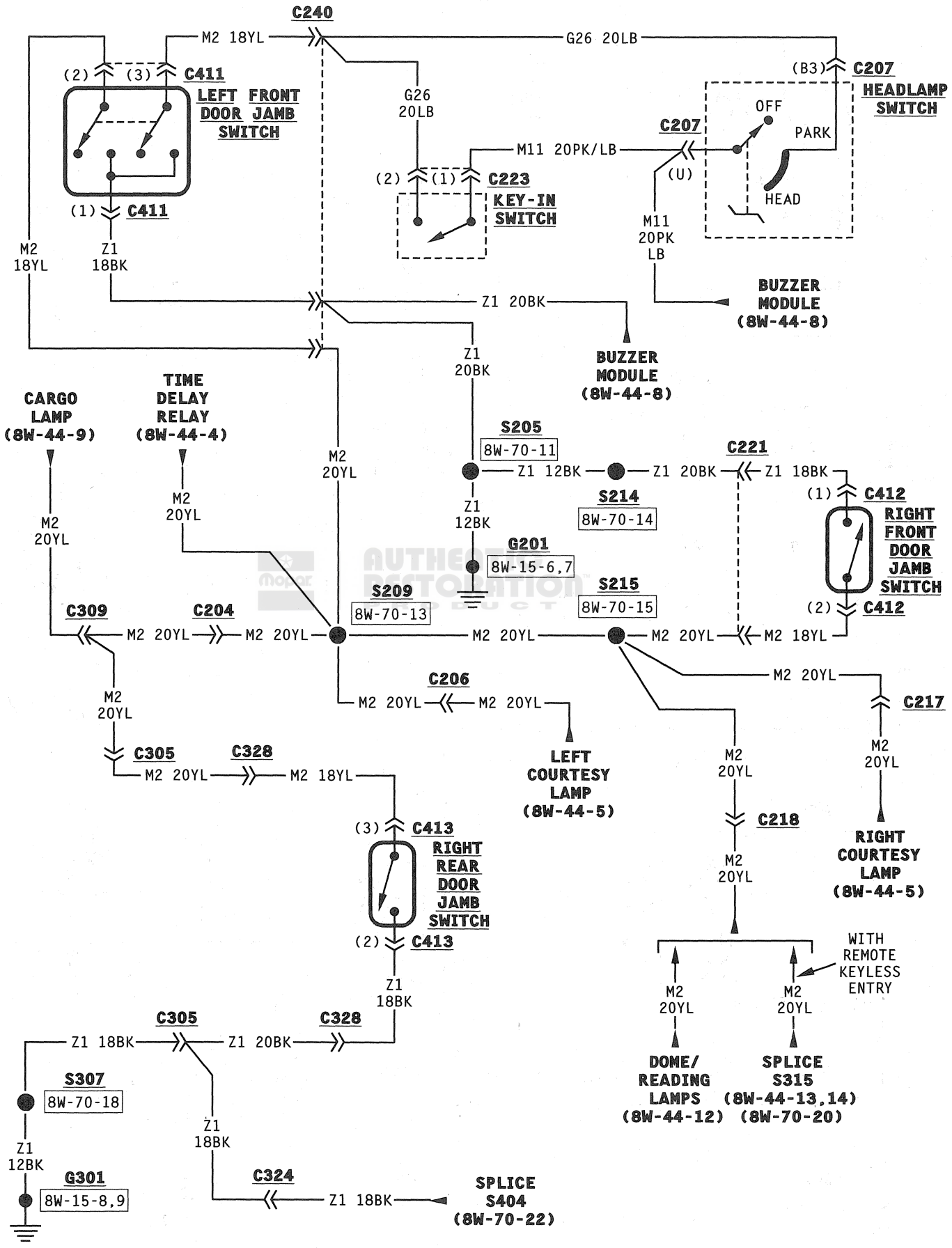


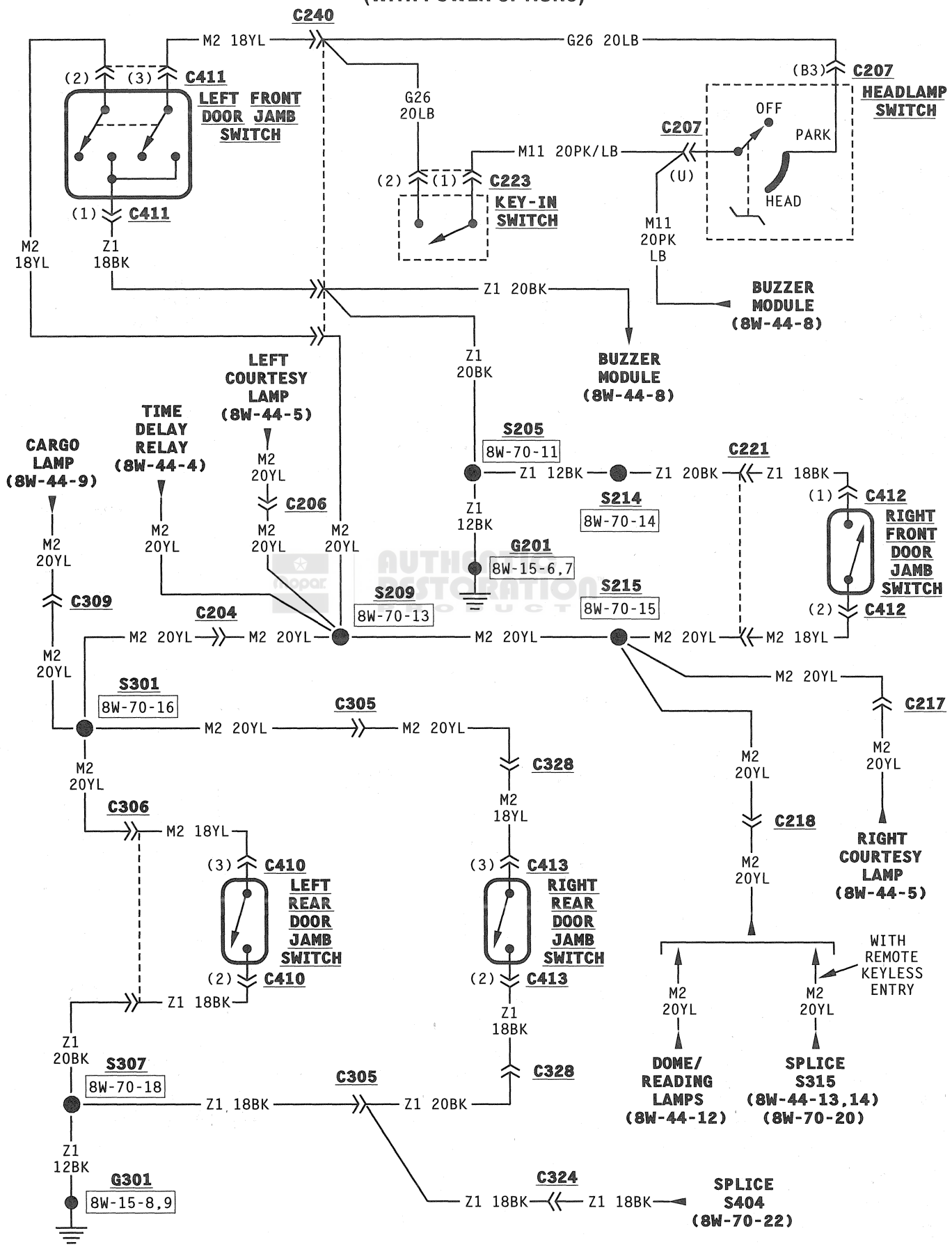
8040ccb3

J968W-7

(WITH REMOTE KEYLESS ENTRY AND OVERHEAD CONSOLE)




C240
M2 18YL
G26 20LB
(2) (3) C411
LEFT FRONT DOOR JAMB SWITCH
(1) C411
M2 18YL
Z1 18BK
G26 20LB
(2) (1) C223
KEY-IN SWITCH
M11 20PK/LB
C207
(U)
M11 20PK LB
(B3) C207
HEADLAMP SWITCH
OFF
PARK
HEAD
BUZZER MODULE (8W-44-8)
Z1 20BK
Z1 20BK
BUZZER MODULE (8W-44-8)
CARGO LAMP (8W-44-9)
TIME DELAY RELAY (8W-44-4)
M2 20YL
M2 20YL
M2 20YL
S205
8W-70-11
Z1 12BK
Z1 20BK
S214
8W-70-14
C221
Z1 18BK
(1) C412
RIGHT FRONT DOOR JAMB SWITCH
(2) C412
Z1 12BK
G201
8W-15-6,7
S209
8W-70-13
S215
8W-70-15
C309
C204
M2 20YL
M2 20YL
M2 20YL
M2 20YL
M2 18YL
C206
M2 20YL
M2 20YL
LEFT COURTESY LAMP (8W-44-5)
M2 20YL
C217
M2 20YL
C305
C328
M2 20YL
M2 18YL
M2 20YL
C218
M2 20YL
RIGHT COURTESY LAMP (8W-44-5)
(3) C413
RIGHT REAR DOOR JAMB SWITCH
(2) C413
Z1 18BK
WITH REMOTE KEYLESS ENTRY
M2 20YL
M2 20YL
DOME/ READING LAMPS (8W-44-12)
SPLICE S315 (8W-44-13,14) (8W-70-20)
C305
C328
Z1 18BK
Z1 20BK
S307
8W-70-18
Z1 18BK
Z1 12BK
G301
8W-15-8,9
C324
Z1 18BK
SPLICE S404 (8W-70-22)


C240
M2 18YL
G26 20LB
(2) (3) C411
LEFT FRONT DOOR JAMB SWITCH
(1) C411
M2 18YL
Z1 18BK
G26 20LB
(2) (1) C223
KEY-IN SWITCH
M11 20PK/LB
C207
(U)
(B3) C207
HEADLAMP SWITCH
OFF
PARK
HEAD
M11 20PK LB
BUZZER MODULE (8W-44-8)
Z1 20BK
BUZZER MODULE (8W-44-8)
Z1 20BK
LEFT COURTESY LAMP (8W-44-5)
TIME DELAY RELAY (8W-44-4)
CARGO LAMP (8W-44-9)
M2 20YL
C206
S205
8W-70-11
Z1 12BK
Z1 20BK
Z1 18BK
C221
S214
8W-70-14
Z1 12BK
G201
8W-15-6,7
S209
8W-70-13
S215
8W-70-15
(1) C412
RIGHT FRONT DOOR JAMB SWITCH
(2) C412
C309
C204
M2 20YL
M2 18YL
S301
8W-70-16
C305
C217
C328
M2 18YL
C306
C218
RIGHT COURTESY LAMP (8W-44-5)
(3) C410
LEFT REAR DOOR JAMB SWITCH
(2) C410
(3) C413
RIGHT REAR DOOR JAMB SWITCH
(2) C413
Z1 18BK
WITH REMOTE KEYLESS ENTRY
Z1 20BK
S307
8W-70-18
Z1 18BK
C305
C328
DOME/ READING LAMPS (8W-44-12)
SPLICE S315 (8W-44-13,14) (8W-70-20)
Z1 12BK
G301
8W-15-8,9
C324
Z1 18BK
SPLICE S404 (8W-70-22)

8W-47 AUDIO SYSTEM

DESCRIPTION AND OPERATION

RADIO

When the ignition switch is in the ACCESSORY or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48. Circuit A48 powers circuit F85 through fuse 2 in the fuse block. Circuit F85 powers the radio.

Circuit Z1 provides ground for the radio. The antenna connects to the rear of the radio.

RADIO MEMORY

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block supplies power for the radio memory. The IOD fuse is removed during vehicle shipping to prevent excessive battery draw.

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) supplies voltage to fuse 9. Circuits A6 and M1 are HOT at all times.

RADIO ILLUMINATION

Circuit E2 supplies battery voltage to the radio illumination lamps when the headlamps or parking lamps are on and the dimmer switch is in the LOW or ON positions.

Circuit X5 supplies battery voltage for the radio clock and station frequency display. Circuit X5 originates at the radio illumination relay and is fed by either circuit F85 or circuit E2 depending on the switch position inside the relay.

When the headlamps and parking lamps are off, the radio illumination relay is in its normal At Rest position. In the At Rest position, the relay connects circuit F85 from fuse 2 in the fuse block to circuit X5.

When the headlamps or parking lamps are on, circuit L90 from the headlamp switch supplies battery voltage to the coil side of the radio illumination relay. Circuit Z1 provides ground for the coil side of the relay.

When voltage is present on circuit L90, the radio illumination relay switches from its At Rest position to connect circuit E2 to circuit X5.

SPEAKERS

There are 3 different radio packages. The standard radio package includes 2 speakers; one in each front door. The four speaker system uses speakers in each front door plus speakers in the instrument panel. The six speaker system has the front door speakers, sound bar speakers and two speakers in the instrument panel.

BASE RADIO

Vehicles with the base radio have a jumper between the radio and the instrument panel connectors. The jumper simulates rear speaker load.

Circuit X53 feeds the speaker in the left front door. Circuit X55 is the return from the speaker to the radio.

Circuit X54 feeds the right front door speaker. Circuit X56 is the return from the speaker to the radio.

FOUR SPEAKER SYSTEM

Circuit X53 feeds the speaker in the left front door and the speaker in the left side of the instrument panel. Circuit X55 is the return from the speakers to the radio. Circuits X53 and X55 are double crimped at the instrument panel speaker and connect to the door speaker.

Circuit X54 feeds the right front door speaker and the speaker in the right side of the instrument panel. Circuit X56 is the return from the speakers to the radio. Circuits X54 and X56 are double crimped at the instrument panel speaker and connect to the door speaker.

SIX SPEAKER SYSTEM

Circuit X53 feeds the left speaker in the instrument panel. The X53 circuit is double crimped at the instrument panel left speaker and branches to the left front door speaker. Circuit X55 is the return to the radio from the instrument panel left speaker and left front door speaker. Circuit X55 is double crimped at the instrument panel left speaker.

Circuit X54 feeds the right speaker in the instrument panel. The X54 circuit is double crimped at the instrument panel right speaker and branches to the right front door speaker. Circuit X56 is the return to the radio from the instrument panel right speaker and right front door speaker. Circuit X56 is double crimped at the instrument panel right speaker.

Circuit X51 feeds the left rear speaker. Circuit X57 is the return from the speaker to the radio.

Circuit X52 feeds the right rear speaker. Circuit X58 is the return from the speaker to the radio.

SCHEMATICS AND DIAGRAMS

WIRING DIAGRAM INDEX

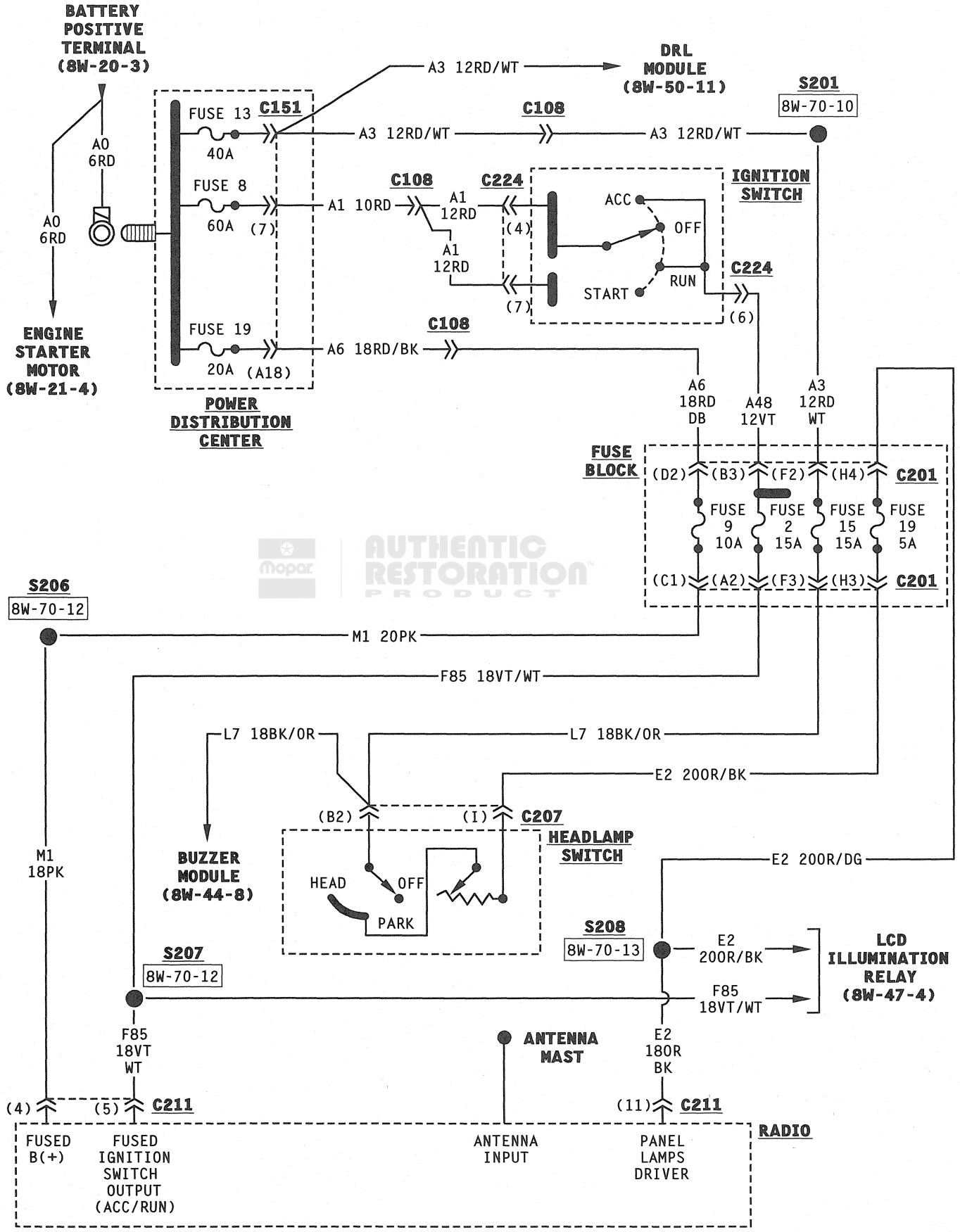
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

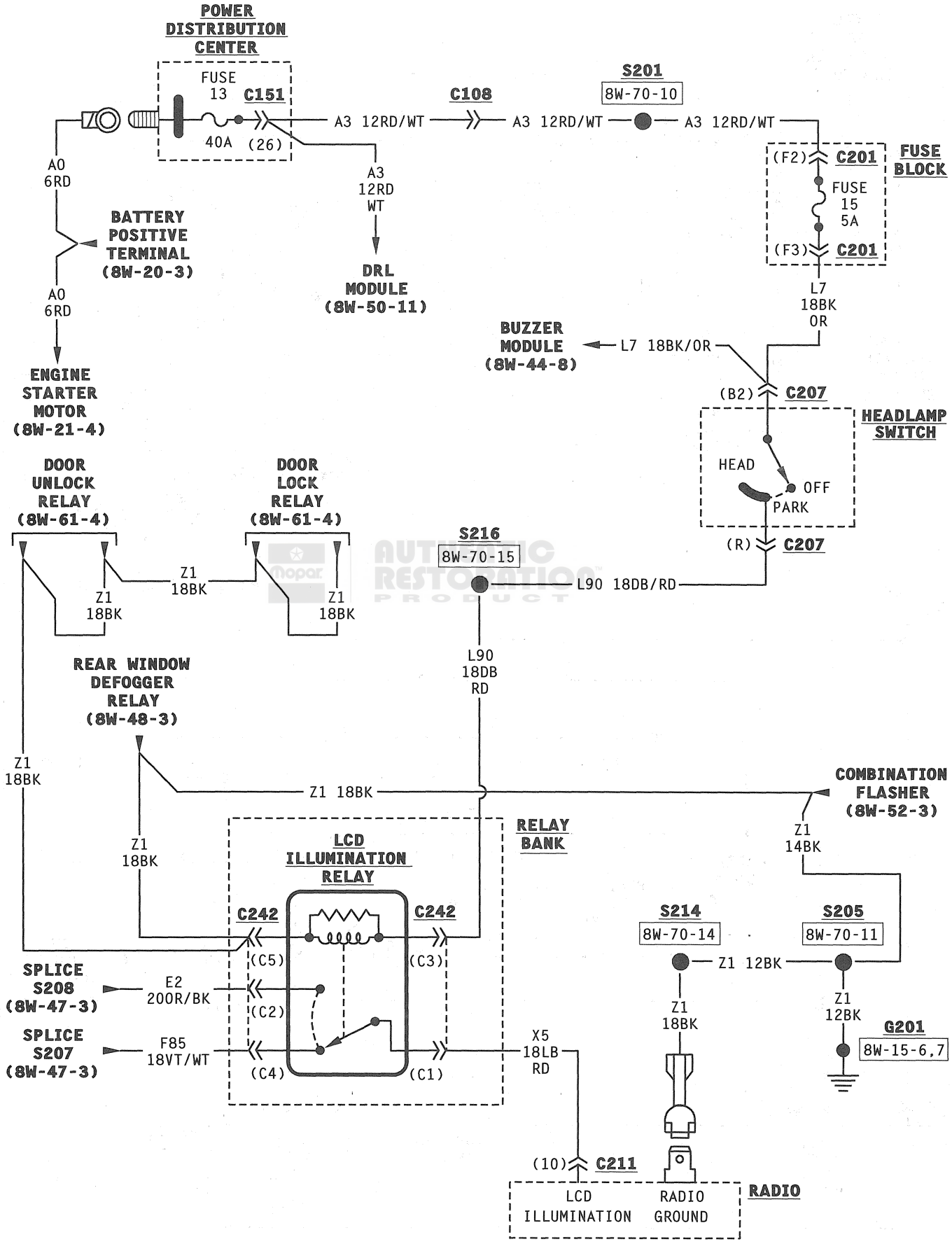
Component	Page
Fuse 2	8W-47-3, 7
Fuse 8 (PDC)	8W-47-3, 7
Fuse 9	8W-47-3, 7
Fuse 13 (PDC)	8W-47-3, 4, 7
Fuse 15	8W-47-3, 4, 7
Fuse 19	8W-47-3, 7
Fuse 19 (PDC)	8W-47-3, 7
Headlamp Switch	8W-47-3, 4, 7
Ignition Switch	8W-47-3, 7
LCD Illumination Relay	8W-47-4
Radio	8W-47-3, 4, 5, 6, 7, 8, 9, 10
Speakers (Six Speaker System)	8W-47-5, 6
Speakers (Two and Four Speaker System)	8W-47-9, 10

Mopar AUTHENTIC RESTORATION PRODUCT

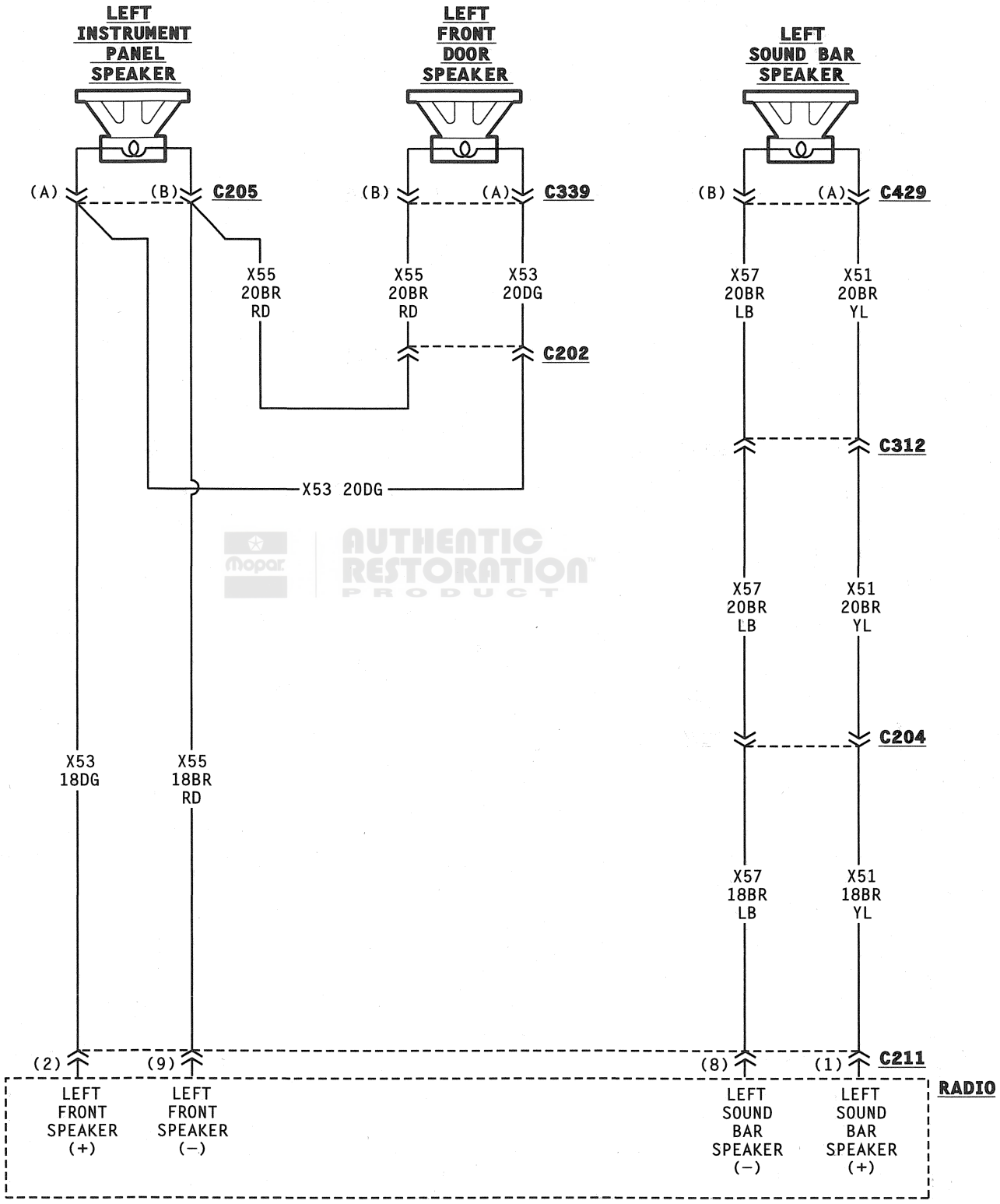
6 SPEAKER SYSTEM

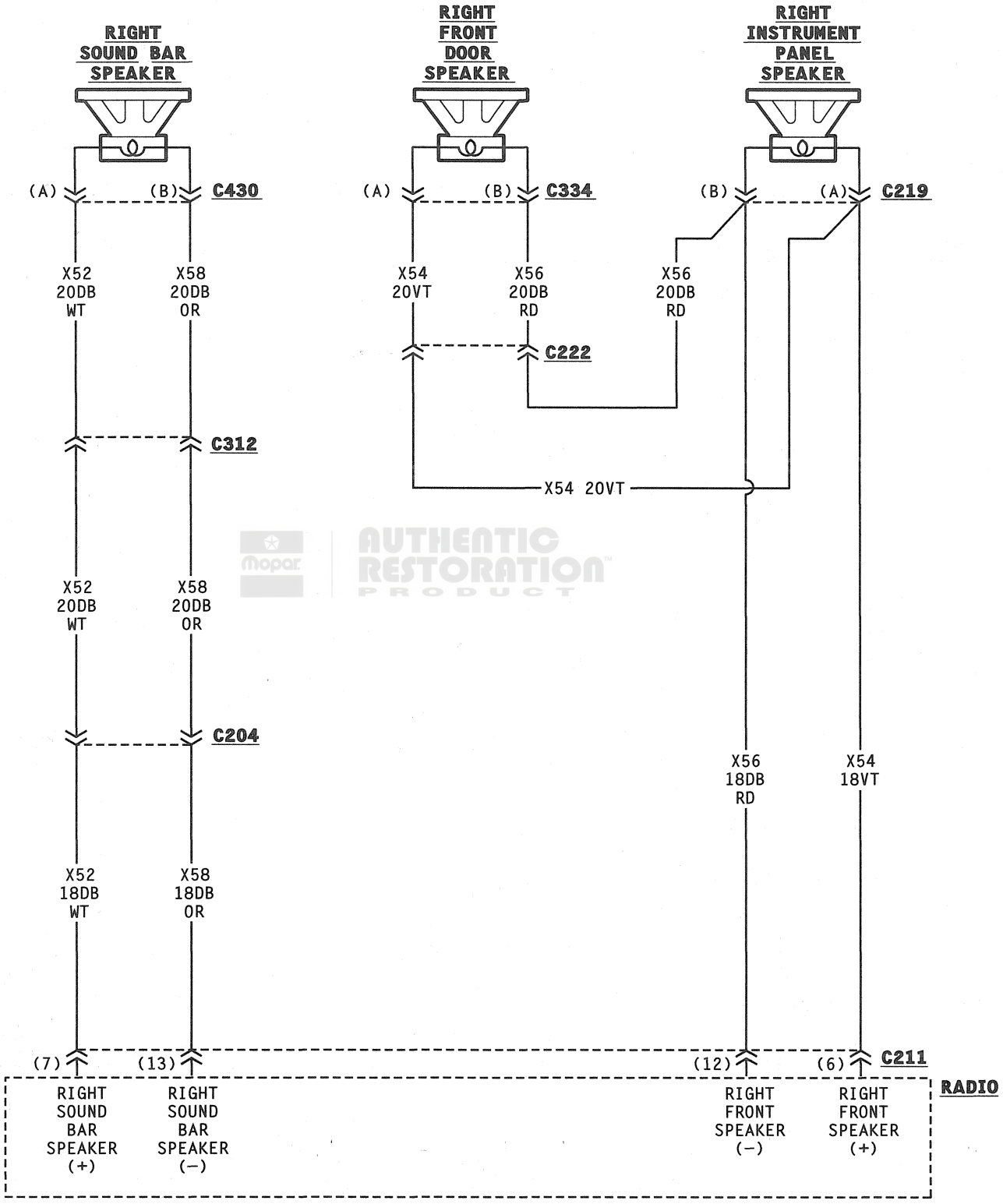


Mopar AUTHENTIC RESTORATION PRODUCT


POWER DISTRIBUTION CENTER
FUSE 13
C151
40A
(26)
A3 12RD/WT
C108
A3 12RD/WT
S201
8W-70-10
A3 12RD/WT
(F2)
C201
FUSE BLOCK
FUSE 15 5A
(F3)
C201
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A3 12RD WT
DRL MODULE (8W-50-11)
L7 18BK OR
BUZZER MODULE (8W-44-8)
L7 18BK/OR
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
(B2)
C207
HEADLAMP SWITCH
HEAD
OFF
PARK
(R)
C207
DOOR UNLOCK RELAY (8W-61-4)
DOOR LOCK RELAY (8W-61-4)
S216
8W-70-15
L90 18DB/RD
Z1 18BK
Z1 18BK
Z1 18BK
Z1 18BK
L90 18DB RD
REAR WINDOW DEFOGGER RELAY (8W-48-3)
Z1 18BK
Z1 18BK
COMBINATION FLASHER (8W-52-3)
Z1 14BK
RELAY BANK
LCD ILLUMINATION RELAY
C242
C242
(C5)
(C3)
S214
8W-70-14
S205
8W-70-11
Z1 12BK
SPLICE S208 (8W-47-3)
E2 200R/BK
(C2)
Z1 18BK
Z1 12BK
G201
8W-15-6,7
SPLICE S207 (8W-47-3)
F85 18VT/WT
(C4)
(C1)
X5 18LB RD
(10)
C211
LCD ILLUMINATION
RADIO GROUND
RADIO

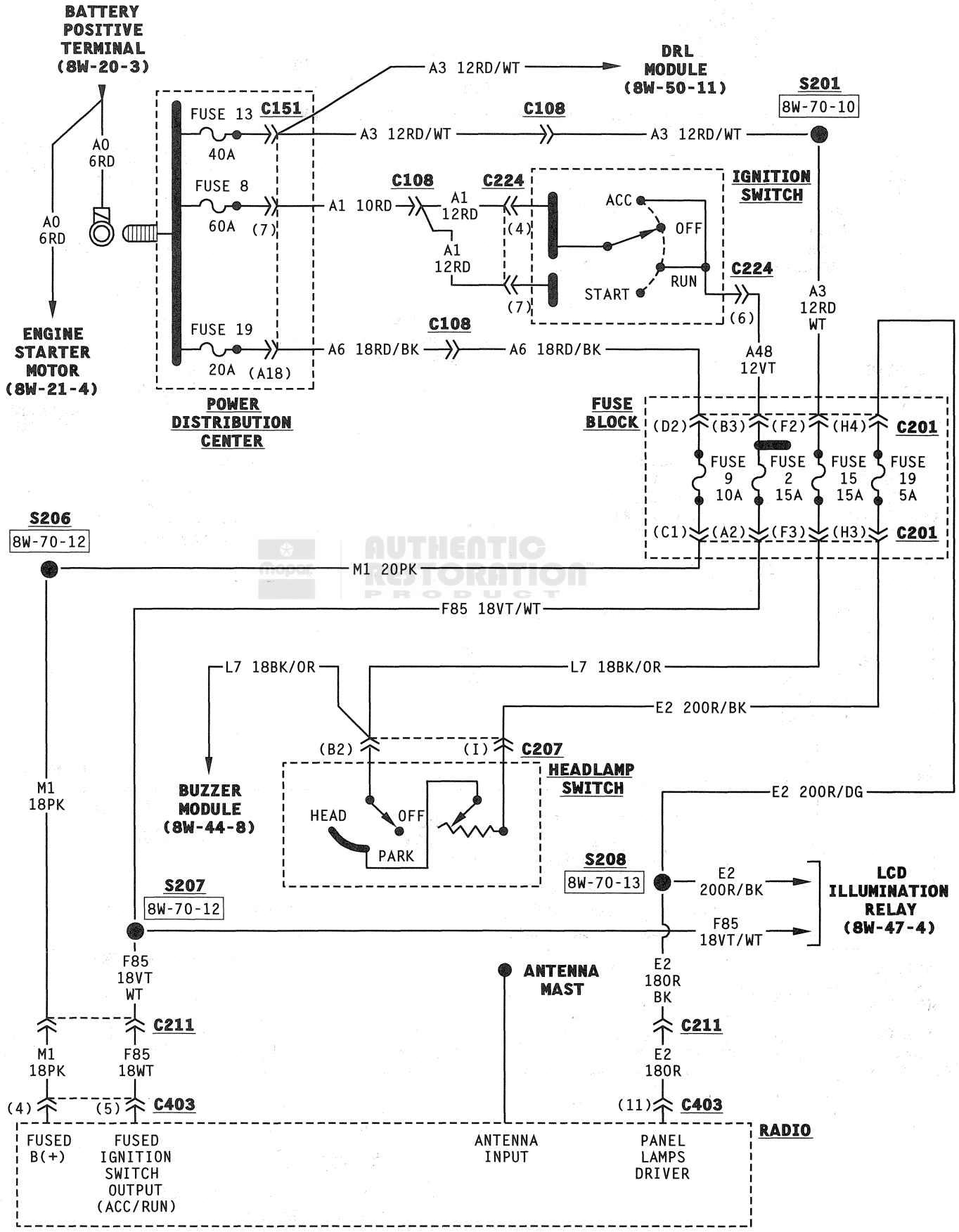
6 SPEAKER SYSTEM



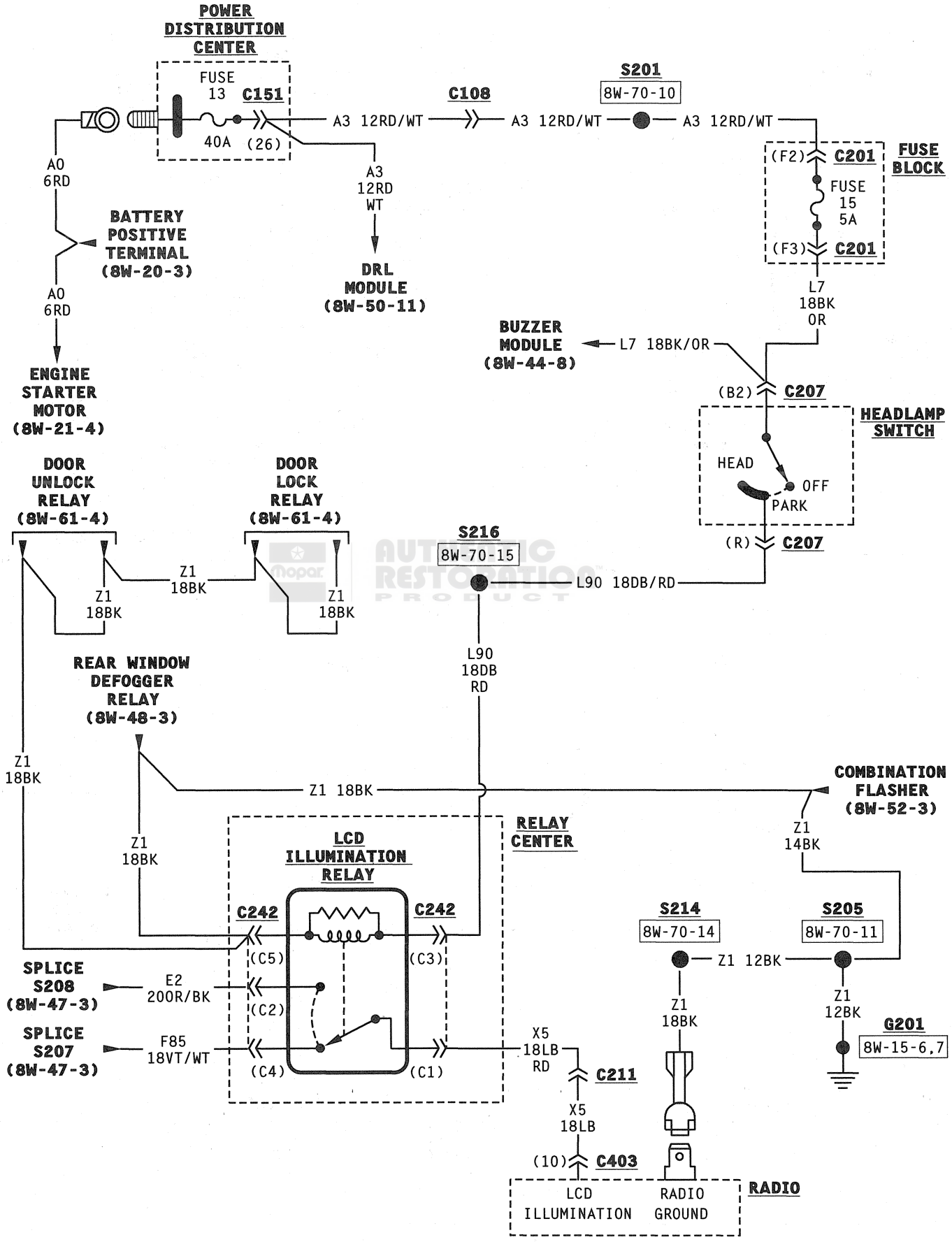


Mopar AUTHENTIC RESTORATION PRODUCT

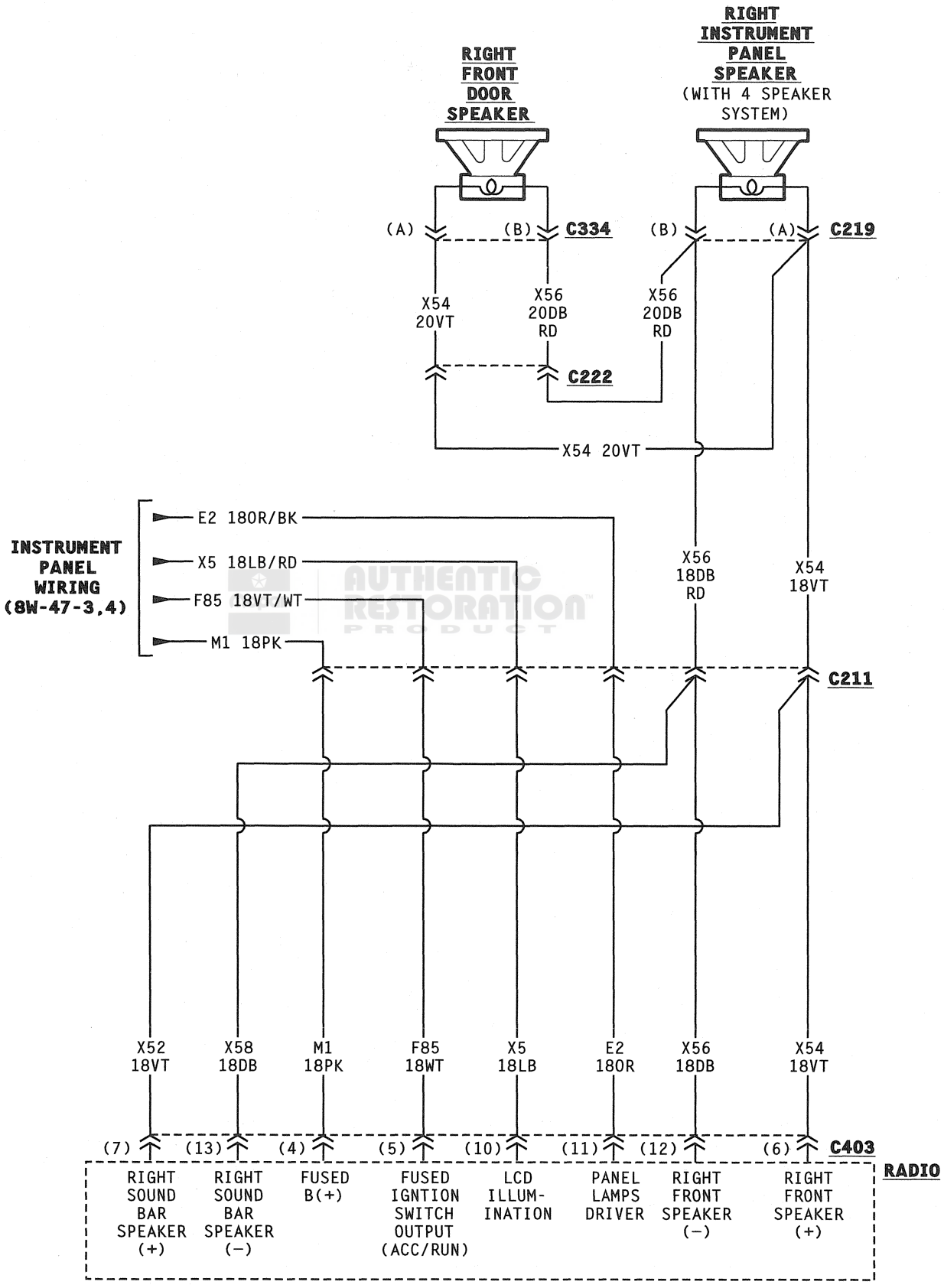
2 AND 4 SPEAKER SYSTEM



2 AND 4 SPEAKER SYSTEM

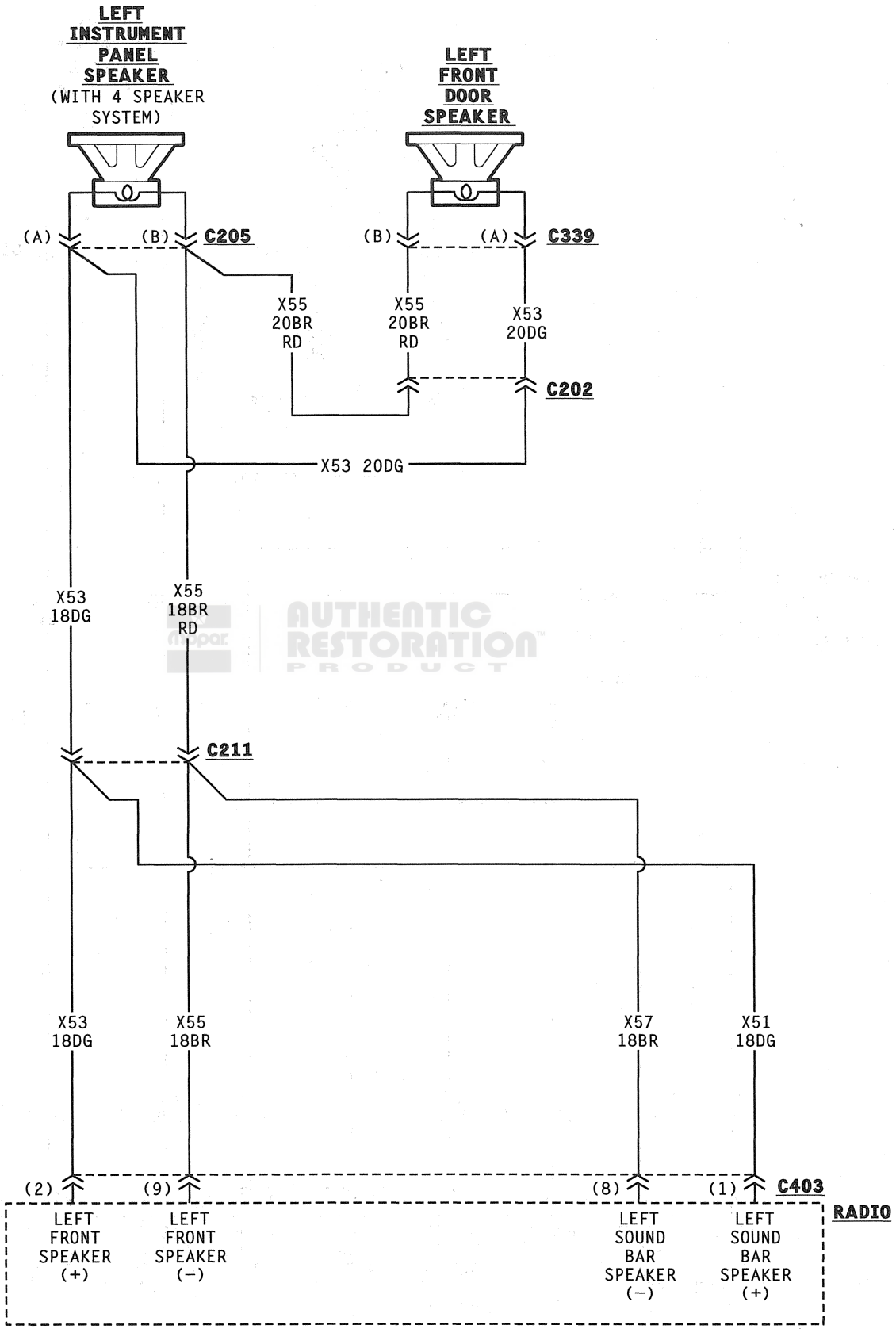


8W-47 AUDIO SYSTEM
2 AND 4 SPEAKER SYSTEM



AUTHENTIC RESTORATION PRODUCT

2 AND 4 SPEAKER SYSTEM



8W-48 REAR WINDOW DEFOGGER

DESCRIPTION AND OPERATION

REAR WINDOW DEFOGGER

The rear window defogger relay supplies power to the rear window defogger grid. Circuit F83 from fuse 10 in the fuse block supplies power to the rear window defogger relay when the ignition switch is in the RUN position.

When the operator presses the rear window defogger switch, the contacts inside the switch momentarily CLOSE and circuit C80 connects the switch to the relay. This causes the relay to change state and complete a circuit to energize the coil side of the relay and start the relay timer.

Circuit F81 from fuse 18 in the fuse block supplies voltage to the coil and contact sides of the relay. Circuit Z1 provides ground for the relay.

When the rear window defogger relay energizes, the contacts inside the relay CLOSE and connect circuit F81 to circuit C15. Circuit C15 splices to power the rear window defogger grid and the indicator lamp in the rear window defogger switch. Circuit Z1 provides ground for the rear window defogger grid.

HELPFUL INFORMATION

- When the ignition switch is in the RUN position, it connects circuit A1 from fuse 8 in the power distribution center (PDC) to circuit A38.
- Check for broken grid lines on the window.
- Check for a broken bus bar or disconnected leads at the rear window.
- Check for a good ground.

SCHEMATICS AND DIAGRAMS

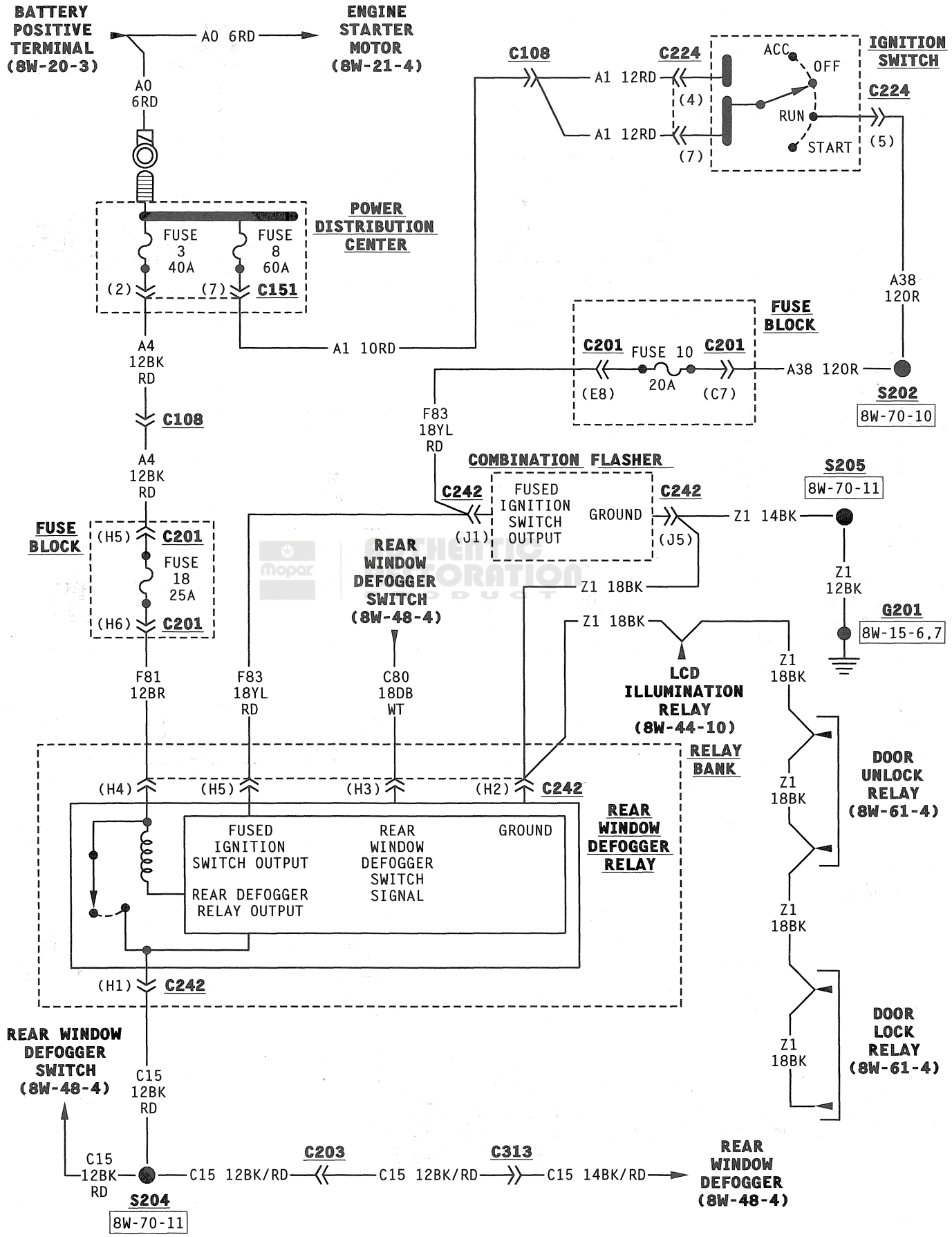
WIRING DIAGRAM INDEX

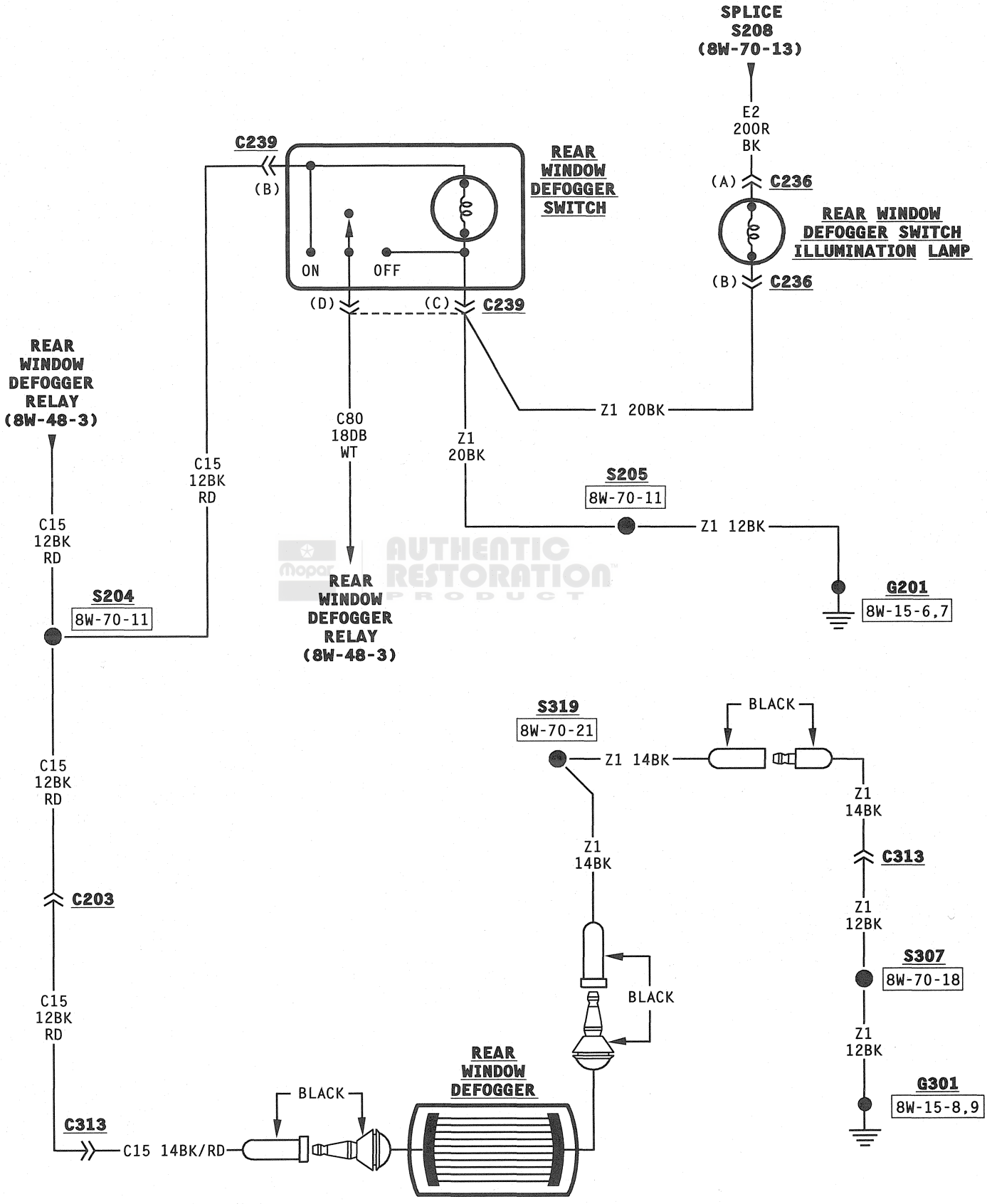
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Combination Flasher	8W-48-3
Fuse 3 (PDC)	8W-48-3
Fuse 8 (PDC)	8W-48-3
Fuse 10	8W-48-3
Fuse 18	8W-48-3
Ignition Switch	8W-48-3
Rear Window Defogger Switch	8W-48-4
Rear Window Defogger Switch Illumination Lamp	8W-48-4
Rear Window Defogger Relay	8W-48-3
Rear Window Defogger	8W-48-4

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
C108
C224
A1 12RD
A1 12RD
(4)
(7)
ACC
OFF
RUN
START
IGNITION SWITCH
C224
(5)
POWER DISTRIBUTION CENTER
FUSE 3 40A
FUSE 8 60A
(2)
(7)
C151
A1 10RD
A38 120R
FUSE BLOCK
C201
FUSE 10
C201
(E8)
20A
(C7)
A38 120R
S202
8W-70-10
A4 12BK RD
C108
F83 18YL RD
COMBINATION FLASHER
C242
FUSED IGNITION SWITCH OUTPUT
GROUND
C242
(J1)
(J5)
S205
8W-70-11
Z1 14BK
A4 12BK RD
FUSE BLOCK
(H5)
C201
FUSE 18 25A
(H6)
C201
REAR WINDOW DEFOGGER SWITCH (8W-48-4)
Z1 18BK
Z1 12BK
G201
8W-15-6,7
Z1 18BK
F81 12BR
F83 18YL RD
C80 18DB WT
LCD ILLUMINATION RELAY (8W-44-10)
Z1 18BK
RELAY BANK
DOOR UNLOCK RELAY (8W-61-4)
(H4)
(H5)
(H3)
(H2)
C242
FUSED IGNITION SWITCH OUTPUT
REAR WINDOW DEFOGGER SWITCH SIGNAL
GROUND
REAR WINDOW DEFOGGER RELAY
REAR DEFOGGER RELAY OUTPUT
Z1 18BK
Z1 18BK
(H1)
C242
DOOR LOCK RELAY (8W-61-4)
Z1 18BK
REAR WINDOW DEFOGGER SWITCH (8W-48-4)
C15 12BK RD
C15 12BK RD
C203
C313
REAR WINDOW DEFOGGER (8W-48-4)
C15 12BK/RD
C15 12BK/RD
C15 14BK/RD
S204
8W-70-11



Mopar AUTHENTIC RESTORATION PRODUCT

8W-49 OVERHEAD CONSOLE

DESCRIPTION AND OPERATION

INTRODUCTION

When the ignition switch is in the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 supplies power to circuit F87 through fuse 17 in the fuse block. Circuit F87 supplies power to the overhead console.

When the headlamps or parking lamps are ON, circuits L90 and E2 provide voltage to the overhead console for illumination. Voltage on circuit L90 informs the overhead console that the headlamps or parking lamps are ON. Circuit E2 from fuse 19 in the fuse block powers the illumination lamps in the overhead console. Circuit E2 originates at the headlamp switch.

Circuits Z1 and Z2 provides ground for the overhead console. Circuit M2 from the door jamb switches also connects to the overhead console.

AMBIENT TEMPERATURE SENSOR

The ambient temperature sensor is a variable resistor. Circuit G31 supplies voltage from the overhead console to the sensor. Circuit G32 is the signal return from the sensor to the overhead console.

SCHEMATICS AND DIAGRAMS

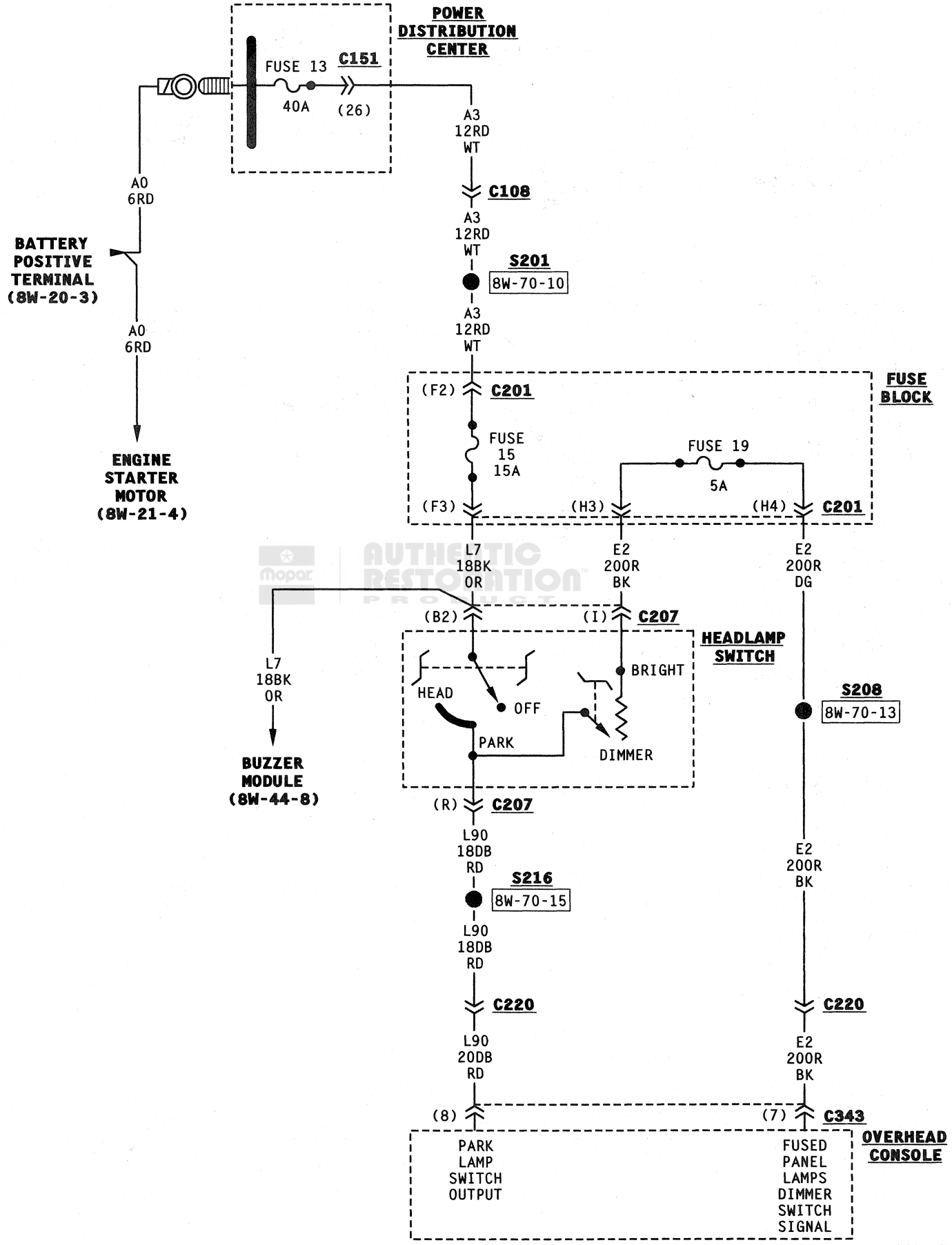
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

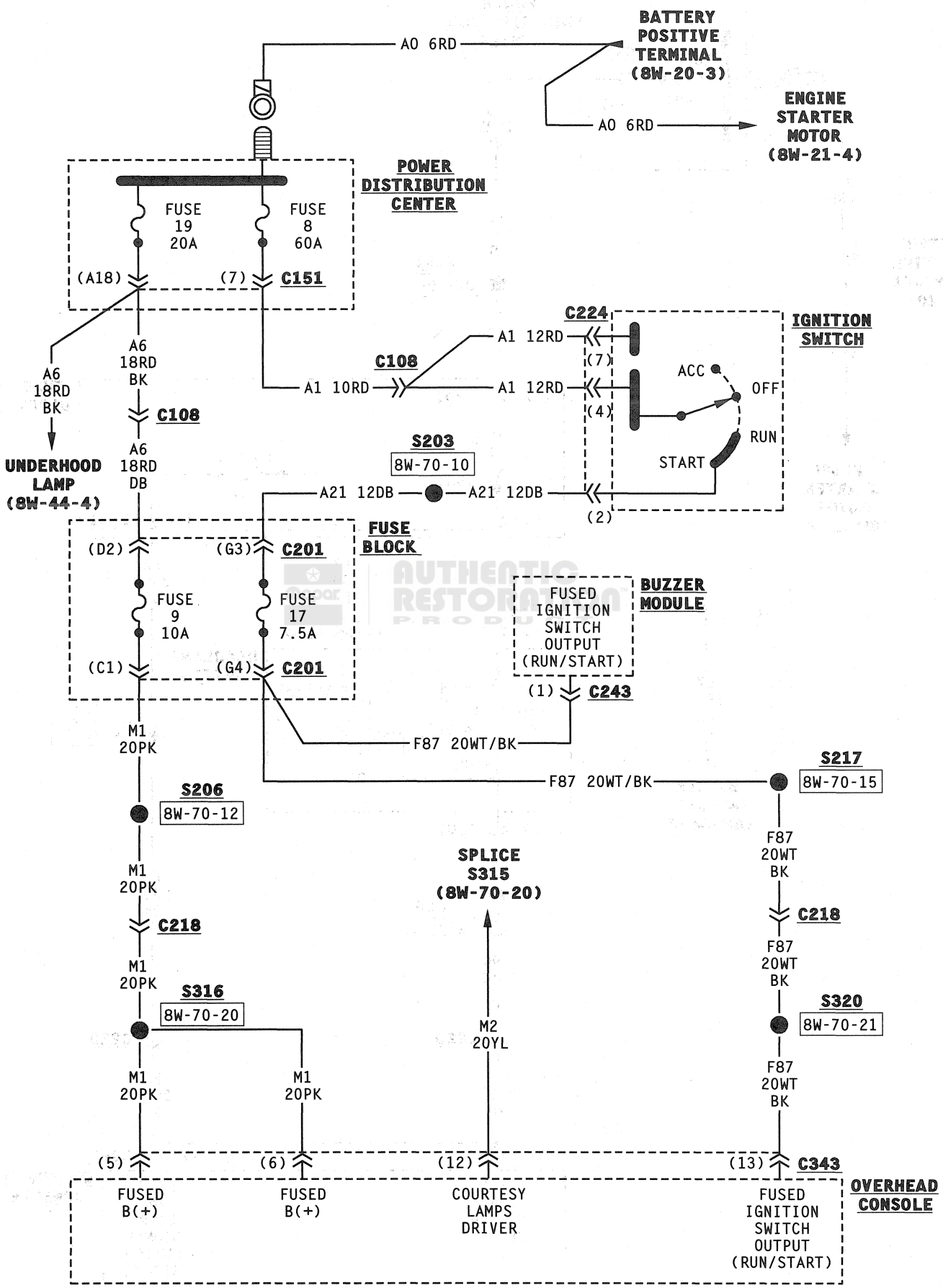
DIAGRAM INDEX

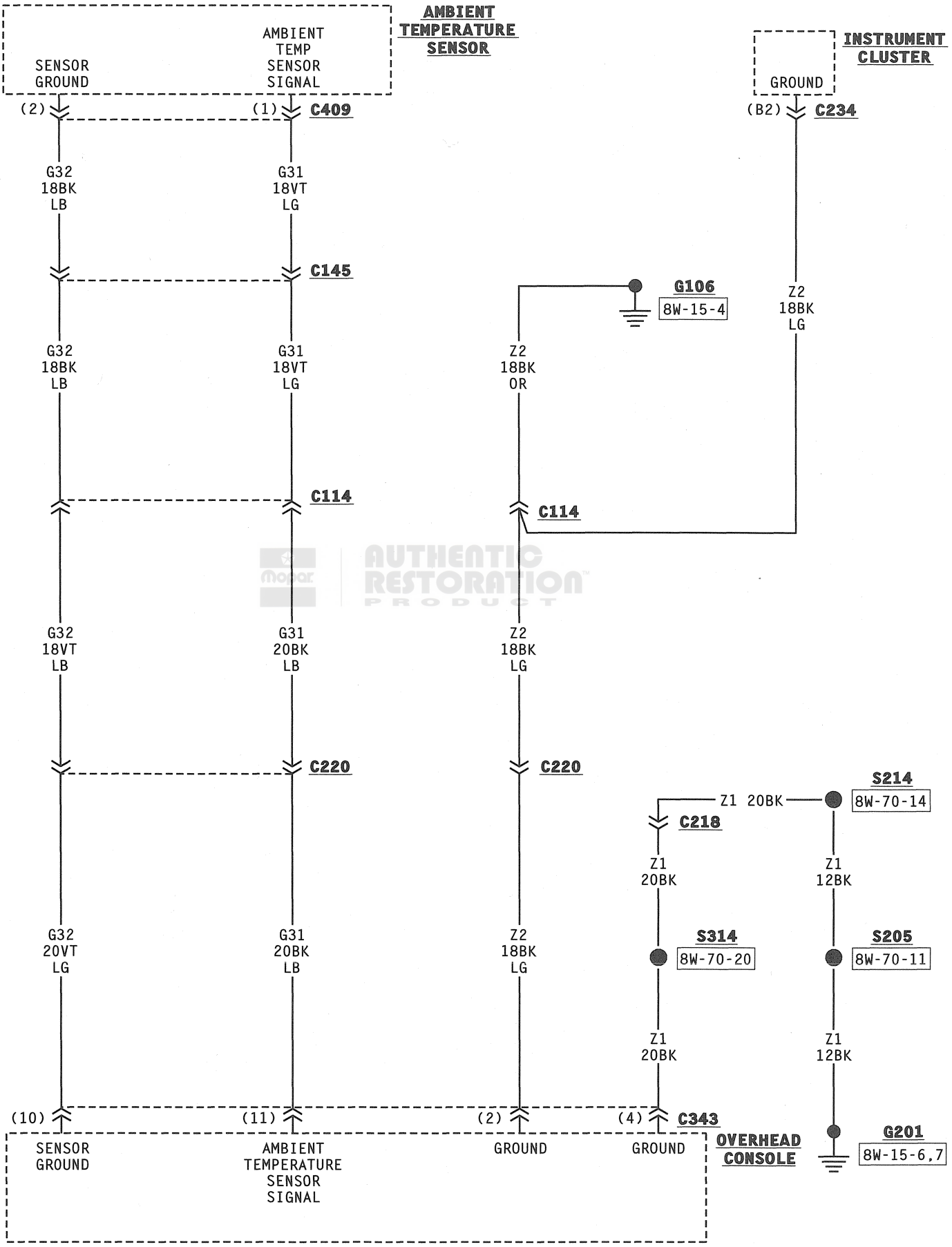
Component	Page
Ambient Temperature Sensor	8W-49-5
Buzzer Module	8W-49-4
Fuse Block	8W-49-3, 4
Fuse 8 (PDC)	8W-49-4
Fuse 9	8W-49-4
Fuse 13 (PDC)	8W-49-3
Fuse 15	8W-49-3
Fuse 17	8W-49-4
Fuse 19	8W-49-3
Fuse 19 (PDC)	8W-49-4
Headlamp Switch	8W-49-3
Ignition Switch	8W-49-4
Instrument Cluster	8W-49-5
Overhead Console	8W-49-3, 4, 5

Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 19 20A
FUSE 8 60A
(A18)
(7)
C151
C224
IGNITION SWITCH
A1 12RD
(7)
C108
A1 10RD
A1 12RD
ACC
OFF
(4)
RUN
START
A6 18RD BK
A6 18RD BK
C108
A6 18RD DB
S203
8W-70-10
UNDERHOOD LAMP (8W-44-4)
A21 12DB
A21 12DB
(2)
FUSE BLOCK
(D2)
(G3)
C201
FUSE 9 10A
FUSE 17 7.5A
(C1)
(G4)
C201
BUZZER MODULE
FUSED IGNITION SWITCH OUTPUT (RUN/START)
(1)
C243
M1 20PK
F87 20WT/BK
S217
8W-70-15
F87 20WT/BK
S206
8W-70-12
SPLICE S315 (8W-70-20)
M1 20PK
F87 20WT BK
C218
C218
M1 20PK
F87 20WT BK
S316
8W-70-20
S320
8W-70-21
M2 20YL
M1 20PK
M1 20PK
F87 20WT BK
(5)
(6)
(12)
(13)
C343
OVERHEAD CONSOLE
FUSED B(+)
FUSED B(+)
COURTESY LAMPS DRIVER
FUSED IGNITION SWITCH OUTPUT (RUN/START)



Mopar AUTHENTIC RESTORATION PRODUCT

8W-50 FRONT LIGHTING

INDEX

page

DESCRIPTION AND OPERATION
- DAYTIME RUNNING LAMP (DRL) MODULE 2
- FOG LAMPS 2
- HEADLAMP DELAY MODULE 1
- HEADLAMPS 1
- PARKING LAMPS 1

SCHEMATICS AND DIAGRAMS
- WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

PARKING LAMPS

Circuit A3 from fuse 13 in the Power Distribution Center (PDC) connects to a bus bar in the fuse block which feeds circuit L7. Fuse 15 in the fuse block protects circuit L7.

The headlamp switch has three positions: ON, PARK (parking lamps) and OFF, plus a dimmer switch. When the headlamp switch is in the PARK or ON position, the switch connects circuit L7 to circuit L90. From the headlamp switch, circuit L90 branches to power the front parking lamps and rear tail lamps, side marker lamps, and rear license plate lamps.

GROUND CIRCUIT

Circuit Z1 provides a ground for the parking lamps and turn signal lamps. The Z1 circuit also provide ground for the headlamps.

HELPFUL INFORMATION

- Check fuse 13 in the PDC.
- Check fuse 15 in the fuse block.
- When the headlamp switch is in the PARK or ON position, the dimmer circuit, L7, also connects to circuit E2. Circuit E2 continues through fuse 19 in the fuse block. Circuit E2 powers the illumination lamps.

HEADLAMPS

The headlamp switch has three positions: ON, PARK (parking lamps) and OFF. Circuit A3 from fuse 13 in the Power Distribution Center (PDC) connects to the headlamp switch and feeds the circuit L7 through fuse 15 in the fuse block. Circuit L7 connects to the headlamp switch.

Circuit A3 also splices to feed circuit L11 through fuse 4 in the fuse block. Circuit L11 connects to the dimmer switch circuitry in the multi-function switch.

Circuit A3 also supplies battery voltage to the headlamp switch. The headlamp switch has an internal circuit breaker that connects circuit A3 to circuit F34. Circuit F34 connects to the dimmer switch circuitry in the multi-function switch.

HEADLAMP SWITCH IN OFF OR PARKING LAMP POSITION

Circuit L11 connects to the dimmer switch portion of the multi-function switch. Circuit L11 supplies power for the high beams on circuit L3 when the operator flashes the headlamps with the turn signal stalk of the multi-function switch.

HEADLAMP SWITCH IN ON POSITION

When the headlamp switch is in the ON position, circuit A3 from fuse 13 in the PDC connects to circuit F34. Circuit F34 connects to the dimmer switch portion of the multi-function switch and feeds circuit L4. Circuit L4 powers the low beam of the headlamps.

When the operator selects high beam operation with the turn signal stalk of the multi-function switch, circuit L11 connects to the L3 circuit. Circuit L3 powers high beam operation.

HEADLAMP GROUND

Circuit Z1 provides ground for both the right and left headlamps. Circuit Z1 also supplies ground for the fog lamps, if equipped.

HELPFUL INFORMATION

- Check fuse 13 in the PDC.
- The headlamp switch has an internal circuit breaker.

HEADLAMP DELAY MODULE

When the operator turns OFF the ignition switch and then turns OFF the headlamp switch, the headlamp delay module powers the headlamps for approximately 45 seconds.

When the ignition switch is in the START or RUN position, circuit A21 powers circuit F87 through fuse 17 in the fuse block. Circuit F87 supplies the IGNITION ON/OFF signal to the headlamp delay module. Circuit Z1 provides ground for the module.

When the headlamp delay module activates, it connects circuit X4 from fuse 11 in the fuse block to cir-

DESCRIPTION AND OPERATION (Continued)

cuit F34. Circuit F34 powers the headlamps through the headlamp dimmer switch circuit L4.

HELPFUL INFORMATION

Circuit A7 from fuse 4 in the Power Distribution Center (PDC) supplies voltage to the fuse block bus bar that powers circuit X4 through the fuse in cavity 11.

FOG LAMPS

The fog lamps are controlled by the fog lamp switch, park lamp relay and high beam relay. The fog lamps operate only when the headlamp switch is in the ON position, and the operator has selected low-beam operation. When the headlamps are in high-beam operation, the fog lamps will not operate.

Circuit F39 from fuse 17 in the Power Distribution Center (PDC) supplies voltage to the contact side of the park lamp relay.

Circuit L90 supplies power to the coil side of the park lamp relay. Circuit L35 connects to the coil side of the relay and to circuit Z1 through the fog lamp switch. Ground for the coil side of the relay is provided on circuit Z1 through the fog lamp switch.

When the fog lamp switch CLOSES, the park lamp relay contacts CLOSE and circuit F39 passes through the relay to power the contact side of the high beam relay. When the headlamp high beams are OFF, the high beam relay is not energized and voltage flows through the normally closed contacts to circuit L39.

Circuit L39 supplies voltage to the fog lamps. Circuit Z1 provides ground for the fog lamps.

If the high beam lamps are ON, circuit G465 energizes the high beam relay. When the high beam relay energizes, the contacts open and power is not supplied to the fog lamps. Circuit Z1 provides ground for the coil side of the high beam relay.

Circuit E2 provides voltage for the illumination lamp in the fog lamp switch.

HELPFUL INFORMATION

Circuit L3 splices to power circuit G465. Circuit L3 powers the high beam circuit of the headlamps.

DAYTIME RUNNING LAMP (DRL) MODULE

On vehicles built for sale in Canada, the low-beam headlamps operate when the ignition switch is in the RUN position.

When the ignition switch is in the START or RUN position, circuit A1 from fuse 8 in the Power Distribution Center (PDC) connects to circuit A21. Circuit A21 splices to supply power to the DRL module.

Circuit A3 from fuse 13 in the PDC connects to DRL module. Circuit A3 is HOT at all times.

The DRL module receives the vehicle speed sensor input from circuit G7. Circuit G465 from the DRL module splices to circuit L3 to provide power for the high beam indicator lamp in the instrument cluster.

Circuit L4 powers the low beams of the left and right headlamps. When the headlamp switch is OFF, the DRL module powers the low beams on circuit L4. When the headlamps are ON, the dimmer switch in the multi-function switch powers the low beams on circuit L4.

Circuit L3 feeds the high beams of the headlamps. When the operator flashes the headlamps with the stalk of the multi-function switch, the DRL senses voltage on circuit L3.

Circuit Z1 provides ground for the DRL module.

SCHEMATICS AND DIAGRAMS

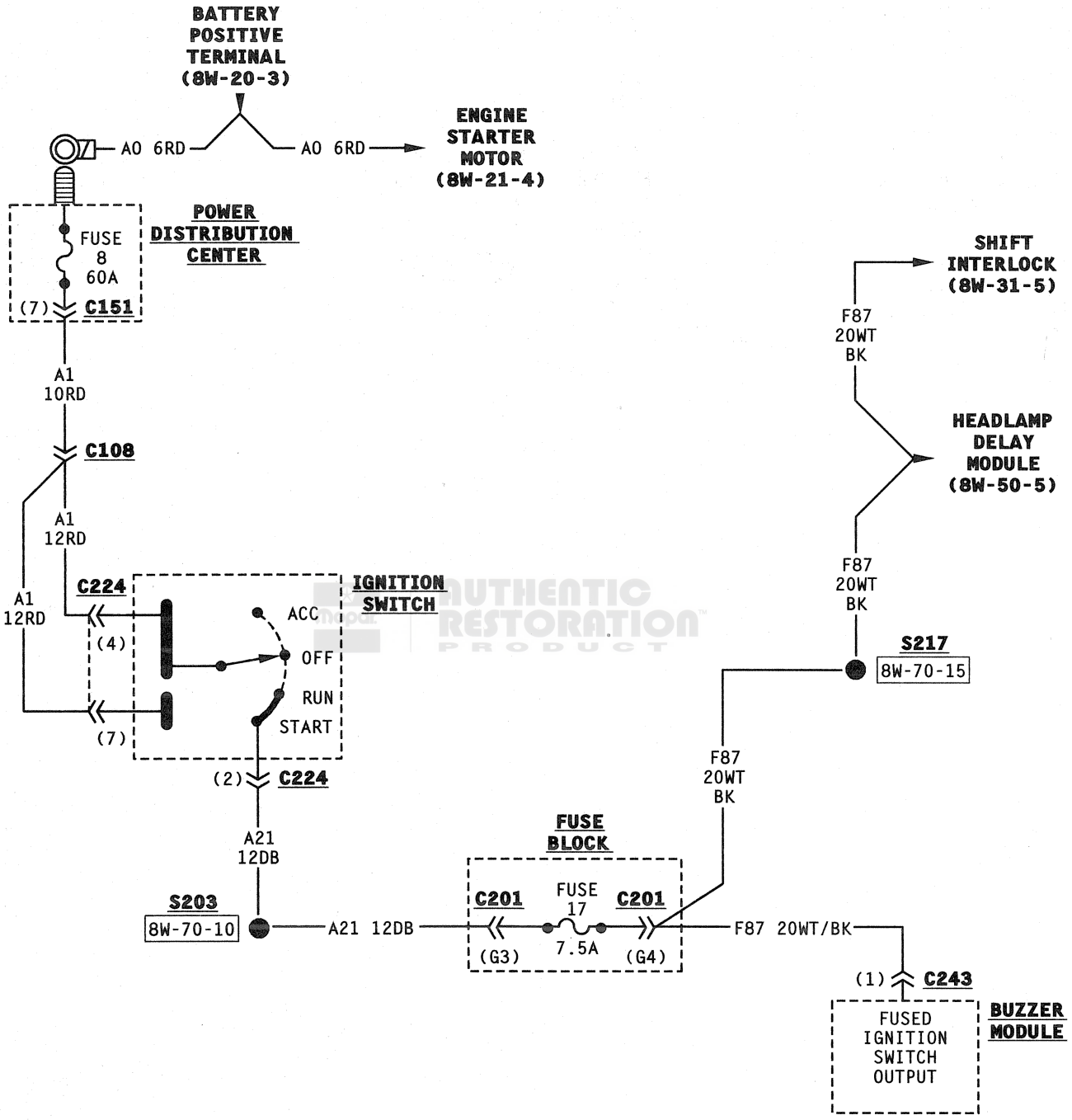
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

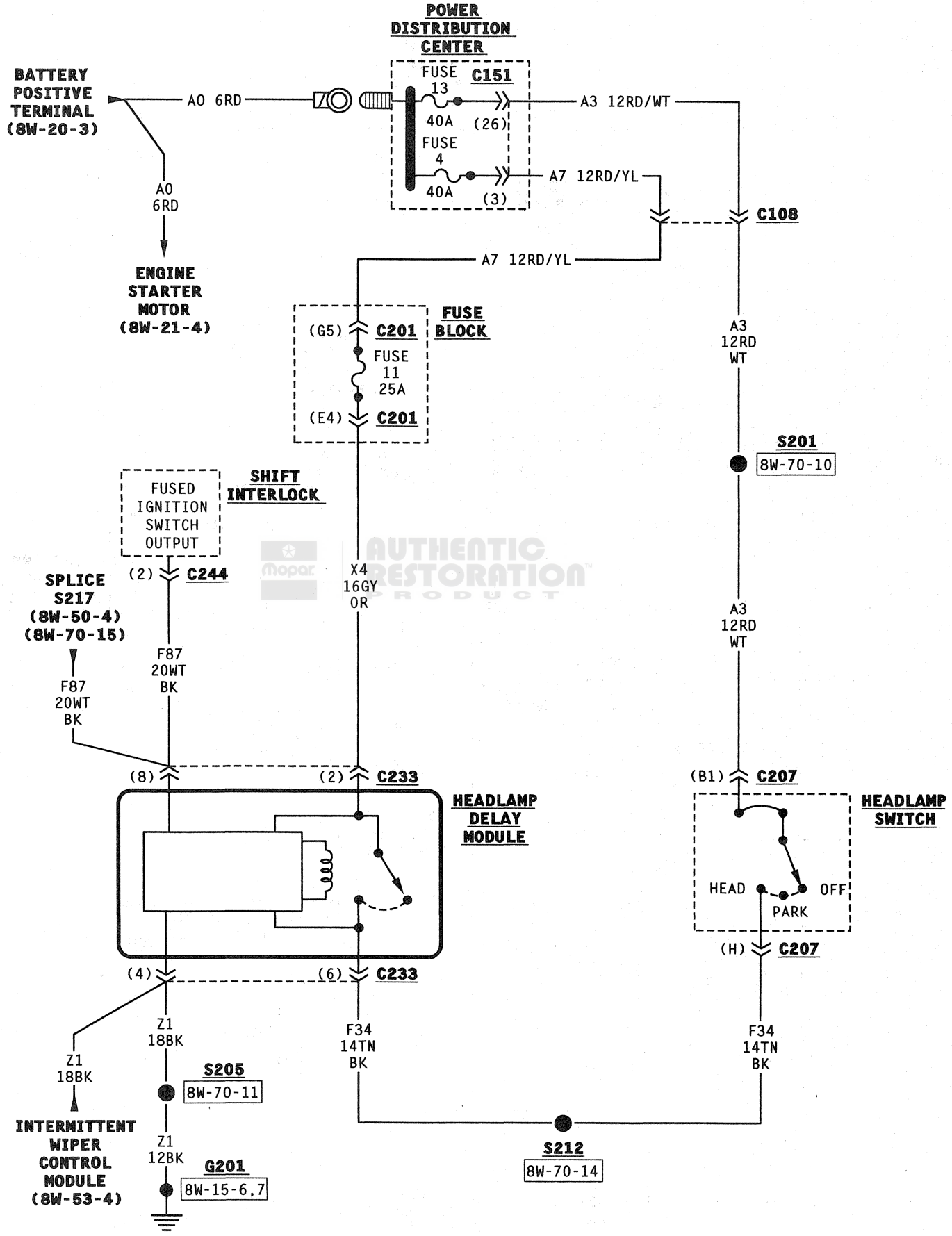
DIAGRAM INDEX

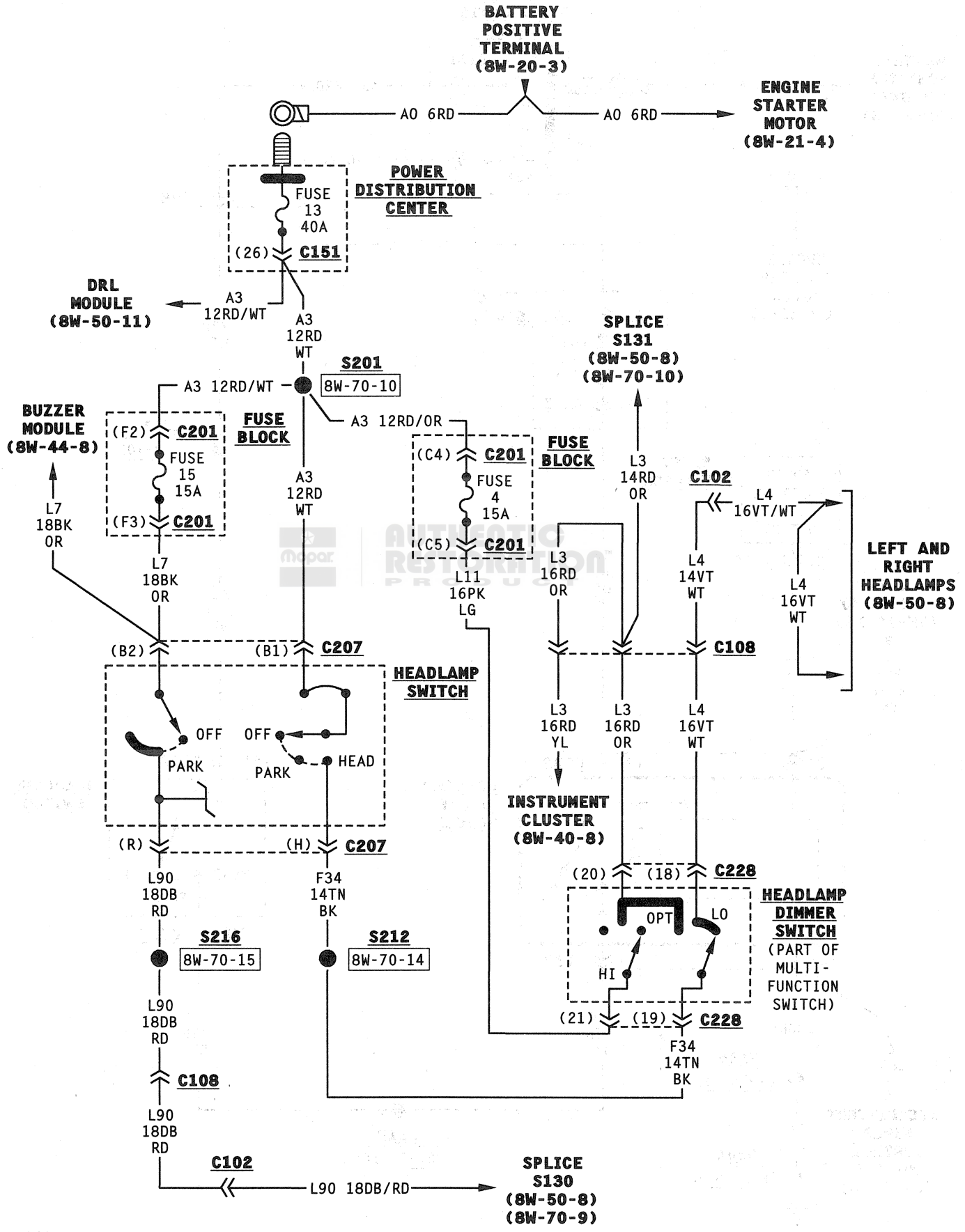
Component	Page
Buzzer Module	8W-50-4
Daytime Running Lamp (DRL) Module	8W-50-11
Fog Lamps	8W-50-10
Fog Lamp Switch	8W-50-10
Fog Lamp Switch Illumination Lamp or Extended Idle Switch Illumination Lamp	8W-50-10
Front Park/Turn Signal Lamps	8W-50-8
Front Side Marker Lamps	8W-50-8
Fuse 4	8W-50-6, 7
Fuse 4 (PDC)	8W-50-5
Fuse 8 (PDC)	8W-50-4, 11
Fuse 11	8W-50-5
Fuse 13 (PDC)	8W-50-5, 6, 7, 9, 11
Fuse 15	8W-50-6, 7
Fuse 17	8W-50-4
Fuse 17 (PDC)	8W-50-9
Fuse 19	8W-50-9
Headlamp Delay Module	8W-50-5
Headlamp Dimmer Switch	8W-50-6
Headlamp Switch	8W-50-5, 6, 7, 9
Headlamps	8W-50-8
High Beam Relay	8W-50-10
Ignition Switch	8W-50-4, 11
Park Lamp Relay	8W-50-9
Shift Interlock	8W-50-5

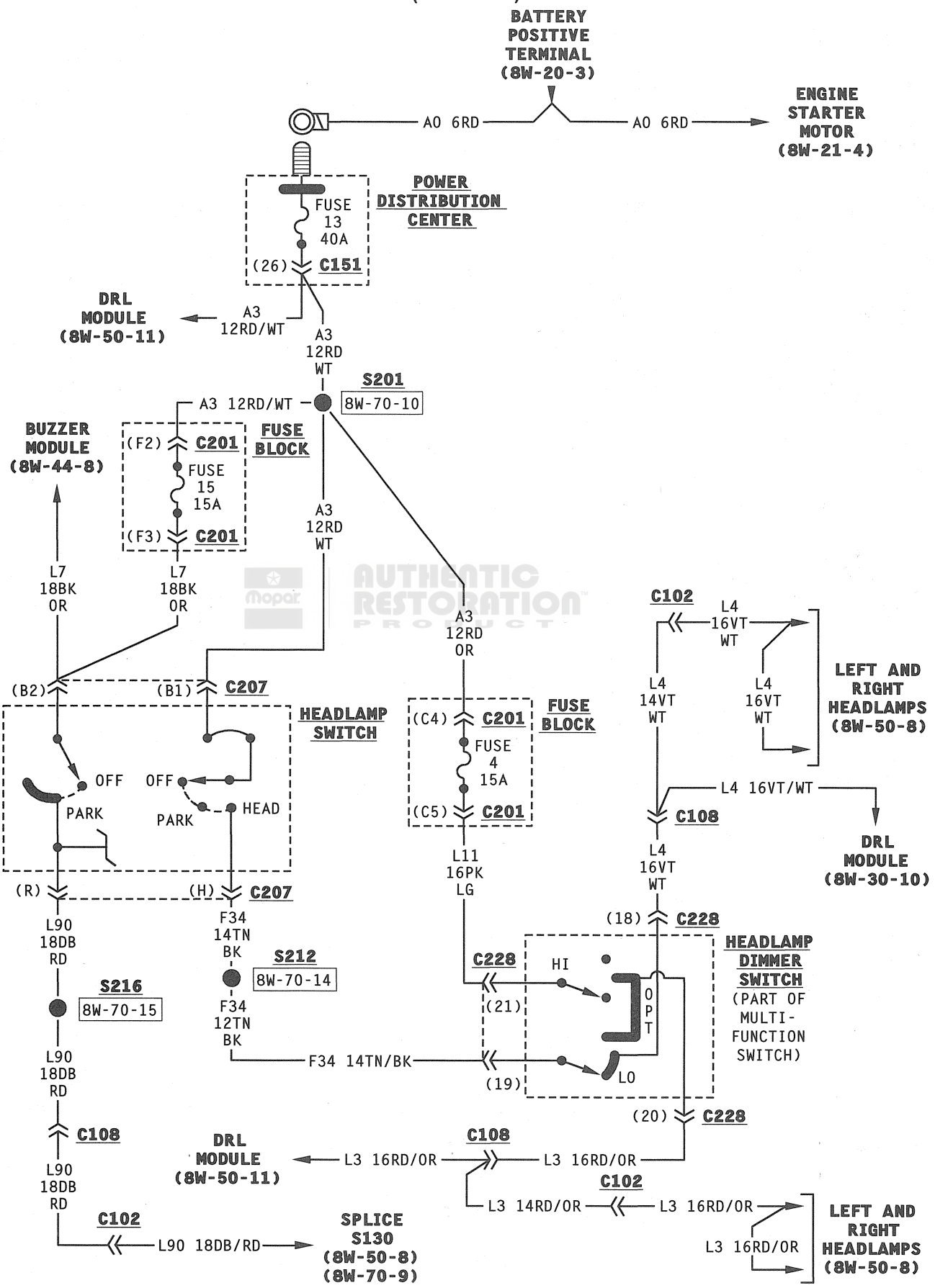
Mopar AUTHENTIC RESTORATION PRODUCT

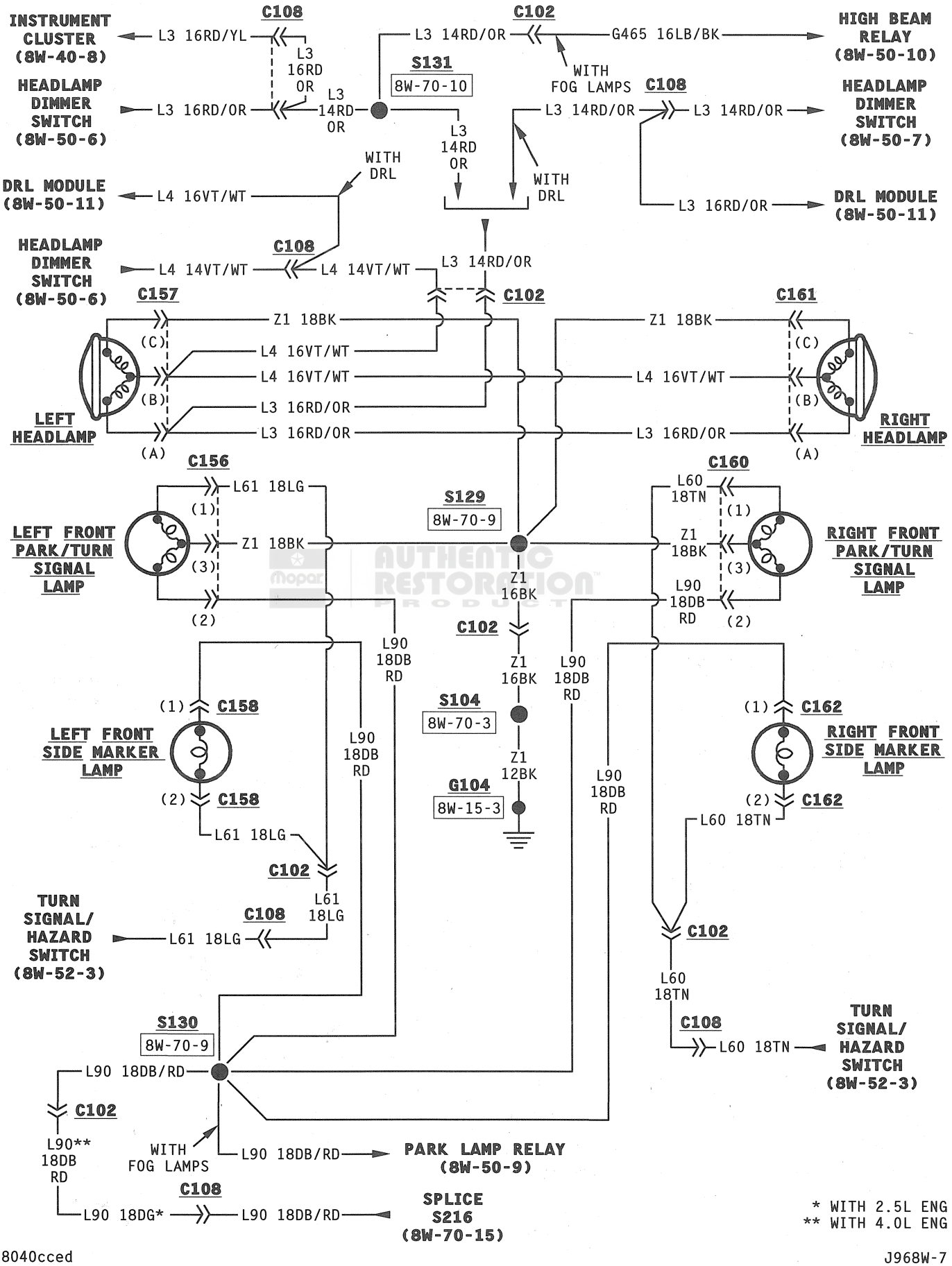


AUTHENTIC RESTORATION PRODUCT

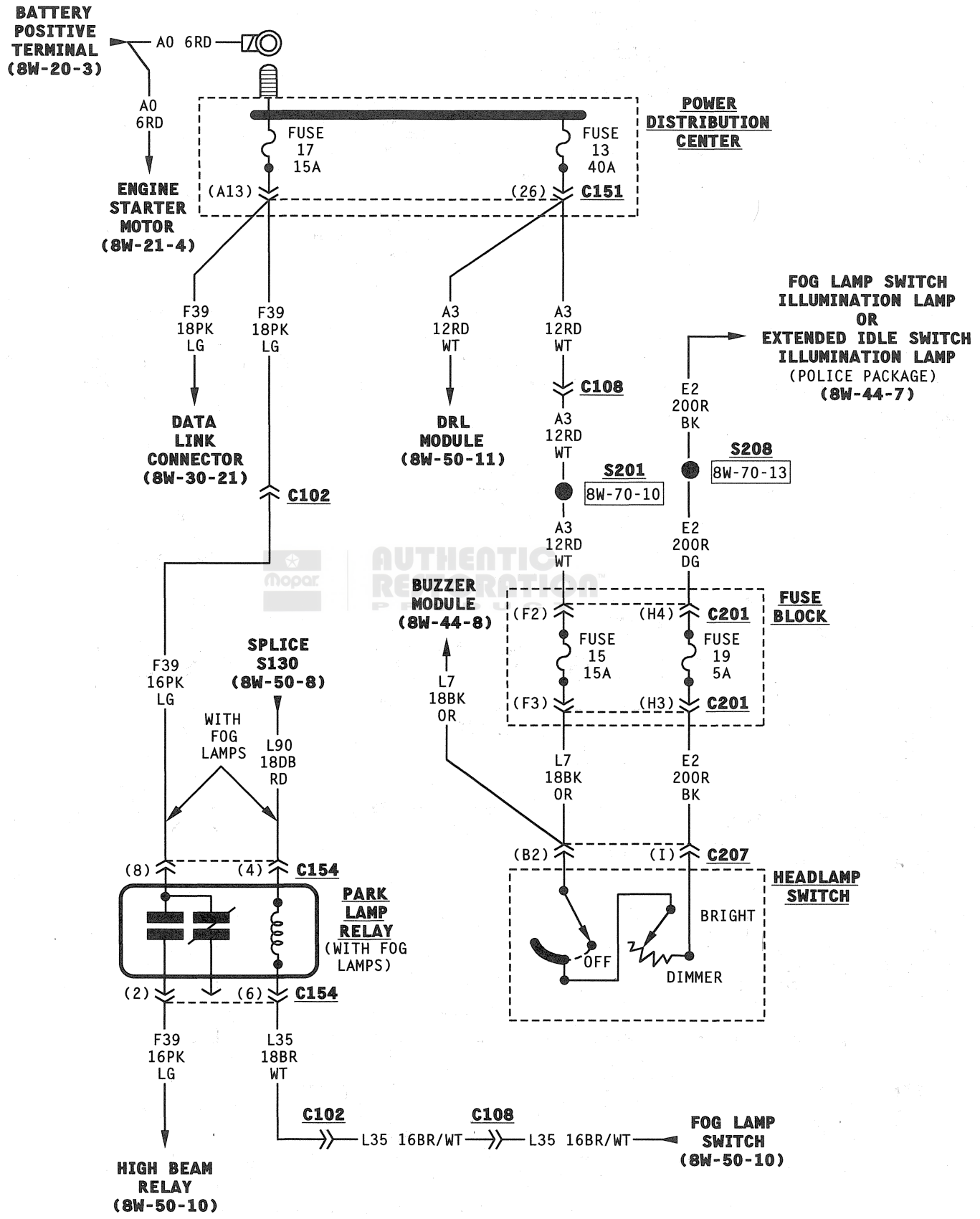

POWER DISTRIBUTION CENTER
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 13
C151
40A
(26)
A3 12RD/WT
FUSE 4
40A
(3)
A7 12RD/YL
C108
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A7 12RD/YL
(G5)
C201
FUSE BLOCK
FUSE 11 25A
(E4)
C201
A3 12RD WT
S201
8W-70-10
FUSED IGNITION SWITCH OUTPUT
SHIFT INTERLOCK
(2)
C244
X4 16GY OR
SPLICE S217 (8W-50-4) (8W-70-15)
F87 20WT BK
F87 20WT BK
A3 12RD WT
(8)
(2)
C233
HEADLAMP DELAY MODULE
(B1)
C207
HEADLAMP SWITCH
HEAD
OFF
PARK
(H)
C207
(4)
(6)
C233
Z1 18BK
F34 14TN BK
F34 14TN BK
Z1 18BK
S205
8W-70-11
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
Z1 12BK
G201
8W-15-6,7
S212
8W-70-14

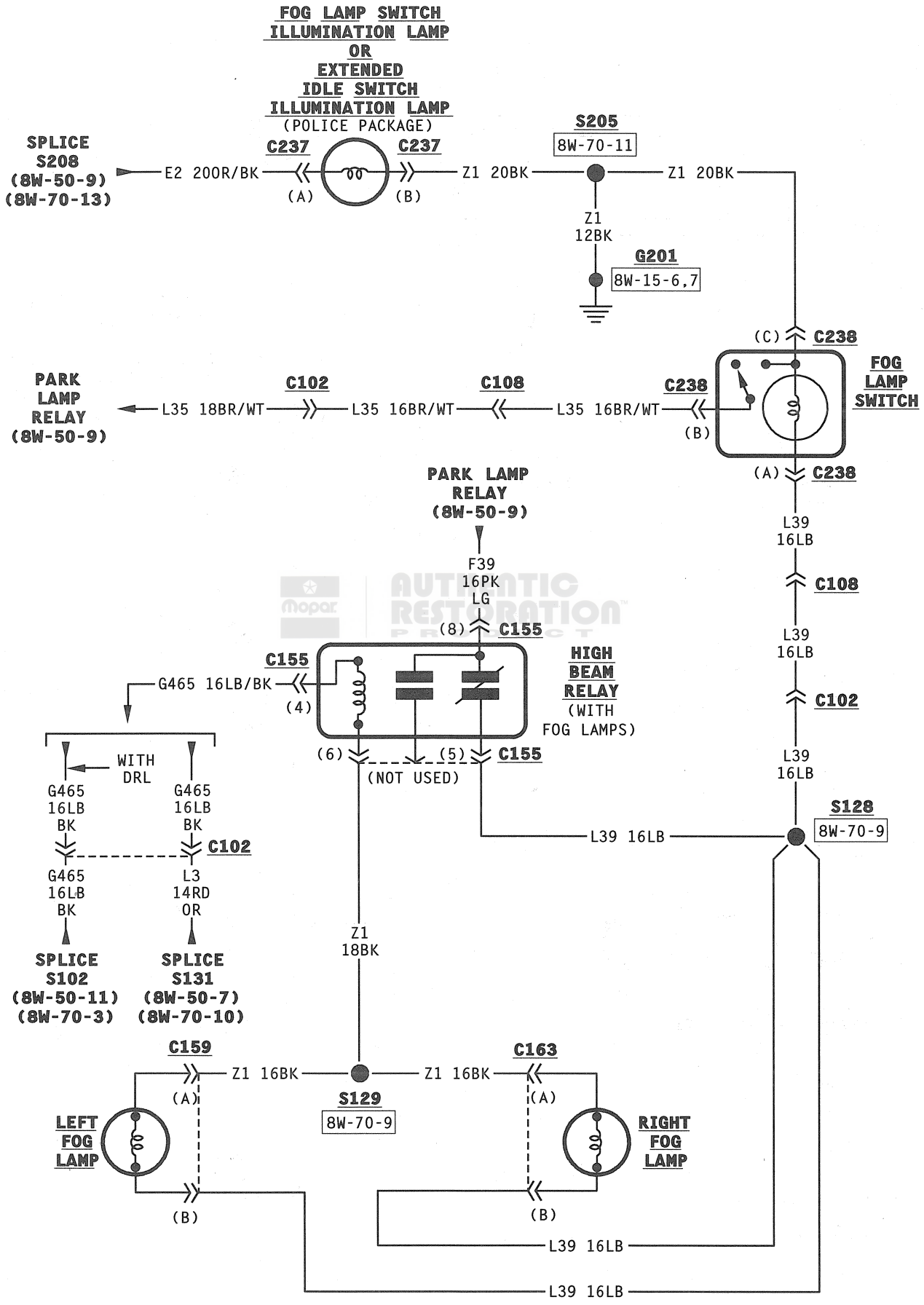

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
DRL MODULE (8W-50-11)
A3 12RD/WT
A3 12RD WT
S201
8W-70-10
A3 12RD/WT
A3 12RD/OR
SPLICE S131 (8W-50-8) (8W-70-10)
BUZZER MODULE (8W-44-8)
FUSE BLOCK
(F2) C201
FUSE 15 15A
(F3) C201
L7 18BK OR
A3 12RD WT
(C4) C201
FUSE 4 15A
(C5) C201
L11 16PK LG
FUSE BLOCK
L3 14RD OR
C102
L4 16VT/WT
LEFT AND RIGHT HEADLAMPS (8W-50-8)
L4 16VT WT
L3 16RD OR
L4 14VT WT
(B2)
(B1) C207
HEADLAMP SWITCH
OFF
PARK
OFF
PARK
HEAD
C108
L3 16RD YL
L3 16RD OR
L4 16VT WT
INSTRUMENT CLUSTER (8W-40-8)
(R)
(H) C207
(20) (18) C228
HEADLAMP DIMMER SWITCH (PART OF MULTI-FUNCTION SWITCH)
OPT
LO
HI
L90 18DB RD
F34 14TN BK
S216
8W-70-15
S212
8W-70-14
(21) (19) C228
F34 14TN BK
L90 18DB RD
C108
L90 18DB RD
C102
L90 18DB/RD
SPLICE S130 (8W-50-8) (8W-70-9)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
DRL MODULE (8W-50-11)
A3 12RD/WT
A3 12RD WT
S201
8W-70-10
A3 12RD/WT
BUZZER MODULE (8W-44-8)
FUSE BLOCK
(F2) C201
FUSE 15 15A
(F3) C201
A3 12RD WT
L7 18BK OR
L7 18BK OR
A3 12RD OR
C102
L4 16VT WT
L4 14VT WT
L4 16VT WT
LEFT AND RIGHT HEADLAMPS (8W-50-8)
(B2)
(B1) C207
HEADLAMP SWITCH
OFF
OFF
PARK
PARK
HEAD
(C4) C201
FUSE BLOCK
FUSE 4 15A
(C5) C201
L4 16VT/WT
C108
DRL MODULE (8W-30-10)
L11 16PK LG
L4 16VT WT
(R)
(H) C207
(18) C228
L90 18DB RD
F34 14TN BK
S212
8W-70-14
C228
HI
HEADLAMP DIMMER SWITCH (PART OF MULTI-FUNCTION SWITCH)
OPT
LO
(21)
S216
8W-70-15
F34 12TN BK
F34 14TN/BK
(19)
(20) C228
L90 18DB RD
C108
DRL MODULE (8W-50-11)
L3 16RD/OR
C108
L3 16RD/OR
C102
L3 14RD/OR
L3 16RD/OR
L3 16RD/OR
LEFT AND RIGHT HEADLAMPS (8W-50-8)
C102
L90 18DB/RD
SPLICE S130 (8W-50-8) (8W-70-9)

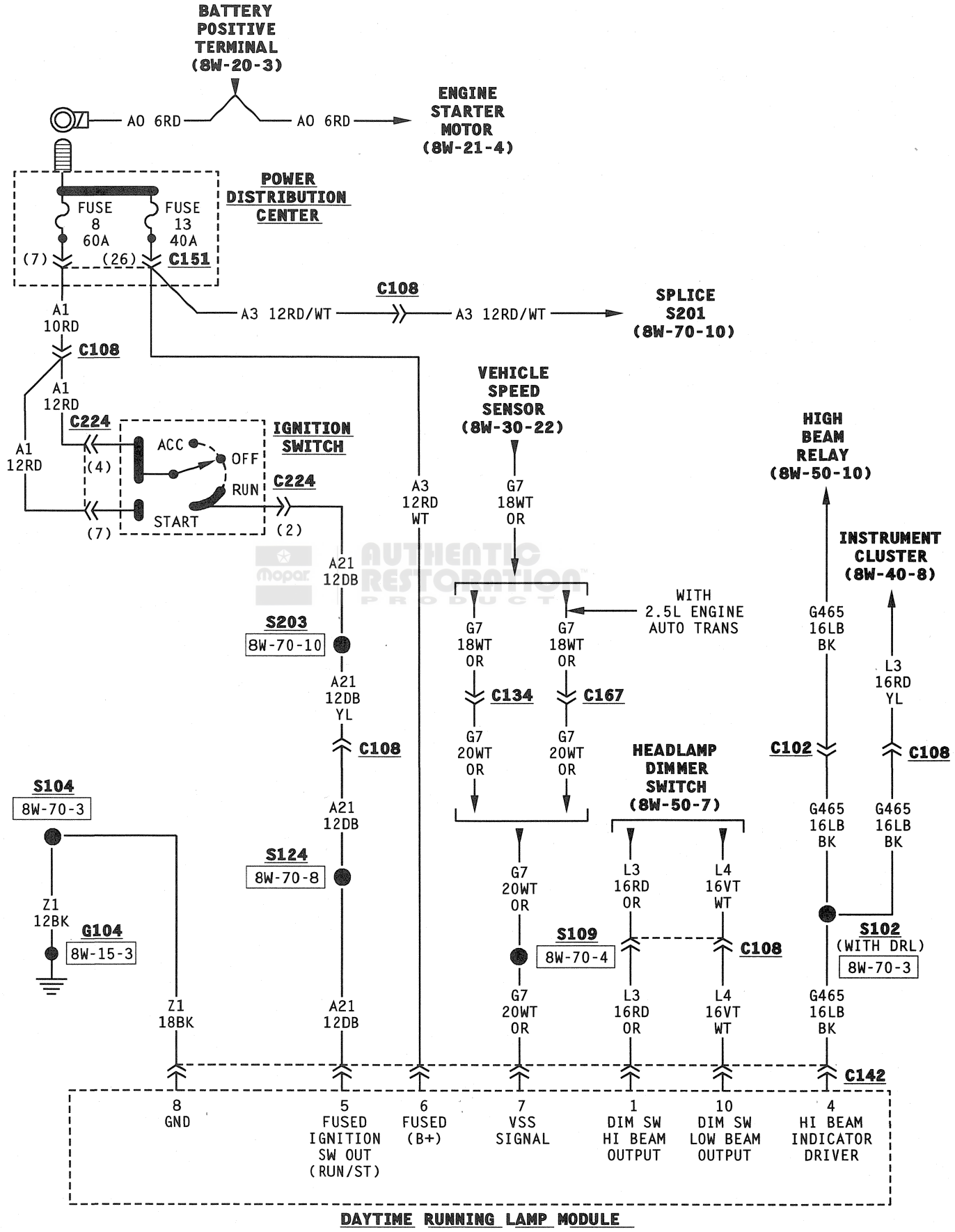


* WITH 2.5L ENG
** WITH 4.0L ENG


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 17 15A
FUSE 13 40A
(A13)
(26)
C151
POWER DISTRIBUTION CENTER
F39 18PK LG
F39 18PK LG
A3 12RD WT
A3 12RD WT
C108
FOG LAMP SWITCH ILLUMINATION LAMP OR EXTENDED IDLE SWITCH ILLUMINATION LAMP (POLICE PACKAGE) (8W-44-7)
E2 200R BK
S208
8W-70-13
S201
8W-70-10
A3 12RD WT
E2 200R DG
DATA LINK CONNECTOR (8W-30-21)
DRL MODULE (8W-50-11)
C102
BUZZER MODULE (8W-44-8)
FUSE BLOCK
(F2)
(H4)
C201
FUSE 15 15A
FUSE 19 5A
(F3)
(H3)
C201
L7 18BK OR
F39 16PK LG
SPLICE S130 (8W-50-8)
WITH FOG LAMPS
L90 18DB RD
L7 18BK OR
E2 200R BK
(B2)
(I)
C207
HEADLAMP SWITCH
BRIGHT
OFF
DIMMER
(8)
(4)
C154
PARK LAMP RELAY (WITH FOG LAMPS)
(2)
(6)
C154
F39 16PK LG
L35 18BR WT
C102
C108
L35 16BR/WT
L35 16BR/WT
FOG LAMP SWITCH (8W-50-10)
HIGH BEAM RELAY (8W-50-10)


FOG LAMP SWITCH ILLUMINATION LAMP OR EXTENDED IDLE SWITCH ILLUMINATION LAMP (POLICE PACKAGE)
SPLICE S208 (8W-50-9) (8W-70-13)
E2 20OR/BK
C237
(A)
C237
(B)
Z1 20BK
S205
8W-70-11
Z1 20BK
Z1 12BK
G201
8W-15-6,7
(C) C238
FOG LAMP SWITCH
C238
(B)
PARK LAMP RELAY (8W-50-9)
L35 18BR/WT
C102
L35 16BR/WT
C108
L35 16BR/WT
C238
(A) C238
PARK LAMP RELAY (8W-50-9)
F39 16PK LG
(8) C155
L39 16LB
C108
L39 16LB
C102
L39 16LB
C155
(4)
G465 16LB/BK
HIGH BEAM RELAY (WITH FOG LAMPS)
(6)
(5) C155
(NOT USED)
WITH DRL
G465 16LB BK
G465 16LB BK
C102
G465 16LB BK
L3 14RD OR
SPLICE S102 (8W-50-11) (8W-70-3)
SPLICE S131 (8W-50-7) (8W-70-10)
L39 16LB
S128
8W-70-9
Z1 18BK
C159
Z1 16BK
(A)
S129
8W-70-9
Z1 16BK
C163
(A)
LEFT FOG LAMP
RIGHT FOG LAMP
(B)
(B)
L39 16LB
L39 16LB

(WITH DAYTIME RUNNING LAMPS)



Mopar AUTHENTIC RESTORATION PRODUCTS

8W-51 REAR LIGHTING

DIAGNOSIS AND TESTING

TAIL LAMPS AND REAR LICENSE PLATE LAMPS

Circuit A3 from fuse 13 in the Power Distribution Center (PDC) connects to a bus bar in the fuse block which feeds circuit L7. Fuse 15 in the fuse block protects circuit L7.

The headlamp switch has three positions: ON, PARK (parking lamps) and OFF, plus a dimmer switch. When the headlamp switch is in the PARK or ON position, the switch connects circuit L7 to circuit L90. From the headlamp switch, circuit L90 branches to power the front parking lamps and rear tail lamps, side marker lamps, and rear license plate lamps.

GROUND CIRCUIT

Circuit Z1 provides a ground for the parking lamps, tail lamps, and rear license plate lamps.

HELPFUL INFORMATION

- If the vehicle is equipped with factory installed trailer tow, circuit L90 splices to the trailer tow harness.
- Check fuse 13 in PDC.
- Check fuse 15 in the fuse block.
- When the headlamp switch is in the PARK or ON position, circuit L7 also connects to circuit E2. Circuit E2 continues through fuse 19 in the fuse block. Circuit E2 powers the illumination lamps.

STOP LAMPS AND CHMSL LAMPS

Circuit L9 from fuse 2 in the Power Distribution Center (PDC) connects to the stop lamp switch.

When the operator presses the brake pedal, the stop lamp switch CLOSES and connects circuit L9 to circuit L50. Circuit L50 connects to the stop lamps and Center High Mounted Stop Lamps (CHMSL). Circuit Z1 provides a ground for the stop lamps and CHMSL lamps.

HELPFUL INFORMATION

- Check fuse 2 in the PDC.
- Check for continuity across the stop lamp switch when it is closed.

BACK-UP LAMPS

In the START or RUN position, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 feeds a bus bar in the PDC that powers circuit F12 through fuse 18.

Circuit F12 supplies power to the back-up lamp switch. On automatic transmission equipped vehicles, the back-up lamp switch is part of an assembly that includes the PARK/NEUTRAL position switch. When the operator puts the transmission in REVERSE, the back-up lamp switch connects circuit F12 to circuit L10. Circuit L10 feeds the back-up lamps. Circuit Z1 provides ground for the back-up lamps.

HELPFUL INFORMATION

- Check fuses 8 and 18 in the PDC.
- Check for continuity across the back-up lamp switch when it is closed.

SCHEMATICS AND DIAGRAMS

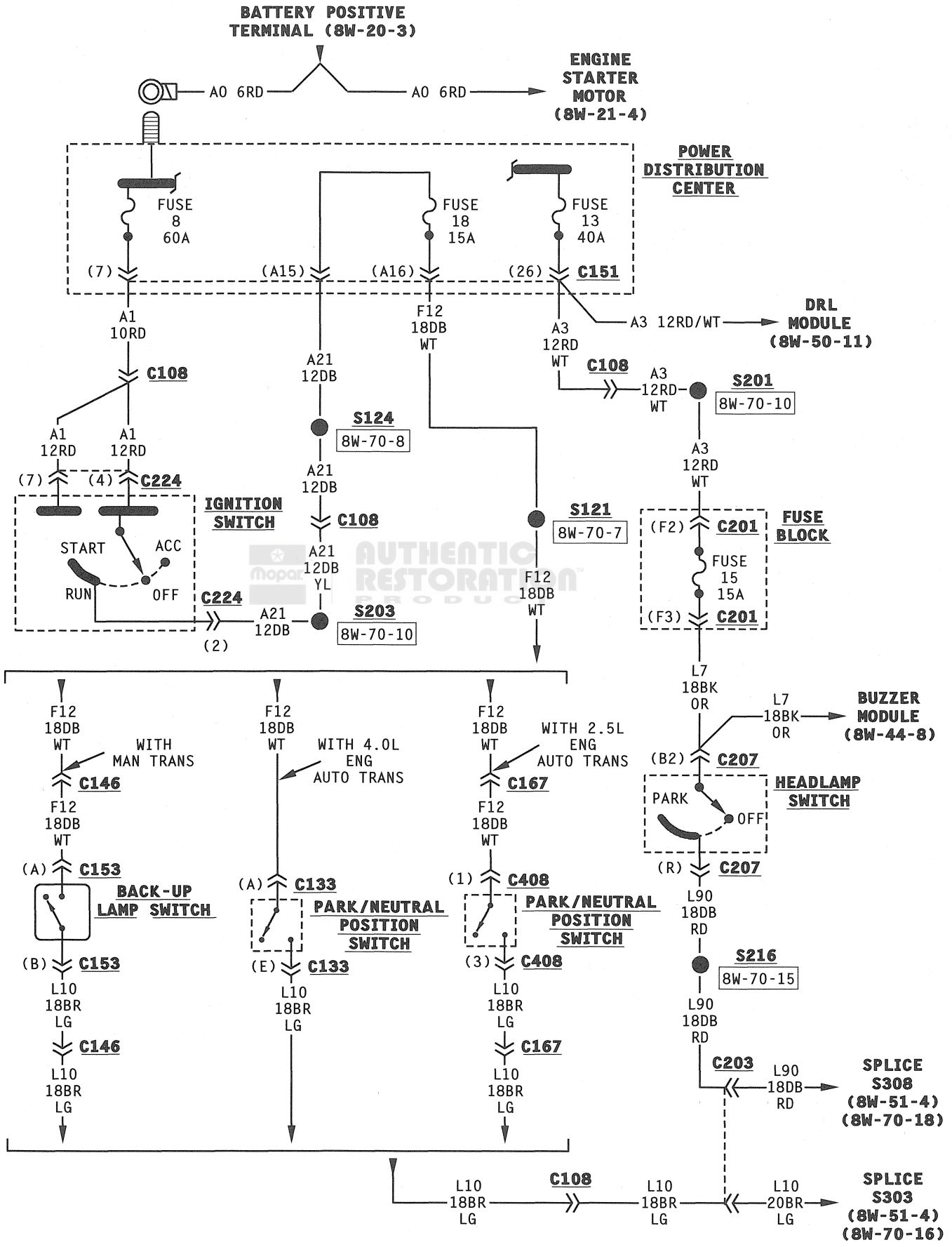
WIRING DIAGRAM INDEX

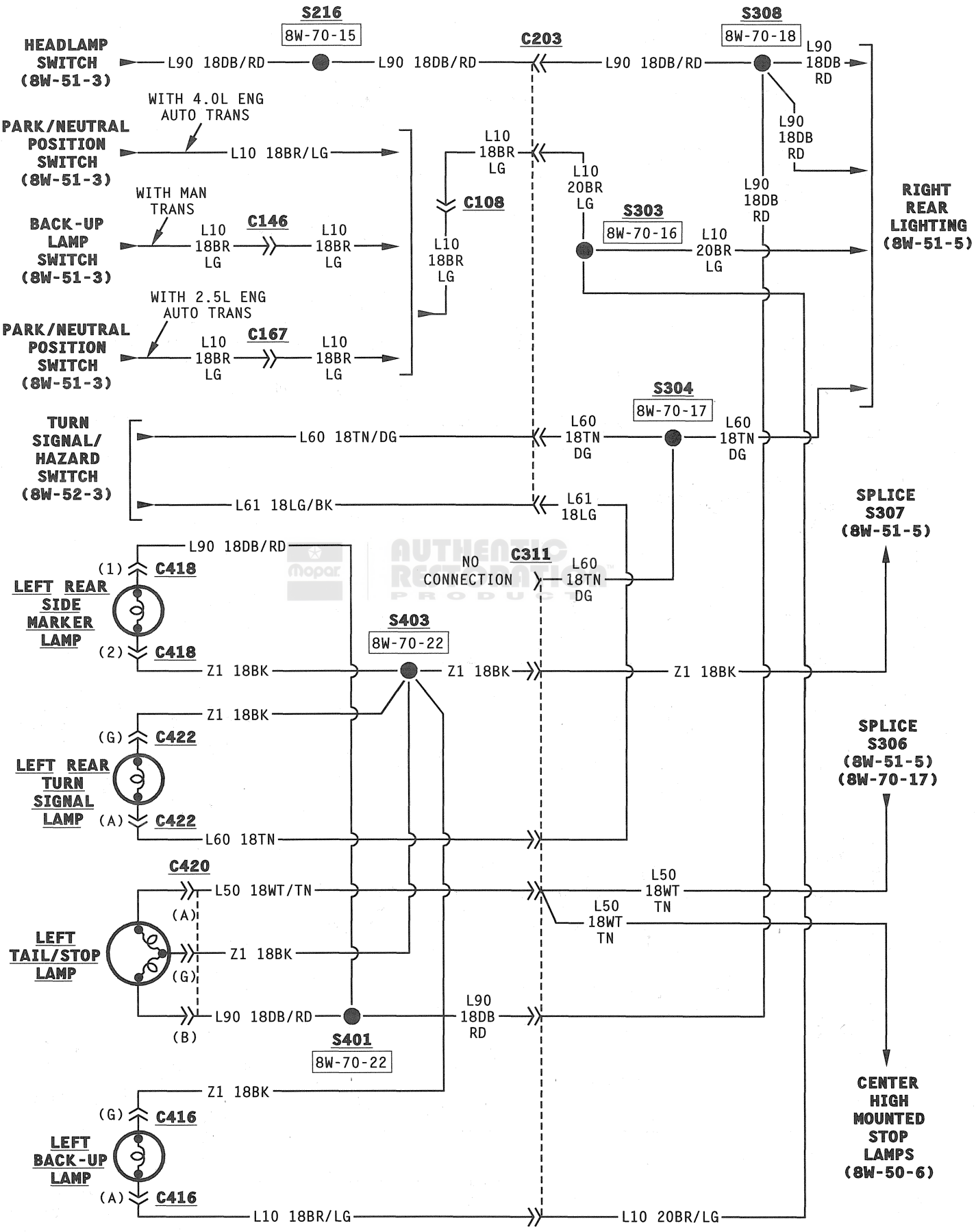
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

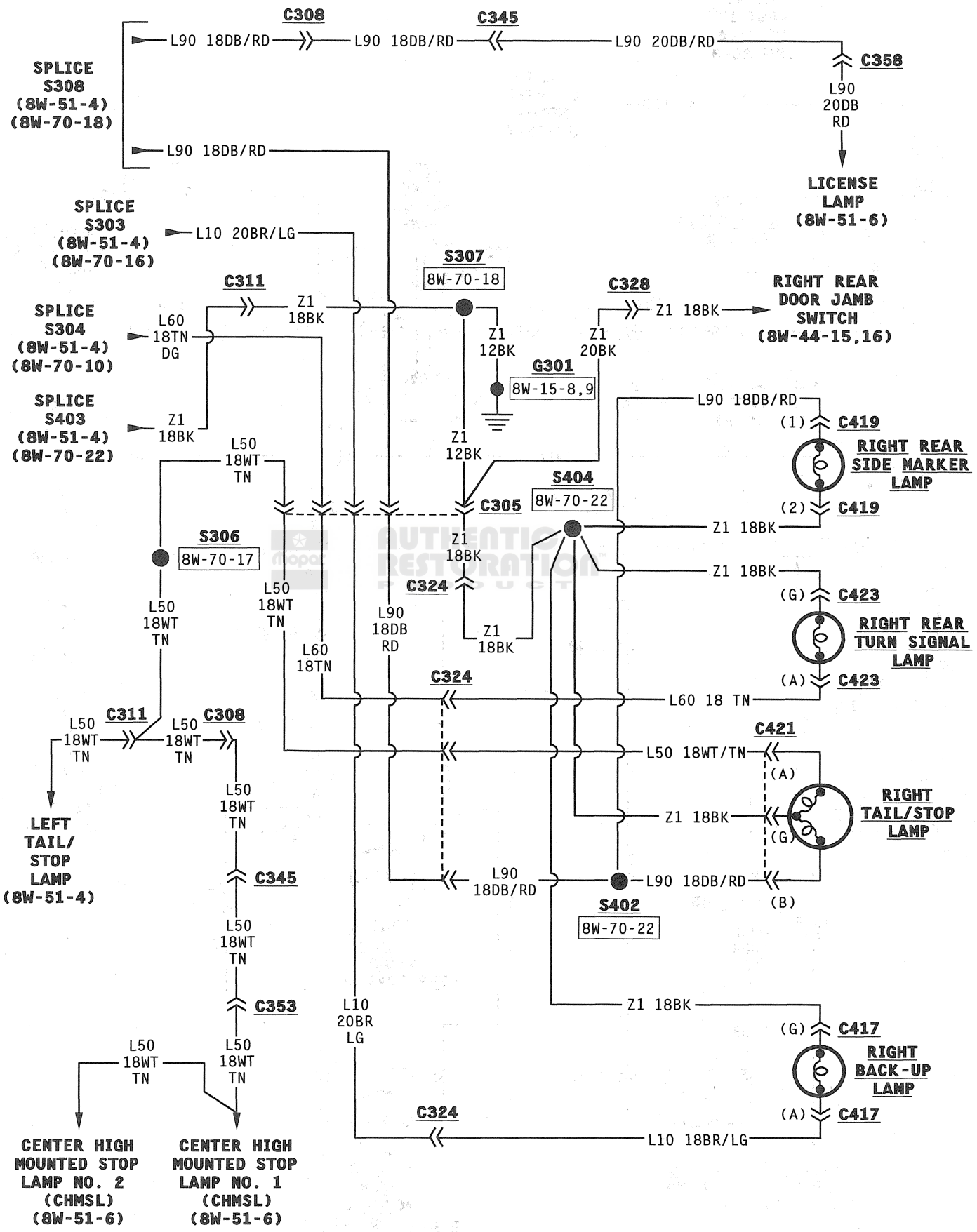
DIAGRAM INDEX

Component	Page
Back-Up Lamps	8W-51-4, 5
Back-Up Lamp Switch	8W-51-3
Center High Mounted Stop Lamps (CHMSL)	8W-51-6
Fuse 2 (PDC)	8W-51-6
Fuse 8 (PDC)	8W-51-3
Fuse 13 (PDC)	8W-51-3
Fuse 15	8W-51-3
Fuse 18 (PDC)	8W-51-3
Headlamp Switch	8W-51-3
Ignition Switch	8W-51-3
License Lamp	8W-51-6
Park/Neutral Position Switch	8W-51-3
Powertrain Control Module	8W-51-7
Rear Side Marker Lamps	8W-51-4, 5
Stop Lamp Switch	8W-51- 6
Tail/Stop Lamps	8W-51-4, 5
Transmission Control Module	8W-51- 7
Turn Signal Lamps	8W-51- 4, 5

Mopar AUTHENTIC RESTORATION PRODUCT

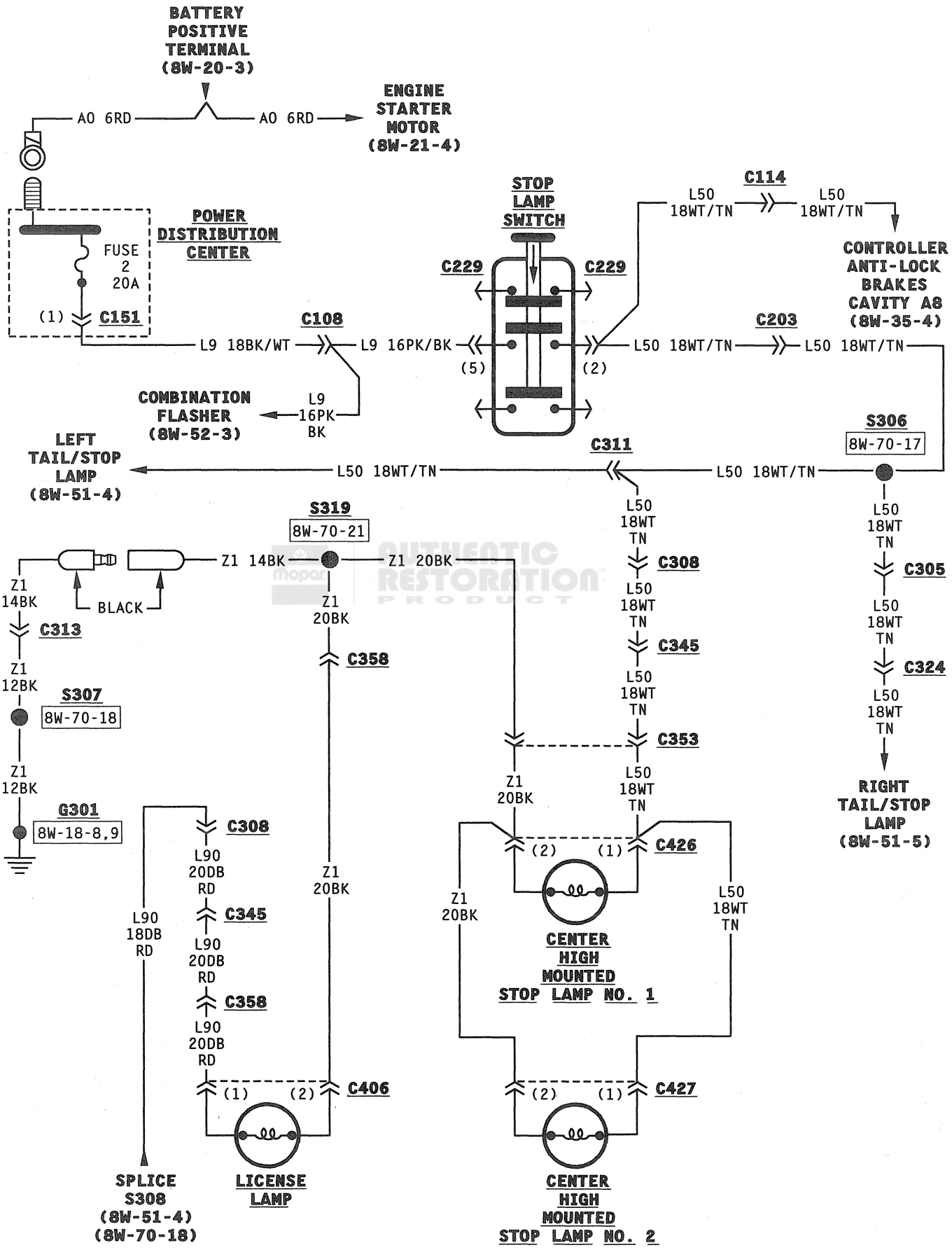

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 8 60A
FUSE 18 15A
FUSE 13 40A
(7)
(A15)
(A16)
(26)
C151
A1 10RD
C108
A21 12DB
F12 18DB WT
A3 12RD WT
A3 12RD/WT
DRL MODULE (8W-50-11)
C108
S201
8W-70-10
A1 12RD
A1 12RD
(7)
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
S124
8W-70-8
A21 12DB
C108
A21 12DB YL
C224
(2)
A21 12DB
S203
8W-70-10
S121
8W-70-7
F12 18DB WT
A3 12RD WT
(F2)
C201
FUSE 15 15A
(F3)
C201
FUSE BLOCK
L7 18BK OR
L7 18BK OR
BUZZER MODULE (8W-44-8)
(B2)
C207
HEADLAMP SWITCH
PARK
OFF
(R)
C207
L90 18DB RD
S216
8W-70-15
L90 18DB RD
C203
L90 18DB RD
SPLICE S308 (8W-51-4) (8W-70-18)
F12 18DB WT
WITH MAN TRANS
C146
F12 18DB WT
(A)
C153
BACK-UP LAMP SWITCH
(B)
C153
L10 18BR LG
C146
L10 18BR LG
F12 18DB WT
WITH 4.0L ENG AUTO TRANS
(A)
C133
PARK/NEUTRAL POSITION SWITCH
(E)
C133
L10 18BR LG
F12 18DB WT
WITH 2.5L ENG AUTO TRANS
C167
F12 18DB WT
(1)
C408
PARK/NEUTRAL POSITION SWITCH
(3)
C408
L10 18BR LG
C167
L10 18BR LG
L10 18BR LG
C108
L10 18BR LG
L10 20BR LG
SPLICE S303 (8W-51-4) (8W-70-16)


S216
8W-70-15
C203
S308
8W-70-18
HEADLAMP SWITCH (8W-51-3)
L90 18DB/RD
L90 18DB/RD
L90 18DB/RD
L90 18DB RD
L90 18DB RD
WITH 4.0L ENG AUTO TRANS
PARK/NEUTRAL POSITION SWITCH (8W-51-3)
L10 18BR/LG
L10 18BR LG
L10 20BR LG
C108
S303
8W-70-16
L90 18DB RD
RIGHT REAR LIGHTING (8W-51-5)
WITH MAN TRANS
BACK-UP LAMP SWITCH (8W-51-3)
C146
L10 18BR LG
L10 18BR LG
L10 18BR LG
L10 20BR LG
WITH 2.5L ENG AUTO TRANS
PARK/NEUTRAL POSITION SWITCH (8W-51-3)
C167
L10 18BR LG
L10 18BR LG
S304
8W-70-17
TURN SIGNAL/ HAZARD SWITCH (8W-52-3)
L60 18TN/DG
L60 18TN DG
L60 18TN DG
L61 18LG/BK
L61 18LG
SPLICE S307 (8W-51-5)
L90 18DB/RD
(1) C418
LEFT REAR SIDE MARKER LAMP
(2) C418
NO CONNECTION
C311
L60 18TN DG
S403
8W-70-22
Z1 18BK
Z1 18BK
Z1 18BK
Z1 18BK
(G) C422
LEFT REAR TURN SIGNAL LAMP
(A) C422
SPLICE S306 (8W-51-5) (8W-70-17)
L60 18TN
C420
L50 18WT/TN
L50 18WT TN
L50 18WT TN
(A)
LEFT TAIL/STOP LAMP
Z1 18BK
(G)
L90 18DB/RD
L90 18DB RD
(B)
S401
8W-70-22
Z1 18BK
(G) C416
LEFT BACK-UP LAMP
(A) C416
CENTER HIGH MOUNTED STOP LAMPS (8W-50-6)
L10 18BR/LG
L10 20BR/LG

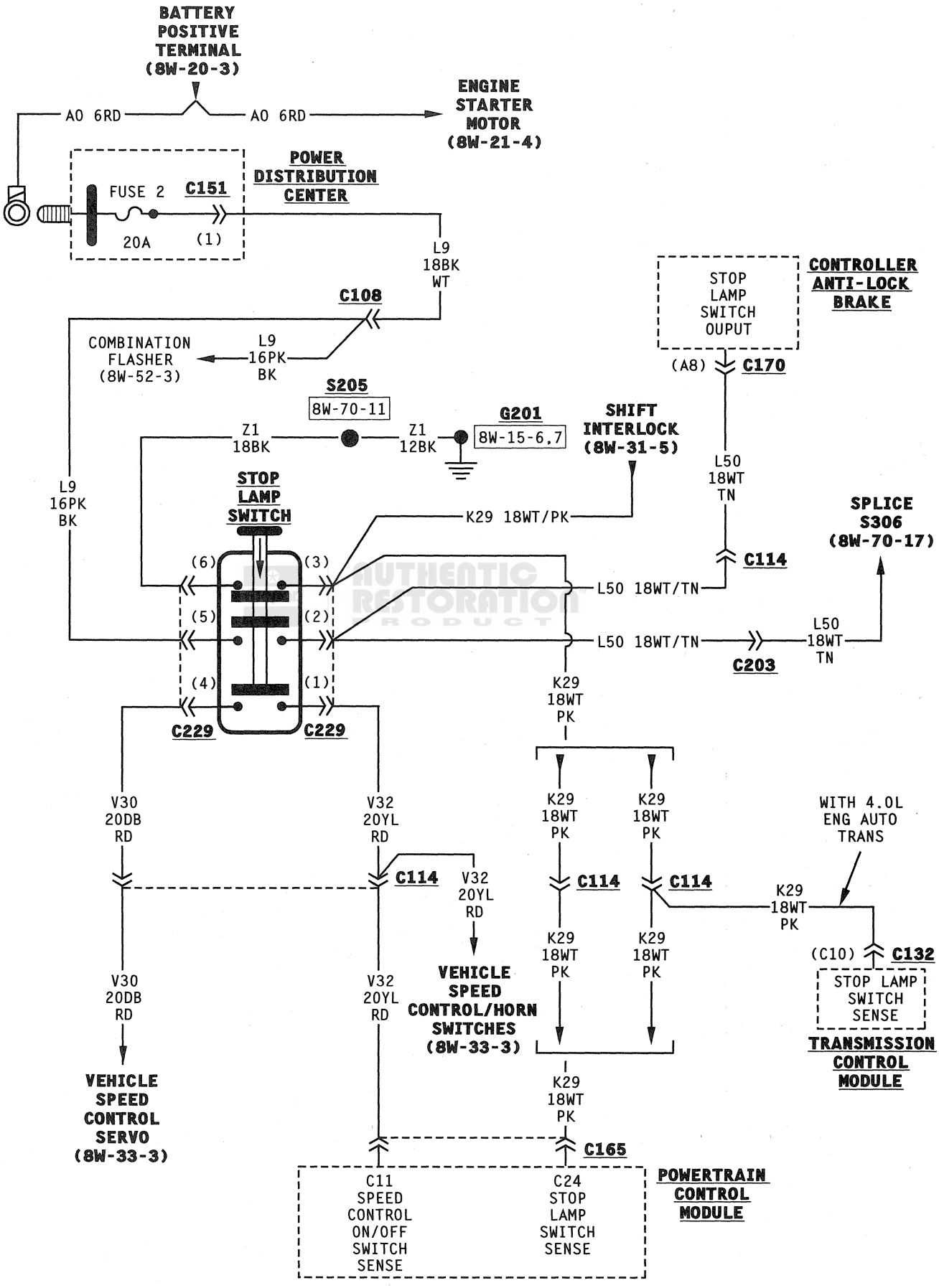


8040d000

J968W-7



Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
POWER DISTRIBUTION CENTER
FUSE 2
C151
20A
(1)
L9 18BK WT
C108
COMBINATION FLASHER (8W-52-3)
L9 16PK BK
S205
8W-70-11
G201
8W-15-6,7
Z1 18BK
Z1 12BK
SHIFT INTERLOCK (8W-31-5)
STOP LAMP SWITCH OUPUT
CONTROLLER ANTI-LOCK BRAKE
(A8)
C170
L50 18WT TN
C114
SPLICE S306 (8W-70-17)
L9 16PK BK
STOP LAMP SWITCH
K29 18WT/PK
(6)
(3)
(5)
(2)
(4)
(1)
C229
C229
L50 18WT/TN
L50 18WT/TN
L50 18WT TN
C203
K29 18WT PK
V30 20DB RD
V32 20YL RD
C114
V32 20YL RD
K29 18WT PK
K29 18WT PK
C114
C114
WITH 4.0L ENG AUTO TRANS
K29 18WT PK
(C10)
C132
STOP LAMP SWITCH SENSE
TRANSMISSION CONTROL MODULE
V30 20DB RD
V32 20YL RD
VEHICLE SPEED CONTROL/HORN SWITCHES (8W-33-3)
K29 18WT PK
K29 18WT PK
VEHICLE SPEED CONTROL SERVO (8W-33-3)
K29 18WT PK
C165
C11 SPEED CONTROL ON/OFF SWITCH SENSE
C24 STOP LAMP SWITCH SENSE
POWERTRAIN CONTROL MODULE

8W-52 TURN SIGNALS

DESCRIPTION AND OPERATION

TURN SIGNALS

When the operator selects the right turn signal, the multi-function switch connects power from circuit L5 to circuit L60. Circuit L60 feeds the right front and right rear turn signal lamps. Circuit L60 also splices to power the right turn signal indicator lamp on the instrument cluster.

When the operator selects the left turn signal, the multi-function switch connects power from circuit L5 to circuit L61. Circuit L61 feeds the left front and left rear turn signal lamp. Circuit L61 also splices to power the left turn signal indicator lamp on the instrument cluster.

Circuit Z1 provides ground for the turn signal lamps.

HELPFUL INFORMATION

- The turn signal lamps are the same lamps used for the hazard flasher.
- Check fuse 8 in the PDC and fuse 8 in the fuse block if the turn signals do not operate.

COMBINATION FLASHER

In the ACCESSORY or RUN position, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48. Circuit A48 feeds circuit F83 through fuse 8 in the fuse block.

Circuit F83 powers the combination flasher for the turn signals. Circuit L9 from fuse 2 in the PDC supplies battery voltage to the combination flasher for the hazard lamps. Circuit Z1 provides ground for the combination flasher.

Circuit L5 from the flasher connects to the multi-function switch to supply power to the turn signals. The multi-function switch supplies voltage to the turn signals and side marker lamps on circuits L60 and L61.

Circuit L12 from the flasher connects to the multi-function switch to supply power to the hazard flasher circuits. The multi-function switch connects to the turn signal and side marker lamps on circuits L60 and L61.

HELPFUL INFORMATION

Circuit F83 also connects to the rear window defogger relay.

HAZARD FLASHERS

When the operator selects the hazard flashers, the multi-function switch connects circuit L12 from the combination flasher to circuits L60 and L61.

Circuit L60 feeds the right front and right rear turn signal lamp. Circuit L60 also splices to power the right turn signal indicator lamp on the instrument cluster.

Circuit L61 feeds the left front and left rear turn signal lamp. Circuit L61 also splices to power the left turn signal indicator lamp on the instrument cluster.

Circuit Z1 provides ground for the hazard flasher lamps.

HELPFUL INFORMATION

- The hazard flasher lamps are the same lamps used for the turn signals.
- Circuit L9 powers circuit L12 through the combination flasher. Circuit L9 also connects to the stop lamp switch.

SCHEMATICS AND DIAGRAMS

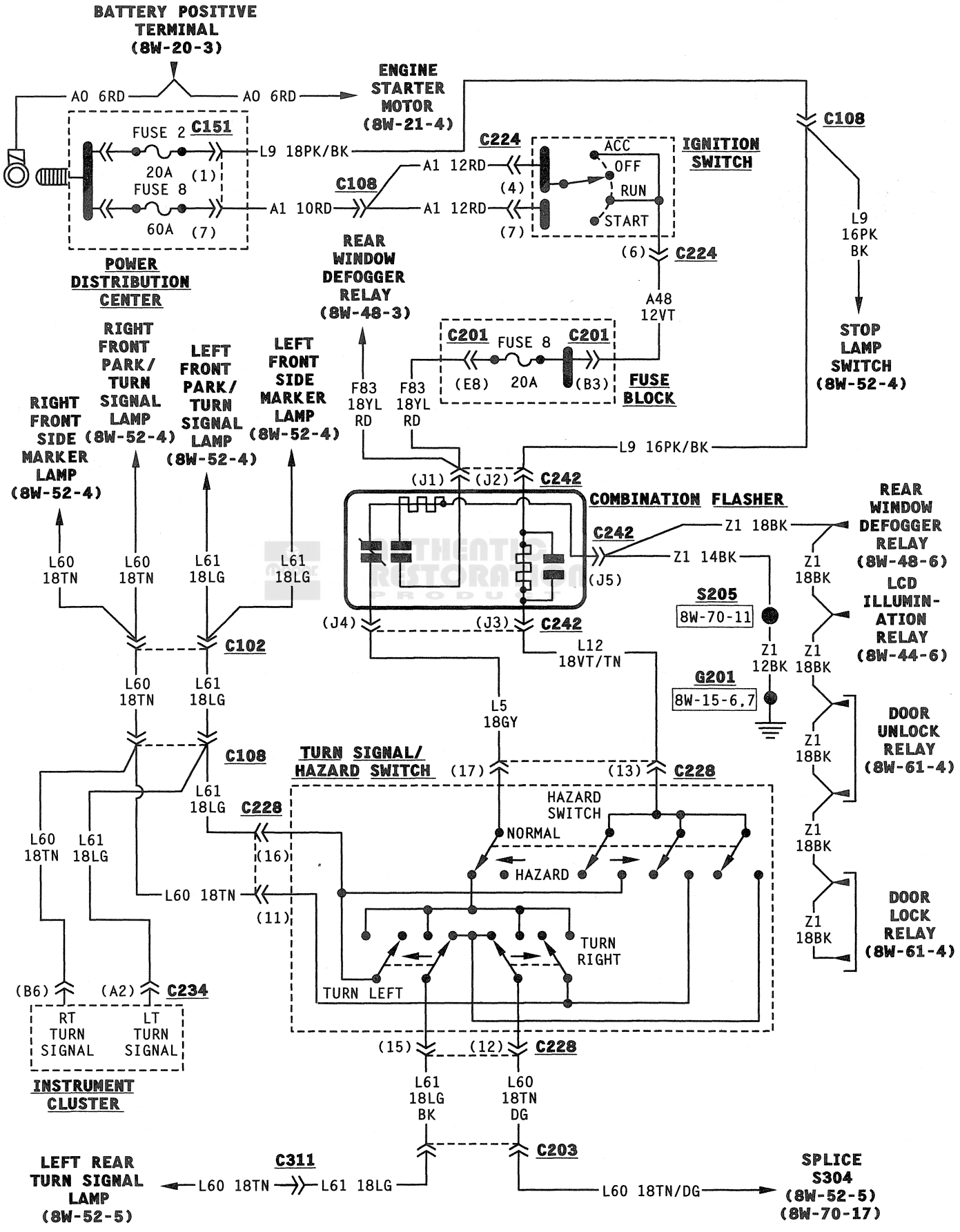
WIRING DIAGRAM INDEX

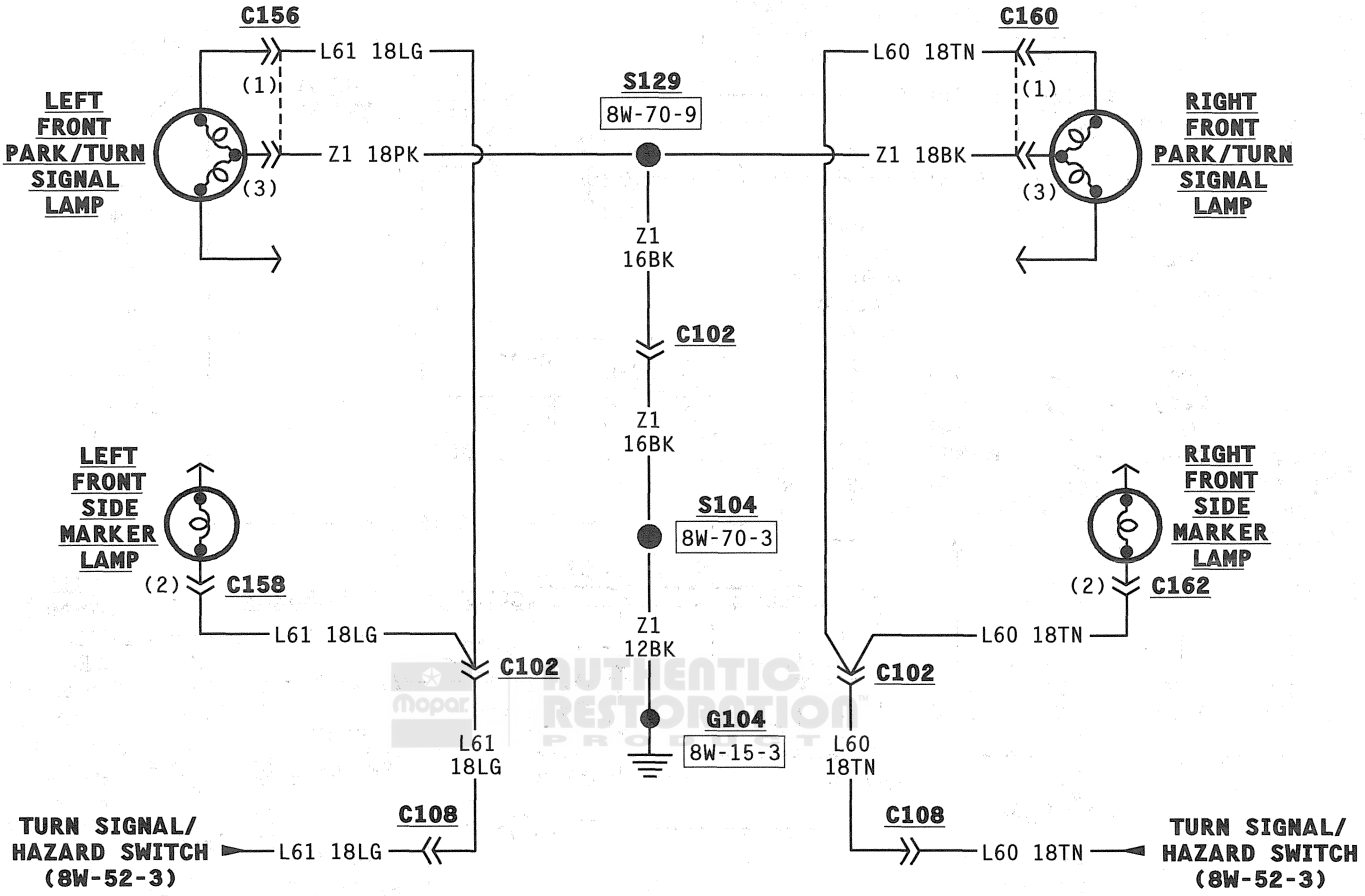
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

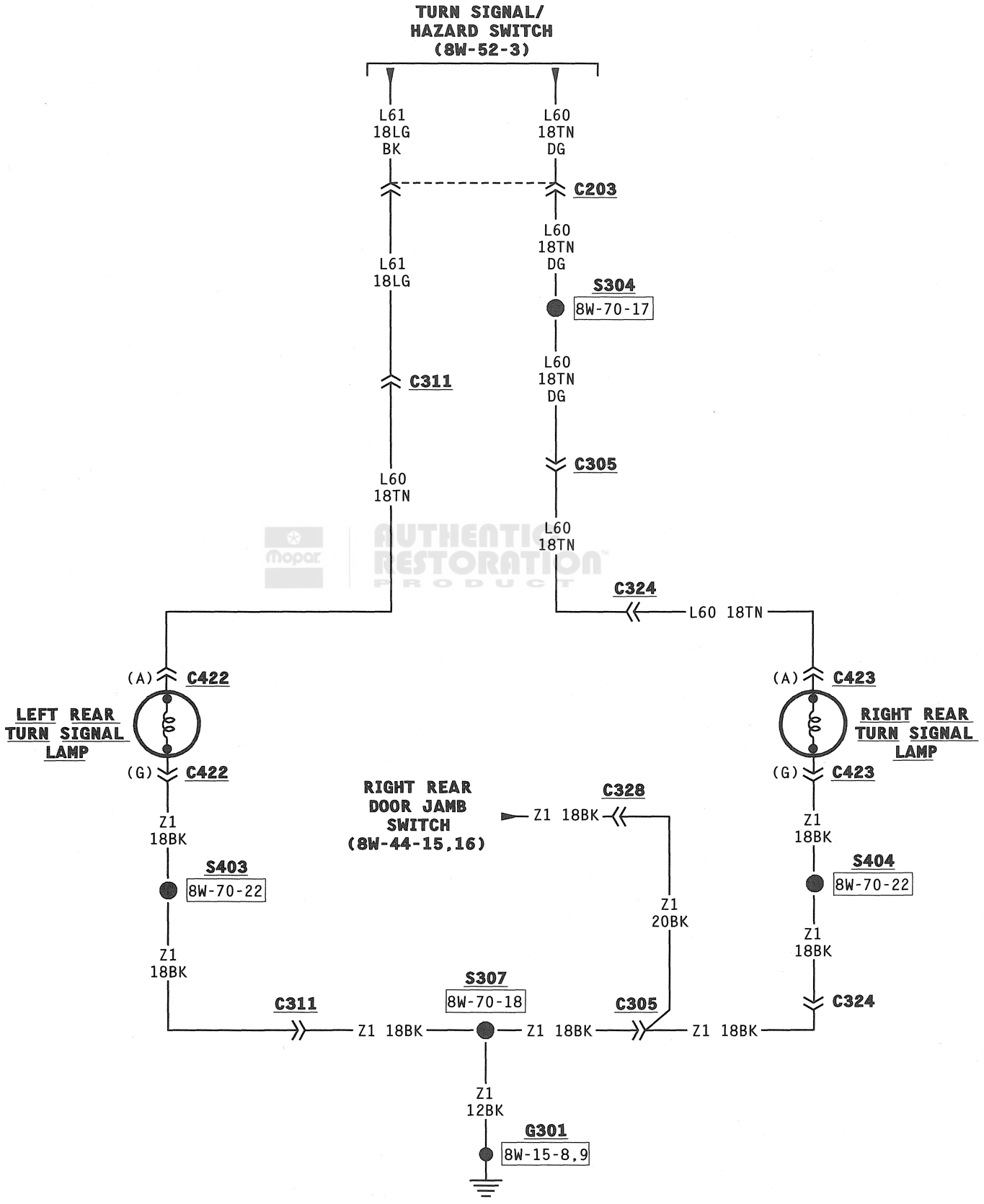
Component	Page
Combination Flasher	8W-52-3
Front Park/Turn Signal Lamps	8W-52-4
Front Side Marker Lamps	8W-52-4
Fuse 2 (PDC)	8W-52-3
Fuse 8 (PDC)	8W-52-3
Fuse 8	8W-52-3
Ignition Switch	8W-52-3
Instrument Cluster	8W-52-3
Rear Turn Signal Lamps	8W-52-5
Turn Signal/Hazard Switch	8W-52-3

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 2
C151
20A (1)
FUSE 8
60A (7)
L9 18PK/BK
POWER DISTRIBUTION CENTER
C224
ACC
OFF
RUN
START
IGNITION SWITCH
A1 12RD
(4)
C108
A1 10RD
A1 12RD
(7)
C108
L9 16PK BK
STOP LAMP SWITCH (8W-52-4)
(6)
C224
A48 12VT
REAR WINDOW DEFOGGER RELAY (8W-48-3)
C201
FUSE 8
C201
(E8) 20A (B3)
FUSE BLOCK
F83 18YL RD
F83 18YL RD
RIGHT FRONT PARK/ TURN SIGNAL LAMP (8W-52-4)
LEFT FRONT PARK/ TURN SIGNAL LAMP (8W-52-4)
LEFT FRONT SIDE MARKER LAMP (8W-52-4)
RIGHT FRONT SIDE MARKER LAMP (8W-52-4)
L9 16PK/BK
(J1)
(J2)
C242
COMBINATION FLASHER
C242
Z1 18BK
Z1 14BK
(J5)
(J4)
(J3)
C242
REAR WINDOW DEFOGGER RELAY (8W-48-6)
Z1 18BK
LCD ILLUMINATION RELAY (8W-44-6)
S205
8W-70-11
Z1 12BK
G201
8W-15-6,7
L12 18VT/TN
L60 18TN
L60 18TN
L61 18LG
L61 18LG
C102
L60 18TN
L61 18LG
L5 18GY
C108
TURN SIGNAL/ HAZARD SWITCH
(17)
(13)
C228
DOOR UNLOCK RELAY (8W-61-4)
DOOR LOCK RELAY (8W-61-4)
L61 18LG
C228
HAZARD SWITCH
NORMAL
HAZARD
L60 18TN
L61 18LG
(16)
L60 18TN
(11)
TURN RIGHT
TURN LEFT
(B6)
(A2)
C234
RT TURN SIGNAL
LT TURN SIGNAL
INSTRUMENT CLUSTER
(15)
(12)
C228
L61 18LG BK
L60 18TN DG
C203
C311
LEFT REAR TURN SIGNAL LAMP (8W-52-5)
L60 18TN
L61 18LG
L60 18TN/DG
SPLICE S304 (8W-52-5) (8W-70-17)



Mopar AUTHENTIC RESTORATION PROJECT


TURN SIGNAL/
HAZARD SWITCH
(8W-52-3)
L61
18LG
BK
L60
18TN
DG
C203
L60
18TN
DG
L61
18LG
S304
8W-70-17
L60
18TN
DG
C311
C305
L60
18TN
L60
18TN
C324
L60 18TN
(A)
C422
LEFT REAR
TURN SIGNAL
LAMP
(G)
C422
(A)
C423
RIGHT REAR
TURN SIGNAL
LAMP
(G)
C423
RIGHT REAR
DOOR JAMB
SWITCH
(8W-44-15,16)
C328
Z1 18BK
Z1
18BK
S403
8W-70-22
Z1
18BK
Z1
20BK
Z1
18BK
S404
8W-70-22
Z1
18BK
S307
8W-70-18
C311
Z1 18BK
Z1 18BK
C305
Z1 18BK
C324
Z1
12BK
G301
8W-15-8,9

8W-53 WIPERS

DESCRIPTION AND OPERATION

INTERMITTENT WIPERS

A circuit breaker powers the intermittent wiper system. The intermittent wiper system operates at either LOW or HIGH or DELAY speeds.

In the ACCESSORY or RUN position, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) with circuit A48. Circuit A48 supplies voltage to circuit F86 through the circuit breaker near the left kick panel.

Circuit F86 supplies power to the front wiper motor and the intermittent wiper control module. Circuit Z1 provides ground for the front wiper motor and the intermittent wiper control module.

When the operator moves the wiper switch to the LOW position, battery voltage passes through the switch to circuit V3. Circuit V3 feeds the wiper motor low speed brushes. If the operator selects wiper HIGH speed operation, the wiper switch passes current to circuit V4. Circuit V4 feeds the wiper motor high speed brushes.

The DELAY portion of the wiper switch contains a variable resistor. The variable resistor connects to the intermittent wiper module on circuit V51. The amount of delay selected by the operator determines the voltage drop through the resistor and the voltage level received by the intermittent wiper module.

After the intermittent wiper control module determines the amount of delay selected, it cycles the wipers by periodically energizing circuit V3. Circuit V3 powers the wiper motor low speed brushes.

As the windshield wiper motor turns, the park switch, internal to the motor, moves from its DOWN position to the UP position. When the wiper switch is turned OFF, the V55 circuit prevents the wipers from stopping in any position but park.

The windshield washer uses a pump motor located inside the windshield washer fluid reservoir. When the washer switch is pressed, circuit V11 provides an input to the intermittent wiper module. The module powers the pump motor on circuit V10. Circuit Z1 provides ground for the pump motor.

HELPFUL INFORMATION

Circuit Z1 also provides ground for the rear wiper washer pump.

REAR WIPER SYSTEM

In the RUN position, the ignition switch connects circuit A1 from fuse 8 in the PDC with circuit A38. Circuit A38 connects to a fuse block bus bar that powers circuit V15 through the fuse in cavity 1. Circuit V15 supplies power to the rear wiper switch.

In the WIPE or WASH positions, the rear wiper switch supplies voltage to the wiper motor on circuit V13. Circuit Z1 provides ground for the wiper motor.

The rear windshield washer uses a pump motor located inside the windshield washer fluid reservoir. When the rear wiper switch is in the WASH position, power is supplied through the wiper switch to the rear wiper on circuit V13 and the rear washer pump motor on circuit V20. Circuit Z1 provides ground for the rear washer pump motor.

As the rear wiper motor turns, the park switch, internal to the motor, moves from the RUN position to the PARK position. When the wiper switch is turned OFF, the F20 circuit prevents the wipers from stopping in any position but park.

LOW WASHER FLUID WARNING LAMP

Circuit G29 connects the low washer fluid switch to the warning lamp in the instrument cluster. Circuit F12 supplies battery voltage to the switch.

When the low washer fluid switch closes, it connects circuits G29 and F12. Battery voltage from circuit F12 powers the low washer fluid lamp. Circuit Z1 at the instrument cluster provides ground to illuminate the warning lamp.

SCHEMATICS AND DIAGRAMS

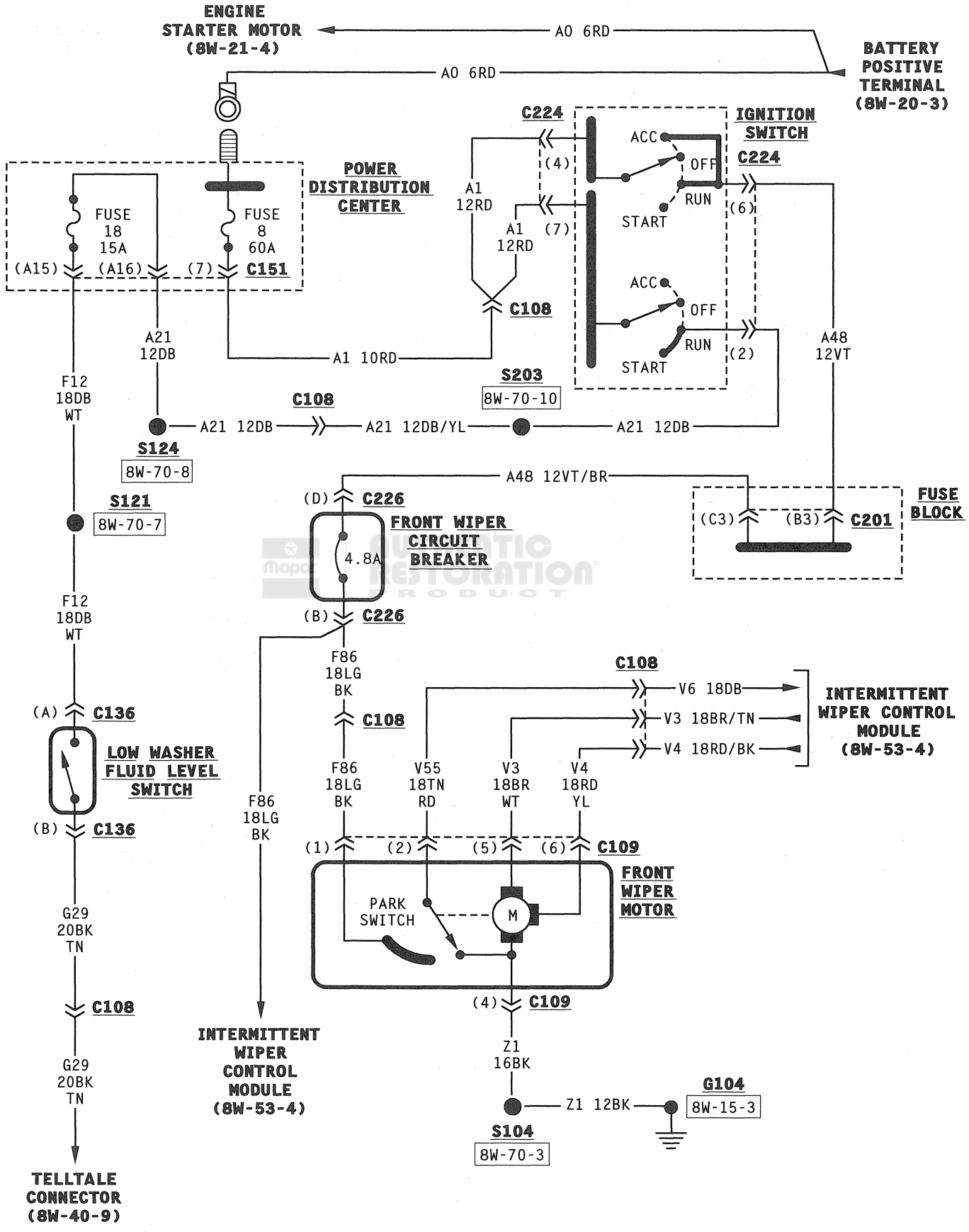
WIRING DIAGRAM INDEX

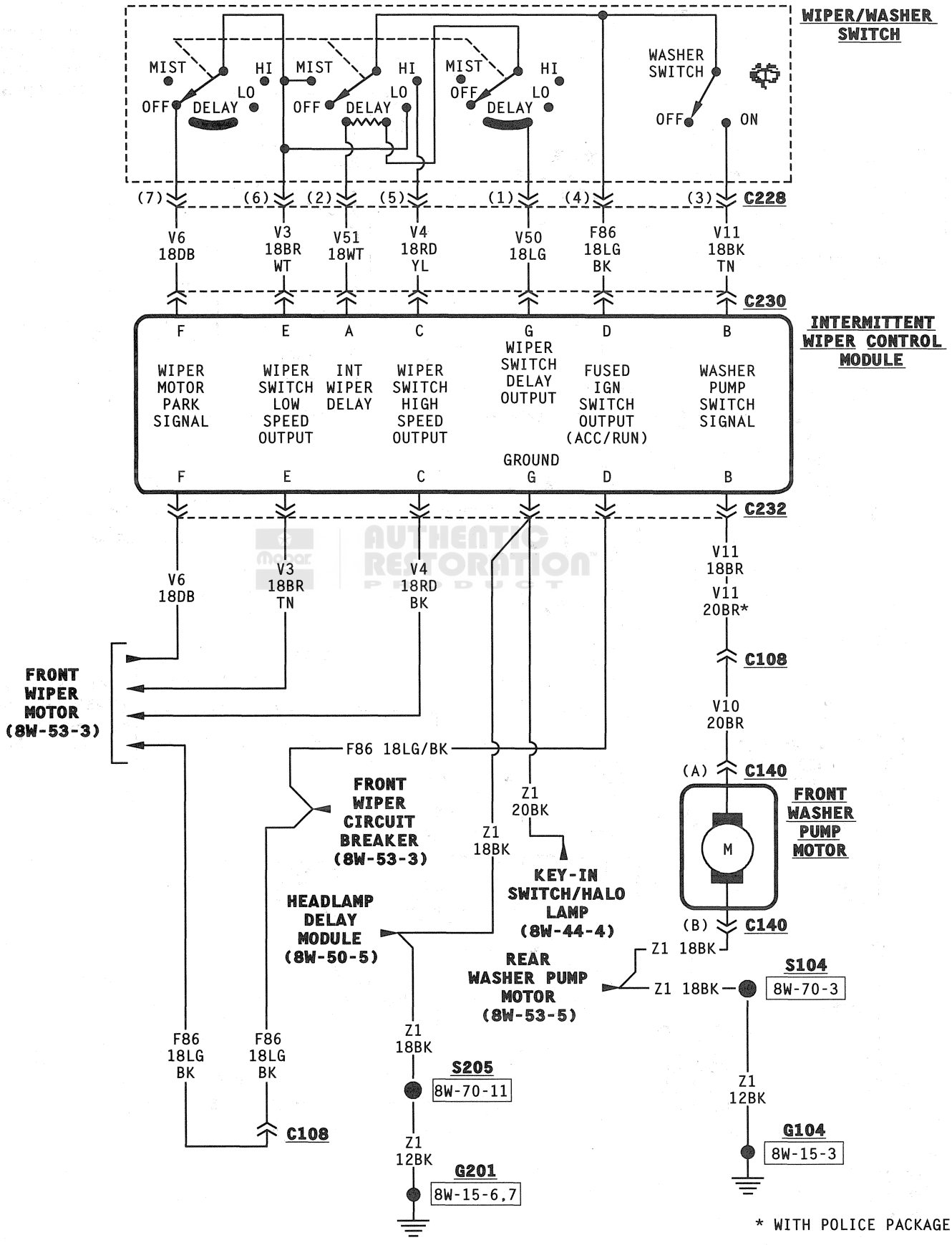
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

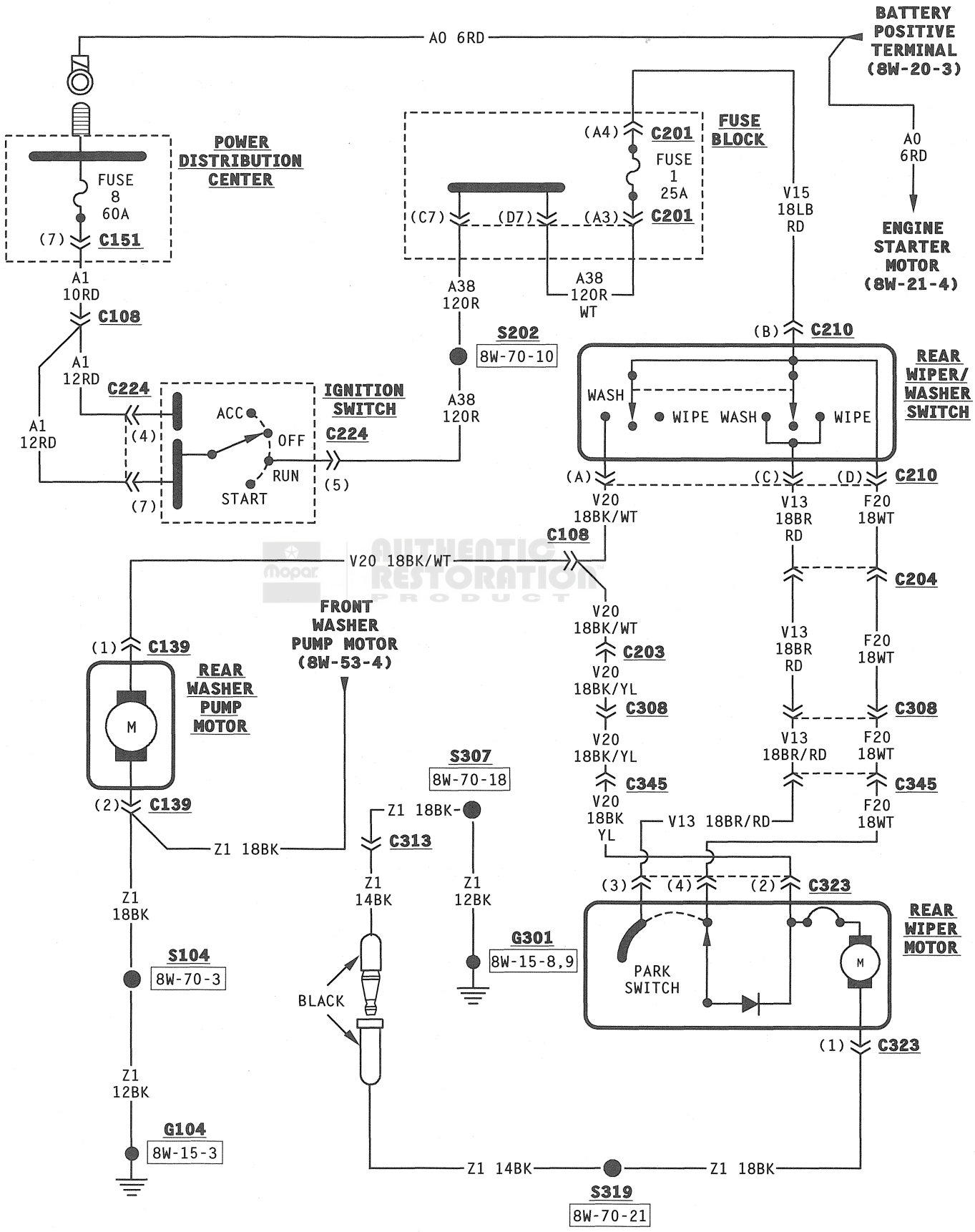
Component	Page
Front Wiper Circuit Breaker	8W-53-3
Front Wiper Motor	8W-53-3
Front Washer Pump Motor	8W-53-4
Fuse 1	8W-53-5
Fuse 8 (PDC)	8W-53-3, 5
Fuse 18 (PDC)	8W-53-3
Fuse Block	8W-53-3, 5
Ignition Switch	8W-53-3, 5
Intermittent Wiper Control Module	8W-53-4
Rear Washer Pump Motor	8W-53-5
Rear Wiper Motor	8W-53-5
Rear Wiper/Washer Switch	8W-53-5
Wiper/Washer Switch	8W-53-4

Mopar AUTHENTIC RESTORATION PRODUCT


ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
POWER DISTRIBUTION CENTER
FUSE 18 15A
FUSE 8 60A
(A15)
(A16)
(7)
C151
C224
IGNITION SWITCH
ACC
OFF
RUN
START
(4)
(6)
(7)
A1 12RD
A1 12RD
C108
A1 10RD
A21 12DB
F12 18DB WT
S124
8W-70-8
S203
8W-70-10
C108
A21 12DB
A21 12DB/YL
A21 12DB
(2)
A48 12VT
A48 12VT/BR
(D)
C226
4.8A
FRONT WIPER CIRCUIT BREAKER
(B)
C226
(C3)
(B3)
C201
FUSE BLOCK
S121
8W-70-7
F12 18DB WT
(A)
C136
LOW WASHER FLUID LEVEL SWITCH
(B)
C136
G29 20BK TN
C108
G29 20BK TN
TELLTALE CONNECTOR (8W-40-9)
F86 18LG BK
C108
C108
V6 18DB
V3 18BR/TN
V4 18RD/BK
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
F86 18LG BK
V55 18TN RD
V3 18BR WT
V4 18RD YL
F86 18LG BK
(1)
(2)
(5)
(6)
C109
FRONT WIPER MOTOR
PARK SWITCH
M
(4)
C109
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
Z1 16BK
Z1 12BK
G104
8W-15-3
S104
8W-70-3



* WITH POLICE PACKAGE


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
A1 10RD
C108
A1 12RD
C224
A1 12RD
(4)
(7)
ACC
OFF
RUN
START
IGNITION SWITCH
C224
(5)
A38 120R
S202
8W-70-10
A38 120R
FUSE BLOCK
(A4) C201
FUSE 1 25A
(C7)
(D7)
(A3) C201
A38 120R WT
V15 18LB RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
(B) C210
REAR WIPER/ WASHER SWITCH
WASH
WIPE WASH
WIPE
(A)
(C)
(D) C210
V20 18BK/WT
V13 18BR RD
F20 18WT
C108
V20 18BK/WT
C204
FRONT WASHER PUMP MOTOR (8W-53-4)
(1) C139
REAR WASHER PUMP MOTOR
M
(2) C139
Z1 18BK
V20 18BK/WT
C203
V20 18BK/YL
C308
V20 18BK/YL
C345
V20 18BK YL
V13 18BR RD
F20 18WT
C308
V13 18BR/RD
F20 18WT
C345
V13 18BR/RD
F20 18WT
S307
8W-70-18
Z1 18BK
C313
Z1 14BK
Z1 12BK
G301
8W-15-8,9
(3) (4) (2) C323
REAR WIPER MOTOR
PARK SWITCH
M
(1) C323
Z1 18BK
S104
8W-70-3
Z1 12BK
G104
8W-15-3
BLACK
Z1 14BK
Z1 18BK
S319
8W-70-21

8W-54 TRAILER TOW

DIAGNOSIS AND TESTING

TRAILER TOW

The factory installed trailer tow system in this vehicle uses three relays and a circuit breaker along with the trailer tow wiring connector located below the rear bumper.

Battery voltage for the trailer tow circuit breaker and relays is supplied on circuit A11. This circuit is HOT at all times and connects to the power accessory tap in the fuse block. An in line 10 amp circuit breaker protects circuit A11 and the trailer tow circuits. The trailer tow circuit breaker is located in the left rear quarter panel.

STOP LAMP RELAY

Power for the coil side of the stop lamp relay is supplied by circuit L50. This circuit connects to the stop lamps. Ground for the coil side is supplied on circuit Z1.

When the operator presses the brake pedal, voltage flows through the coil of the relay to ground causing the contacts in the relay to connect circuits A11 and L495.

Circuit L495 connects to the left and right turn signal relays. Voltage flows through the CLOSED contacts in the relays to the trailer tow connector.

RIGHT TURN RELAY

Power for the coil side of the right turn relay is supplied by circuit L60 from the multi-function switch. Circuit L60 connects to the right side turn signal lamps. Ground for the coil side of the relay is supplied on circuit Z1.

When the operator turns the right turn signal ON, power flows through the coil in the relay to ground causing the contacts in the relay to switch from the normally CLOSED position to connect circuits L494 and L60.

Circuit L494 is the feed for the contact side of the relay. Circuit L60 connects from the relay to the trailer tow connector.

Circuit L494 is fed power through the normally CLOSED side of the stop lamp relay by circuit A11. The A11 circuit is HOT at all times and protected by a 10 amp circuit breaker located in the left rear quarter panel.

LEFT TURN RELAY

Power for the coil side of the left turn relay is supplied by circuit L61 from the multi-function switch. Circuit L61 connects to the left side turn signal lamps. Ground for the coil side of the relay is supplied on circuit Z1.

When the operator turns the left turn signal ON, power flows through the coil in the relay to ground causing the contacts in the relay to switch from there normally CLOSED position and connect circuits L494 and L61.

Circuit L494 is the feed for the contact side of the relay. Circuit L61 connects from the relay to the trailer tow connector.

Circuit L494 is fed power through the normally CLOSED side of the stop lamp relay by circuit A11. The A11 circuit is HOT at all times and protected by a 10 amp circuit breaker located in the right rear quarter panel.

HELPFUL INFORMATION

Check the In-Line circuit breaker.

SCHEMATICS AND DIAGRAMS

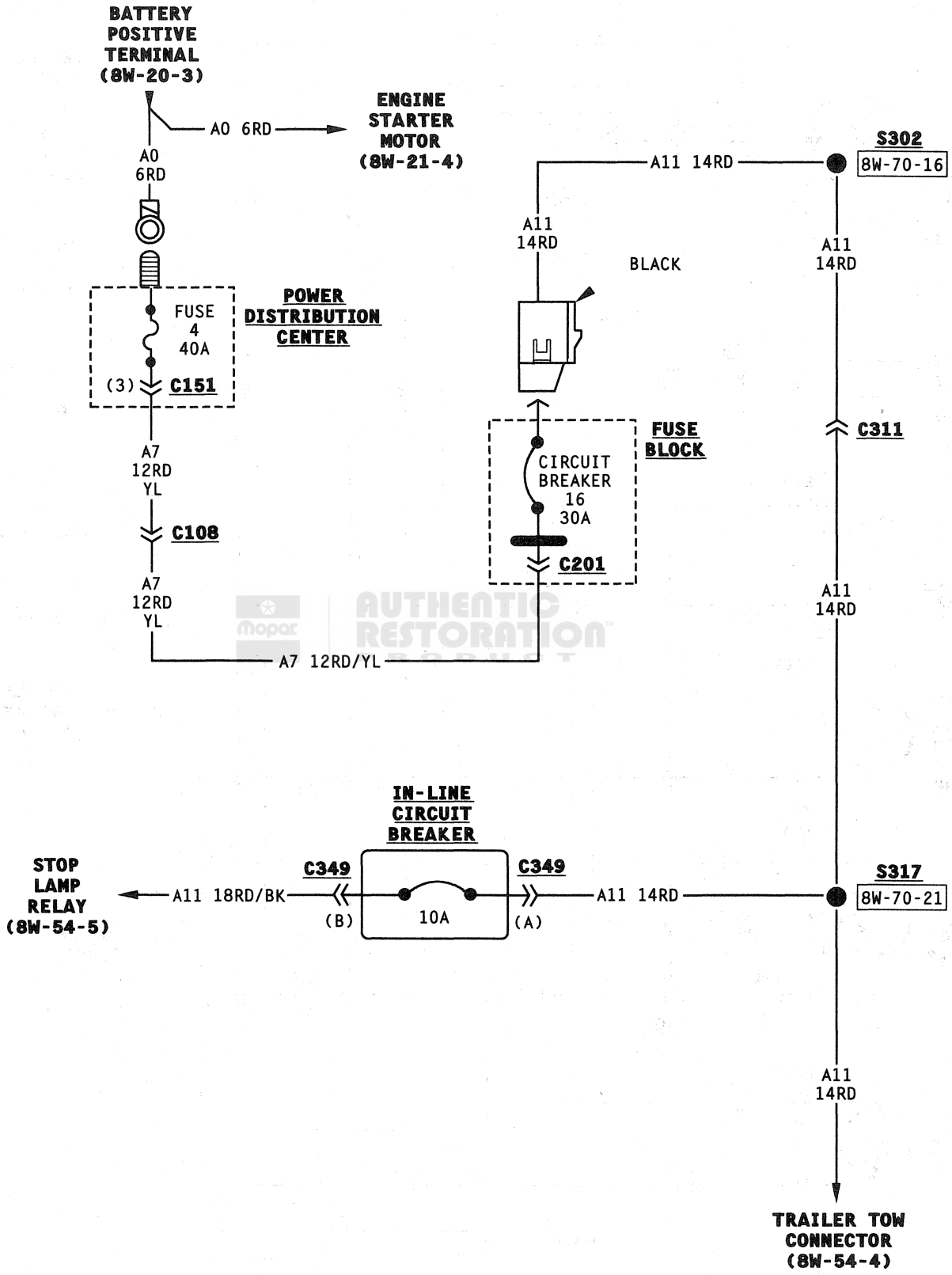
WIRING DIAGRAM INDEX

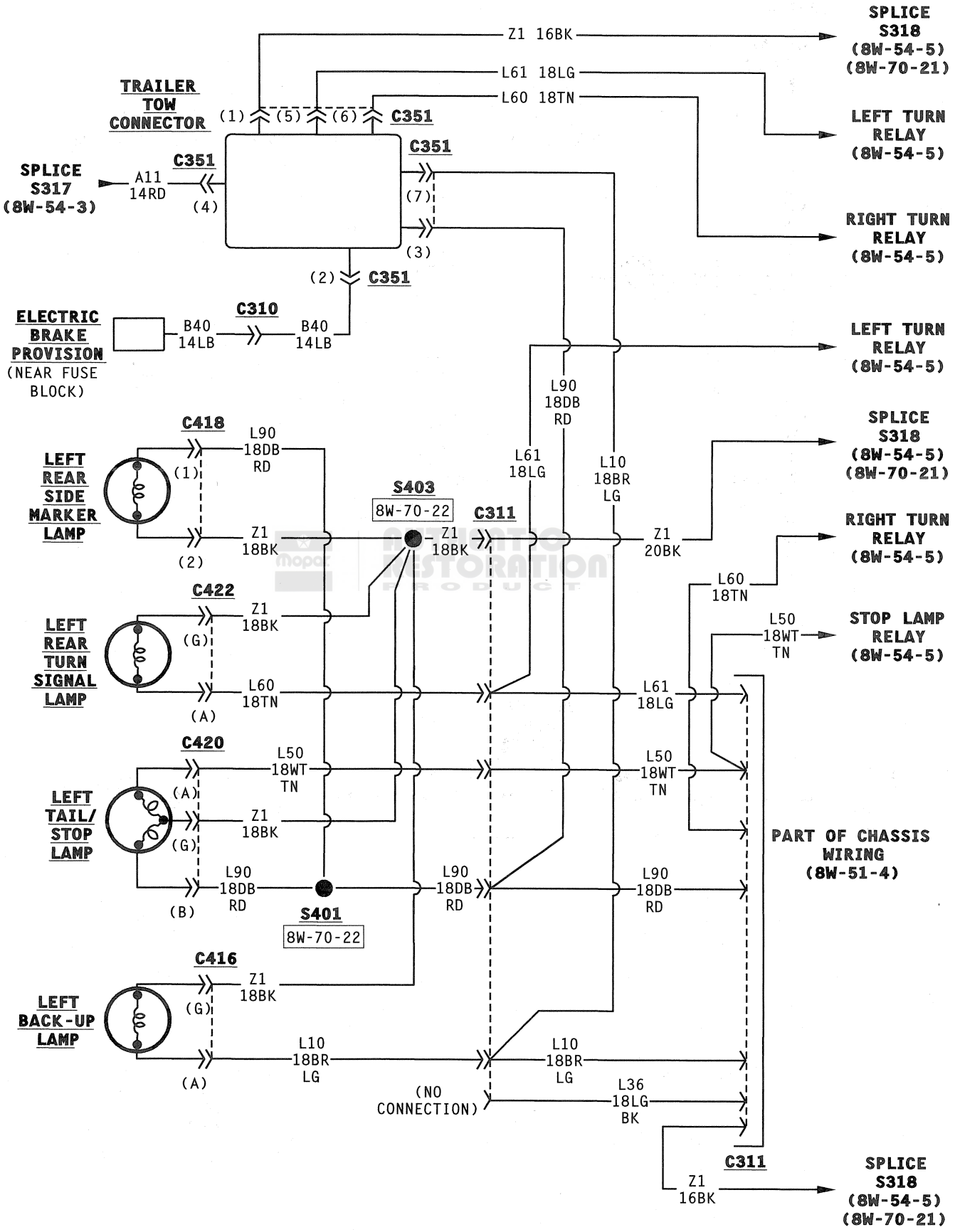
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

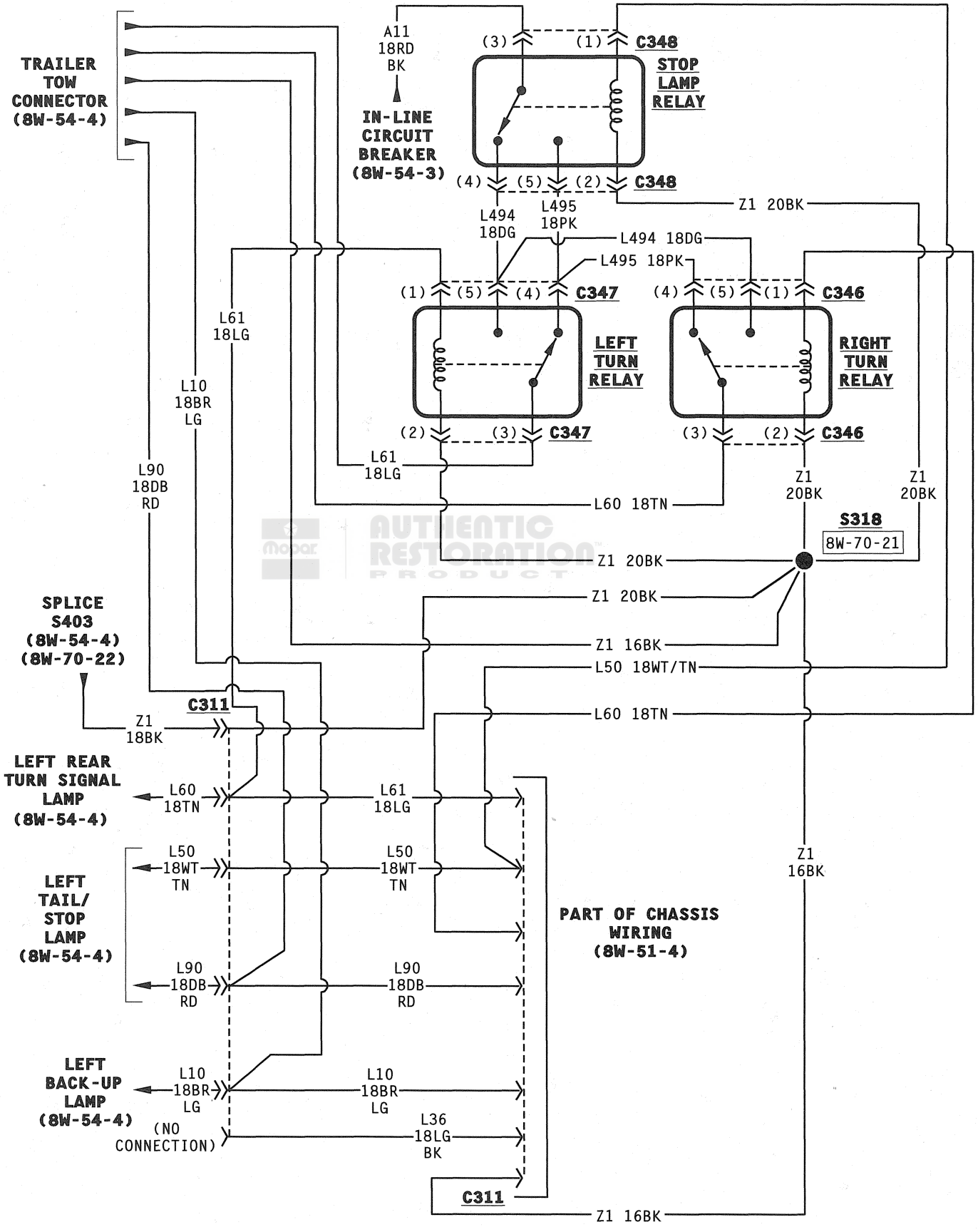
DIAGRAM INDEX

Component	Page
Circuit Breaker (Fuse Block Cavity 16)	8W-54-3
Circuit Breaker (In-Line)	8W-54-3
Electric Brake Provision	8W-54-4
Fuse 4 (PDC)	8W-54-3
Left Back-Up Lamp	8W-54-4
Left Rear Side Marker Lamp	8W-54-4
Left Rear Turn Signal Lamp	8W-54-4
Left Tail/Stop Lamp	8W-54-4
Left Turn Relay	8W-54-5
Right Turn Relay	8W-54-5
Stop Lamp Relay	8W-54-5
Trailer Tow Connector	8W-54-4

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
FUSE 4 40A
(3)
C151
POWER DISTRIBUTION CENTER
A7 12RD YL
C108
A7 12RD YL
A7 12RD/YL
A11 14RD
S302
8W-70-16
A11 14RD
BLACK
A11 14RD
C311
CIRCUIT BREAKER 16 30A
C201
FUSE BLOCK
A11 14RD
IN-LINE CIRCUIT BREAKER
STOP LAMP RELAY (8W-54-5)
A11 18RD/BK
C349
(B)
10A
C349
(A)
A11 14RD
S317
8W-70-21
A11 14RD
TRAILER TOW CONNECTOR (8W-54-4)


SPLICE S318 (8W-54-5) (8W-70-21)
Z1 16BK
L61 18LG
L60 18TN
TRAILER TOW CONNECTOR
(1) (5) (6) C351
LEFT TURN RELAY (8W-54-5)
C351
SPLICE S317 (8W-54-3)
A11 14RD
C351
(4)
(7)
RIGHT TURN RELAY (8W-54-5)
(3)
(2) C351
C310
ELECTRIC BRAKE PROVISION (NEAR FUSE BLOCK)
B40 14LB
B40 14LB
LEFT TURN RELAY (8W-54-5)
L90 18DB RD
C418
SPLICE S318 (8W-54-5) (8W-70-21)
L61 18LG
L10 18BR LG
LEFT REAR SIDE MARKER LAMP
(1)
S403
8W-70-22
C311
Z1 18BK
Z1 18BK
Z1 20BK
RIGHT TURN RELAY (8W-54-5)
(2)
C422
L60 18TN
Z1 18BK
LEFT REAR TURN SIGNAL LAMP
(G)
L50 18WT TN
STOP LAMP RELAY (8W-54-5)
L60 18TN
L61 18LG
(A)
C420
L50 18WT TN
L50 18WT TN
LEFT TAIL/ STOP LAMP
(A)
Z1 18BK
(G)
PART OF CHASSIS WIRING (8W-51-4)
L90 18DB RD
L90 18DB RD
L90 18DB RD
(B)
S401
8W-70-22
C416
Z1 18BK
LEFT BACK-UP LAMP
(G)
L10 18BR LG
L10 18BR LG
(A)
(NO CONNECTION)
L36 18LG BK
C311
SPLICE S318 (8W-54-5) (8W-70-21)
Z1 16BK



AUTHENTIC RESTORATION PRODUCT

8W-60 POWER WINDOWS

INDEX

page

DESCRIPTION AND OPERATION
HELPFUL INFORMATION 2
POWER WINDOW OPERATION 1

SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

POWER WINDOW OPERATION

The power window system is powered by circuit F81 which connects to the accessory tap in the fuse block. The accessory tap receives its feed from the ignition switch on the A38 circuit. The circuit breaker in cavity 6 of the fuse block protects circuit F81. Circuits A38 and F81 are HOT only when the ignition switch is in the RUN position.

Circuit F81 connects to the master window switch. Circuit Z1 provides ground for the power windows.

A LOCK-OUT feature is provided on the driver's door window switch. When this feature is engaged the other windows in the system will not operate.

LEFT FRONT WINDOW OPERATION

When the operator selects window DOWN operation, power is supplied on the F81 circuit through the switch to circuit Q11. Circuit Q11 connects the switch to the power window motor. Ground for the motor is supplied on the Q21 circuit back to the switch. A bus bar, internal to the switch, connects the Q21 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuit Q11 is the feed, and circuit Q21 is the ground.

RIGHT FRONT WINDOW OPERATION

When the DRIVER selects window DOWN operation, power is supplied on the F81 circuit through the switch to circuit Q26. Circuit Q26 connects the drivers door switch to the right front door switch. Power is passed through this switch to circuit Q22. The Q22 circuit then goes to the right front window motor.

Ground for the window motor is supplied on the Q12 circuit back to the right door switch. Circuity internal to the switch then passes the ground to circuit Q16. Circuit Q16 connects the right front door switch to the master switch. A bus bar, internal to the switch, connects the Q16 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuits Q16 and Q12 are the feeds, and circuits Q22 and Q26 are the grounds.

If the switch is being operated from the PASSENGER'S front door, and the operator is requesting window DOWN operation, power is supplied on the Q1 circuit from the driver's master switch circuit through the switch to the Q22 circuit.

Ground for the motor is supplied on the Q12 circuit through the switch and back to the master switch on circuit Q16. A bus bar, internal to the switch, connects the Q16 circuit to the Z1 circuit.

For window UP operation, the circuits are reversed. Circuit Q12 is the power and circuit Q22 is the ground.

LEFT REAR WINDOW

When the DRIVER selects window DOWN operation power is supplied on the F81 circuit through the switch to circuit Q17. Circuit Q17 connects the drivers door switch to the left rear door power window switch. Power is passed through the switch to circuit Q22. The Q22 circuit then goes to the left rear window motor.

Ground for the window motor is supplied on the Q12 circuit back to the left rear door switch. Circuity internal to the switch then passes the ground to circuit Q27. Circuit Q27 connects the left rear door switch to the master switch. A bus bar, internal to the switch, connects the Q27 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuits Q27 and Q12 are the feeds, and circuits Q22, and Q17 are the grounds.

If the switch is being operated from the LEFT REAR door, and the operator is requesting window DOWN operation, power is supplied on the Q1 circuit from the driver's master switch circuit through the switch to the Q22 circuit.

Ground for the motor is supplied on the Q12 circuit through the switch and to circuit Q27. Circuit Q27 connects to the master window switch. A bus bar, internal to the switch, connects the Q27 circuit to the Z1 circuit.

For window UP operation, the circuits are reversed. Circuit Q12 is the power and circuits Q22, and Q17 are the grounds.

DESCRIPTION AND OPERATION (Continued)

RIGHT REAR WINDOW

When the DRIVER selects window DOWN operation, power is supplied on the F81 circuit through the switch to circuit Q18. Circuit Q18 connects the drivers door switch to the right rear door window switch connector where it changes to circuit Q33. Circuit Q33 connects to the right rear door window switch. Power is passed through this switch to circuit Q22. The Q22 circuit then connects to the right rear window motor.

Ground for the window motor is supplied on the Q12 circuit back to the right rear door switch. Circuity internal to the switch then passes the ground to circuit Q28. Circuit Q28 connects the right rear door switch to the master switch. A bus bar, internal to the switch, connects the Q28 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuits Q28 and Q12 are the feeds, and circuits Q22, Q33 and Q18 are the grounds.

If the switch is being operated from the RIGHT REAR door, and the operator is requesting window DOWN operation, power is supplied on the Q1 circuit from the driver's master switch circuit through the switch to the Q22 circuit.

Ground for the motor is supplied on the Q12 circuit through the switch and back to the master switch on circuit Q28. A bus bar, internal to the switch, connects the Q28 circuit to the Z1 circuit.

For window UP operation, the circuits are reversed. Circuit Q12 is the power and circuit Q22 is the ground.

HELPFUL INFORMATION

- When the ignition switch is in the RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A38.
- Refer to the appropriate group of the Service Manual for test procedures.

SCHEMATICS AND DIAGRAMS

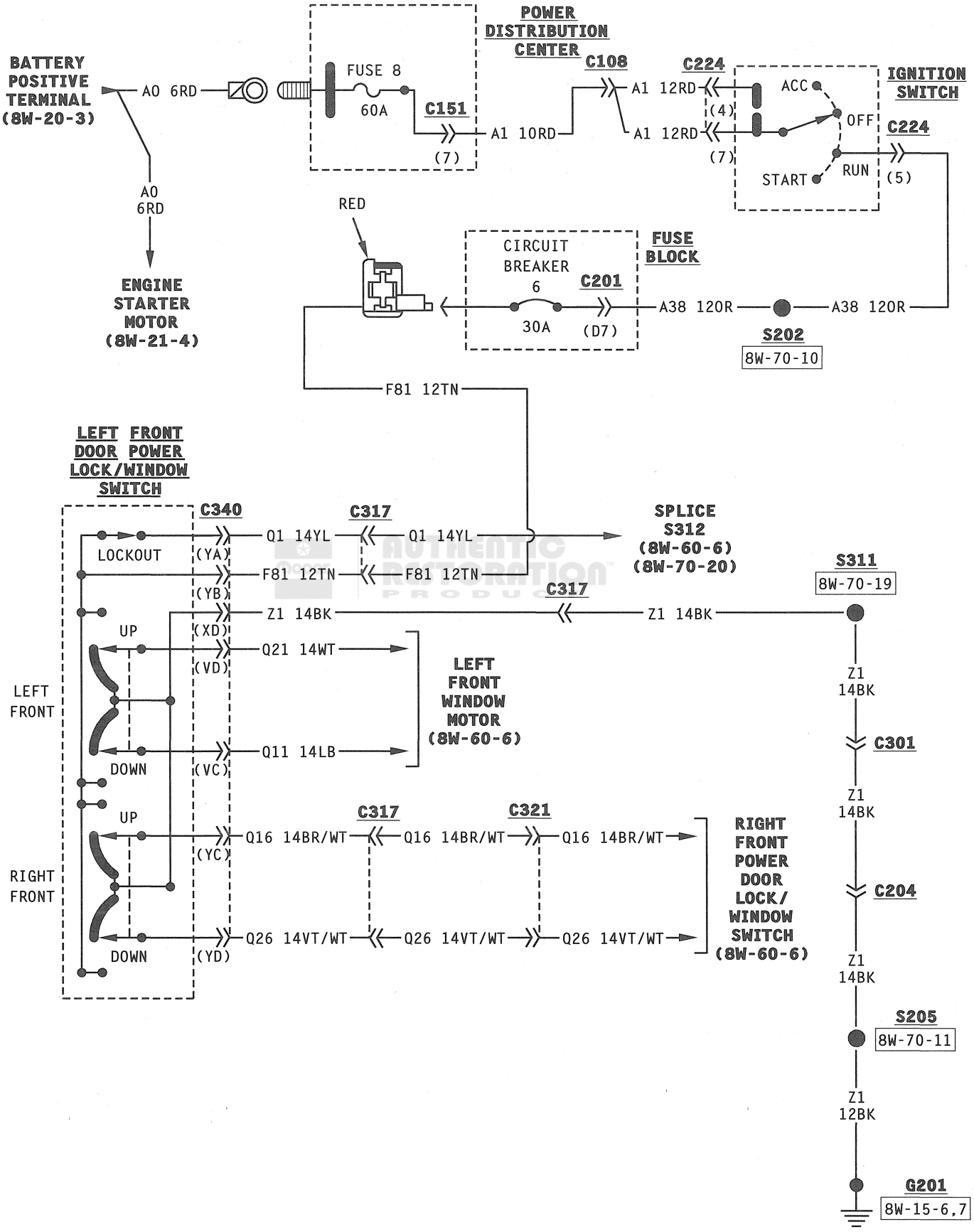
WIRING DIAGRAM INDEX

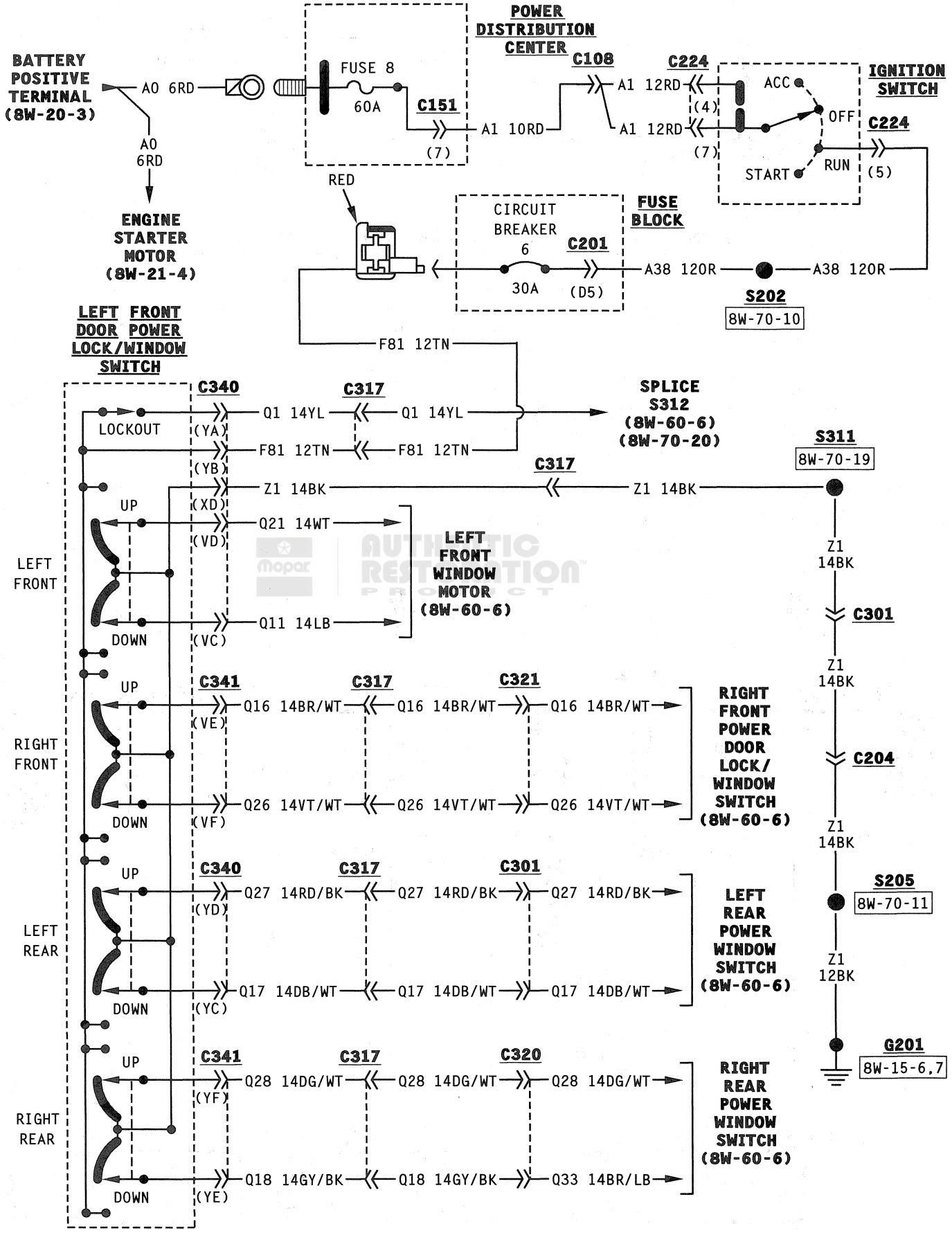
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

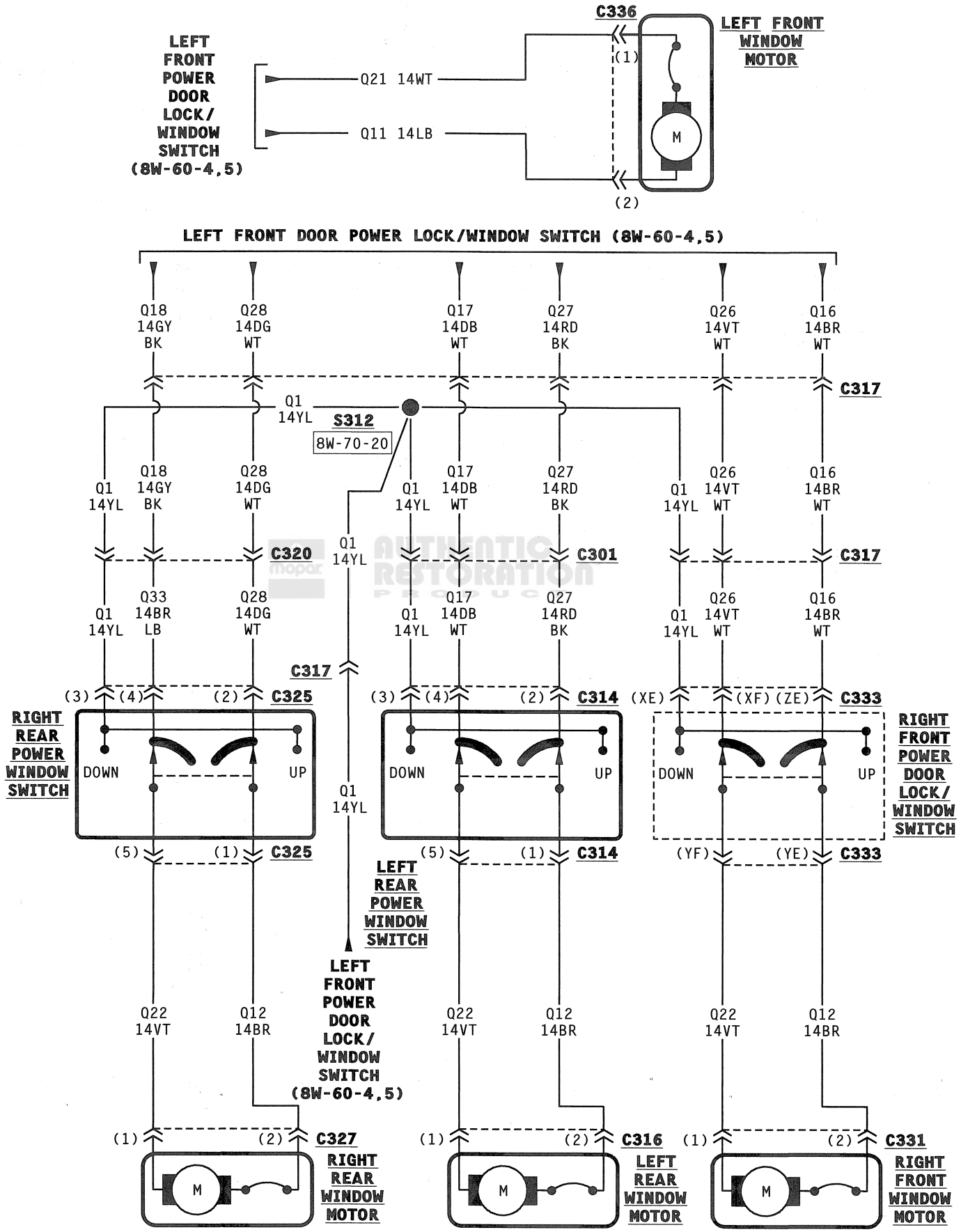
DIAGRAM INDEX

Component	Page
Circuit Breaker 6 (Fuse Block)	8W-60-4, 5
Fuse 8 (PDC)	8W-60-4, 5
Ignition Switch	8W-60-4, 5
Left Front Door Power Lock/Window Switch	8W-60-4, 5
Left Front Window Motor	8W-60-6
Left Rear Power Window Switch	8W-60-6
Left Rear Window Motor	8W-60-6
Power Distribution Center	8W-60-4, 5
Right Front Door Power Lock/Window Switch	8W-60-6
Right Front Window Motor	8W-60-6
Right Rear Power Window Switch	8W-60-6
Right Rear Window Motor	8W-60-6

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 8
60A
C151
(7)
POWER DISTRIBUTION CENTER
C108
A1 10RD
A1 12RD
C224
(4)
(7)
ACC
OFF
START
RUN
IGNITION SWITCH
C224
(5)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
RED
CIRCUIT BREAKER 6
30A
C201
(D7)
FUSE BLOCK
A38 12OR
A38 12OR
S202
8W-70-10
F81 12TN
LEFT FRONT DOOR POWER LOCK/WINDOW SWITCH
C340
LOCKOUT
(YA)
(YB)
(XD)
(VD)
(VC)
(YC)
(YD)
UP
DOWN
LEFT FRONT
RIGHT FRONT
Q1 14YL
F81 12TN
Z1 14BK
Q21 14WT
Q11 14LB
Q16 14BR/WT
Q26 14VT/WT
C317
C321
SPLICE S312 (8W-60-6) (8W-70-20)
LEFT FRONT WINDOW MOTOR (8W-60-6)
RIGHT FRONT POWER DOOR LOCK/ WINDOW SWITCH (8W-60-6)
S311
8W-70-19
Z1 14BK
C301
C204
S205
8W-70-11
Z1 12BK
G201
8W-15-6,7


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
FUSE 8
60A
C151
(7)
POWER DISTRIBUTION CENTER
C108
A1 10RD
A1 12RD
A1 12RD
C224
(4)
(7)
ACC
OFF
START
RUN
IGNITION SWITCH
C224
(5)
RED
CIRCUIT BREAKER 6
30A
C201
(D5)
FUSE BLOCK
A38 12OR
A38 12OR
S202
8W-70-10
F81 12TN
LEFT FRONT DOOR POWER LOCK/WINDOW SWITCH
C340
C317
LOCKOUT
(YA)
Q1 14YL
Q1 14YL
F81 12TN
F81 12TN
(YB)
SPLICE S312 (8W-60-6) (8W-70-20)
C317
Z1 14BK
Z1 14BK
S311
8W-70-19
UP
(XD)
Q21 14WT
(VD)
LEFT FRONT
LEFT FRONT WINDOW MOTOR (8W-60-6)
DOWN
(VC)
Q11 14LB
Z1 14BK
C301
Z1 14BK
C341
C317
C321
UP
(VE)
Q16 14BR/WT
Q16 14BR/WT
Q16 14BR/WT
RIGHT FRONT
RIGHT FRONT POWER DOOR LOCK/ WINDOW SWITCH (8W-60-6)
DOWN
(VF)
Q26 14VT/WT
Q26 14VT/WT
Q26 14VT/WT
C204
Z1 14BK
C340
C317
C301
UP
(YD)
Q27 14RD/BK
Q27 14RD/BK
Q27 14RD/BK
LEFT REAR
LEFT REAR POWER WINDOW SWITCH (8W-60-6)
DOWN
(YC)
Q17 14DB/WT
Q17 14DB/WT
Q17 14DB/WT
S205
8W-70-11
Z1 12BK
C341
C317
C320
UP
(YF)
Q28 14DG/WT
Q28 14DG/WT
Q28 14DG/WT
RIGHT REAR
RIGHT REAR POWER WINDOW SWITCH (8W-60-6)
DOWN
(YE)
Q18 14GY/BK
Q18 14GY/BK
Q33 14BR/LB
G201
8W-15-6,7



AUTHENTIC RESTORATION PRODUCTS

8040d028

J968W-7

8W-61 POWER DOOR LOCKS

DESCRIPTION AND OPERATION

INTRODUCTION

Two relays provide power for the power door lock motors. The Unlock relay provides power for the unlock circuits while the Lock relay powers the lock circuits. Either the power door lock switches or the remote keyless entry module operate the Unlock and Lock relays.

LOCK RELAY

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block powers circuit P38. When either power door lock switch is put in the LOCK position, the switch connects circuit P38 to circuit P35. If the operator uses Remote Keyless Entry (RKE), the RKE module powers circuit P35. In either case, circuit P35 supplies power to the coil side of the lock relay, causing the relay contacts to connect circuits P37 and P2. Circuit Z1 provides ground for the coil side of the lock relay.

When the lock relay contacts connect circuit P37 to circuit P2, circuit P2 supplies battery voltage to the power door lock motors to LOCK the doors.

When the power doors LOCK, ground for the motors is on circuit P34 through the door unlock relay to ground on circuit Z1.

UNLOCK RELAY

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block powers circuit P38. When either power door lock switch is put in the UNLOCK position, the switch connects circuit P38 to circuit P36. If the operator uses Remote Keyless Entry (RKE), the RKE module powers circuit P36. In either case, circuit P36 supplies power to the coil side of the unlock relay, causing the relay contacts to connect circuits P37 and P34. Circuit Z1 provides ground for the coil side of the unlock relay.

When the unlock relay contacts connect circuit P37 to circuit P34, circuit P34 supplies battery voltage to the power door lock motors to UNLOCK the doors.

When the power doors UNLOCK, ground for the motors is on circuit P2 through the door lock relay to ground on circuit Z1.

REMOTE KEYLESS ENTRY MODULE

Circuit M1 from the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block supplies power to the Remote Keyless Entry (RKE) module. Circuit F87 from fuse 17 in the fuse block supplies power to the RKE module when the ignition switch is in the START or RUN position. Circuit Z1 provides ground for the RKE module.

The RKE module UNLOCKS the doors by energizing the unlock relay on circuit P36. Refer to Unlock Relay.

The module LOCKS the doors by energizing the lock relay on circuit P35. Refer to Lock Relay.

HELPFUL INFORMATION

- Fuse 13 in the fuse block powers circuit P37. Circuit A7 from fuse 4 in the PDC feeds fuse 13 in the fuse block.
- Circuit A6 from fuse 16 in the PDC powers fuse 9 in the fuse block. Fuse 9 protects the M1 circuit.

SCHEMATICS AND DIAGRAMS

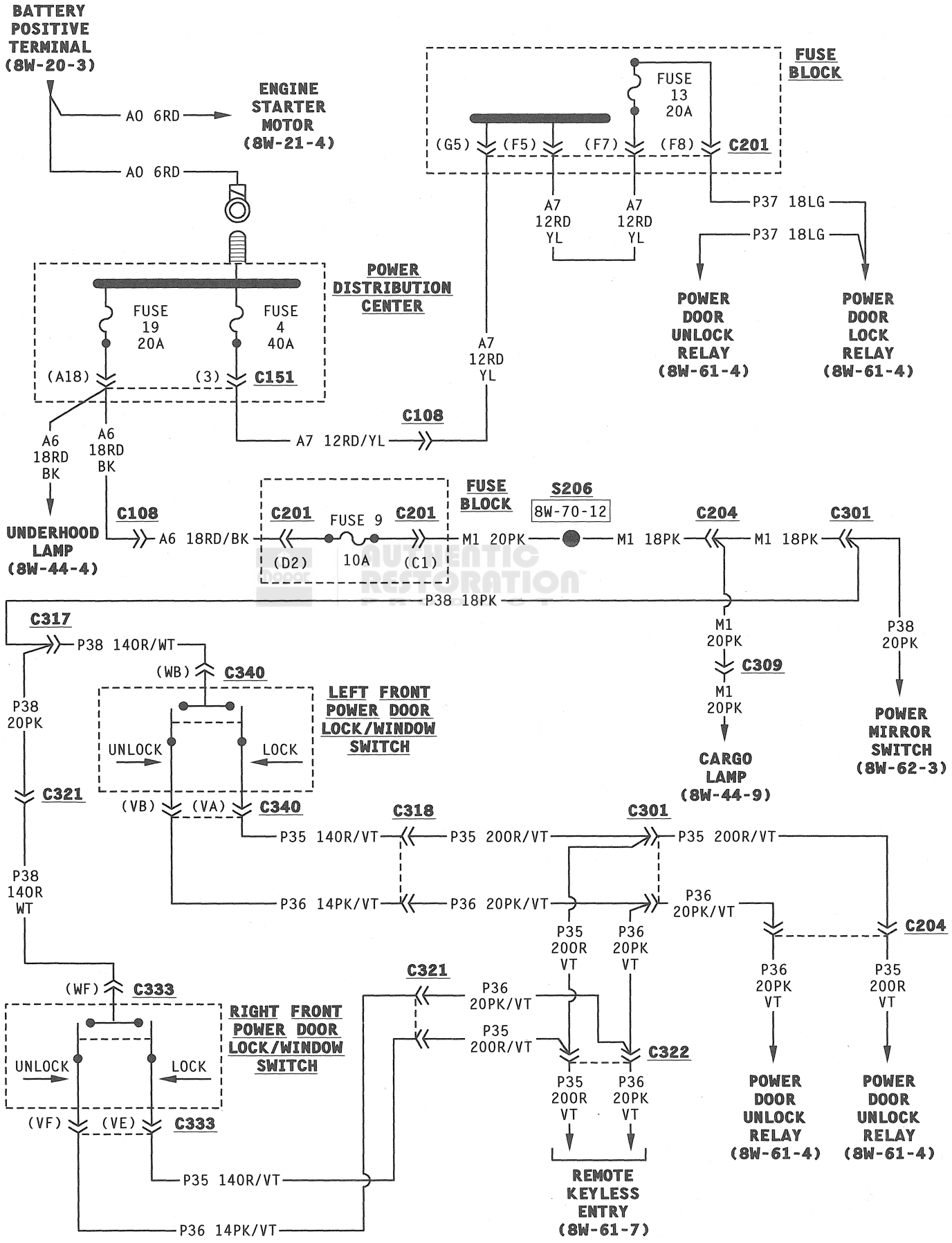
WIRING DIAGRAM INDEX

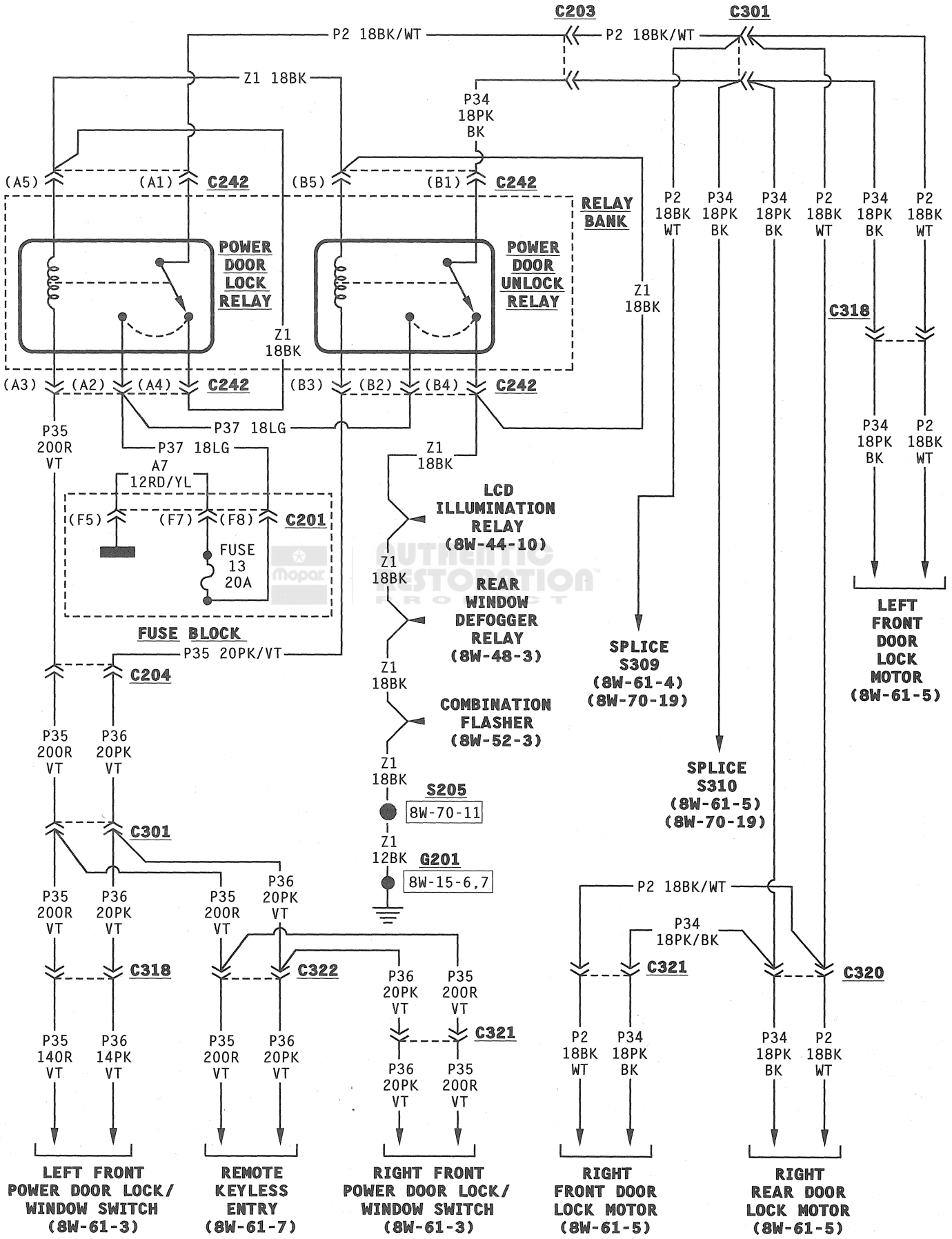
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Buzzer Module	8W-61-6
Fuse 4 (PDC)	8W-61-3
Fuse 8 (PDC)	8W-61-6
Fuse 9	8W-61-3, 7
Fuse 13	8W-61-3, 4
Fuse 17	8W-61-6
Fuse 18 (PDC)	8W-61-7
Fuse 19 (PDC)	8W-61-3
Ignition Switch	8W-61-6
Left Front Door Lock Motor	8W-61-5
Left Front Door Power Lock/Window Switch	8W-61-3
Left Rear Door Lock Motor	8W-61-5
Liftgate Lock Motor	8W-61-5
Power Door Lock Relay	8W-61-4
Power Door Unlock Relay	8W-61-4
Relay Bank	8W-61-4
Remote Keyless Entry Module	8W-61-7
Right Front Door Lock Motor	8W-61-5
Right Front Door Power Lock/Window Switch	8W-61-3
Right Rear Door Lock Motor	8W-61-5
Telltale Connector	8W-61-6

Mopar AUTHENTIC RESTORATION PRODUCT

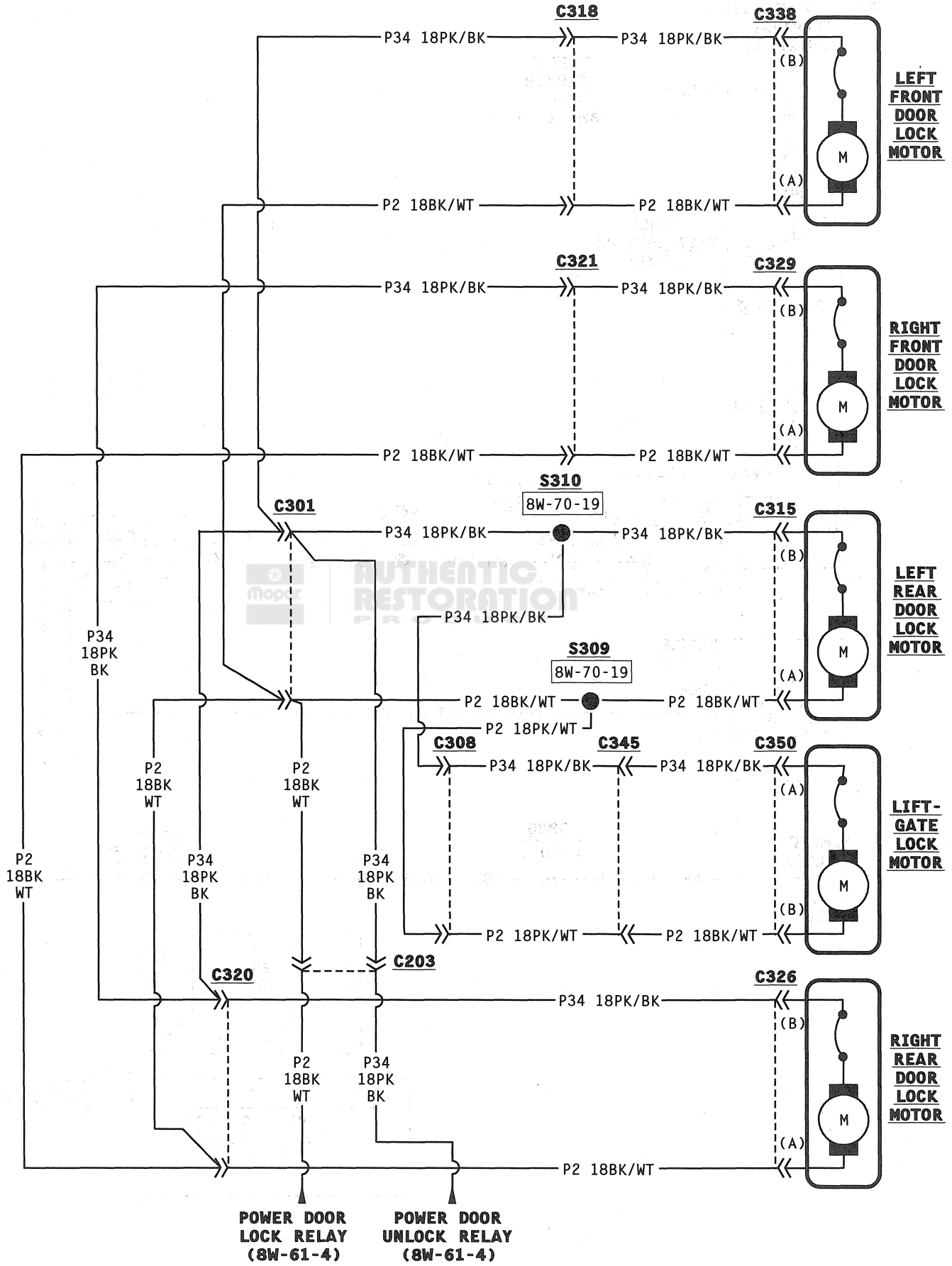

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
A0 6RD
FUSE BLOCK
FUSE 13 20A
(G5) (F5) (F7) (F8) C201
A7 12RD YL
A7 12RD YL
P37 18LG
P37 18LG
POWER DOOR UNLOCK RELAY (8W-61-4)
POWER DOOR LOCK RELAY (8W-61-4)
POWER DISTRIBUTION CENTER
FUSE 19 20A
FUSE 4 40A
(A18) (3) C151
A7 12RD YL
C108
A7 12RD/YL
A6 18RD BK
A6 18RD BK
UNDERHOOD LAMP (8W-44-4)
C108
A6 18RD/BK
C201 FUSE 9 C201
(D2) 10A (C1)
FUSE BLOCK
S206
8W-70-12
M1 20PK
M1 18PK
C204
M1 18PK
C301
P38 18PK
C317
P38 14OR/WT
(WB) C340
P38 20PK
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH
UNLOCK
LOCK
C321
(VB) (VA) C340
C318
C301
P35 14OR/VT
P35 20OR/VT
P35 20OR/VT
P38 14OR WT
P36 14PK/VT
P36 20PK/VT
P36 20PK/VT
C204
P35 20OR VT
P36 20PK VT
(WF) C333
C321
P36 20PK/VT
P35 20OR/VT
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH
UNLOCK
LOCK
C322
P35 20OR VT
P36 20PK VT
(VF) (VE) C333
P35 14OR/VT
P36 14PK/VT
REMOTE KEYLESS ENTRY (8W-61-7)
M1 20PK
C309
M1 20PK
CARGO LAMP (8W-44-9)
P38 20PK
POWER MIRROR SWITCH (8W-62-3)
P36 20PK VT
P35 20OR VT
POWER DOOR UNLOCK RELAY (8W-61-4)
POWER DOOR UNLOCK RELAY (8W-61-4)



8040d030

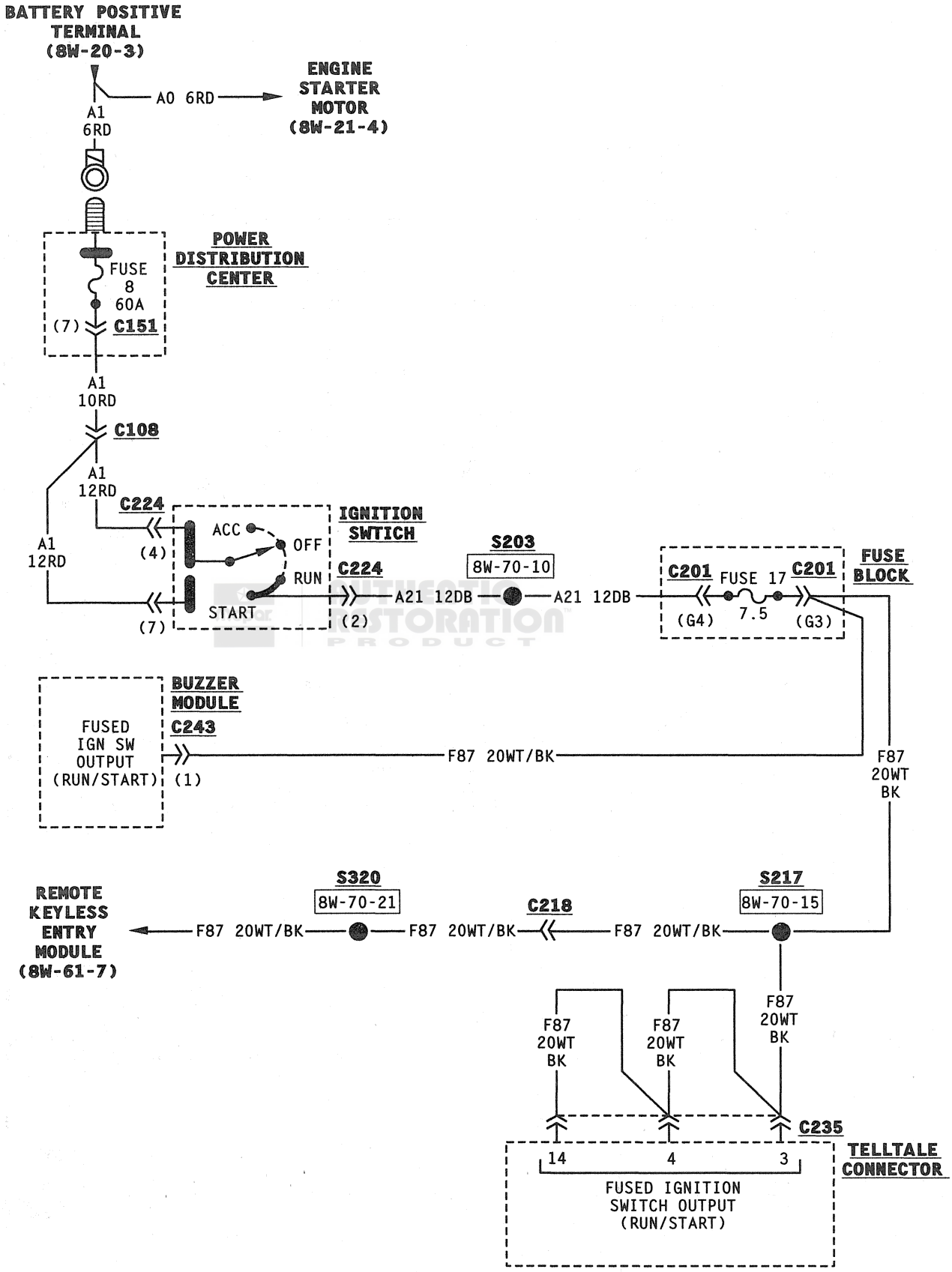
J968W-7

REMOTE KEYLESS ENTRY SYSTEM

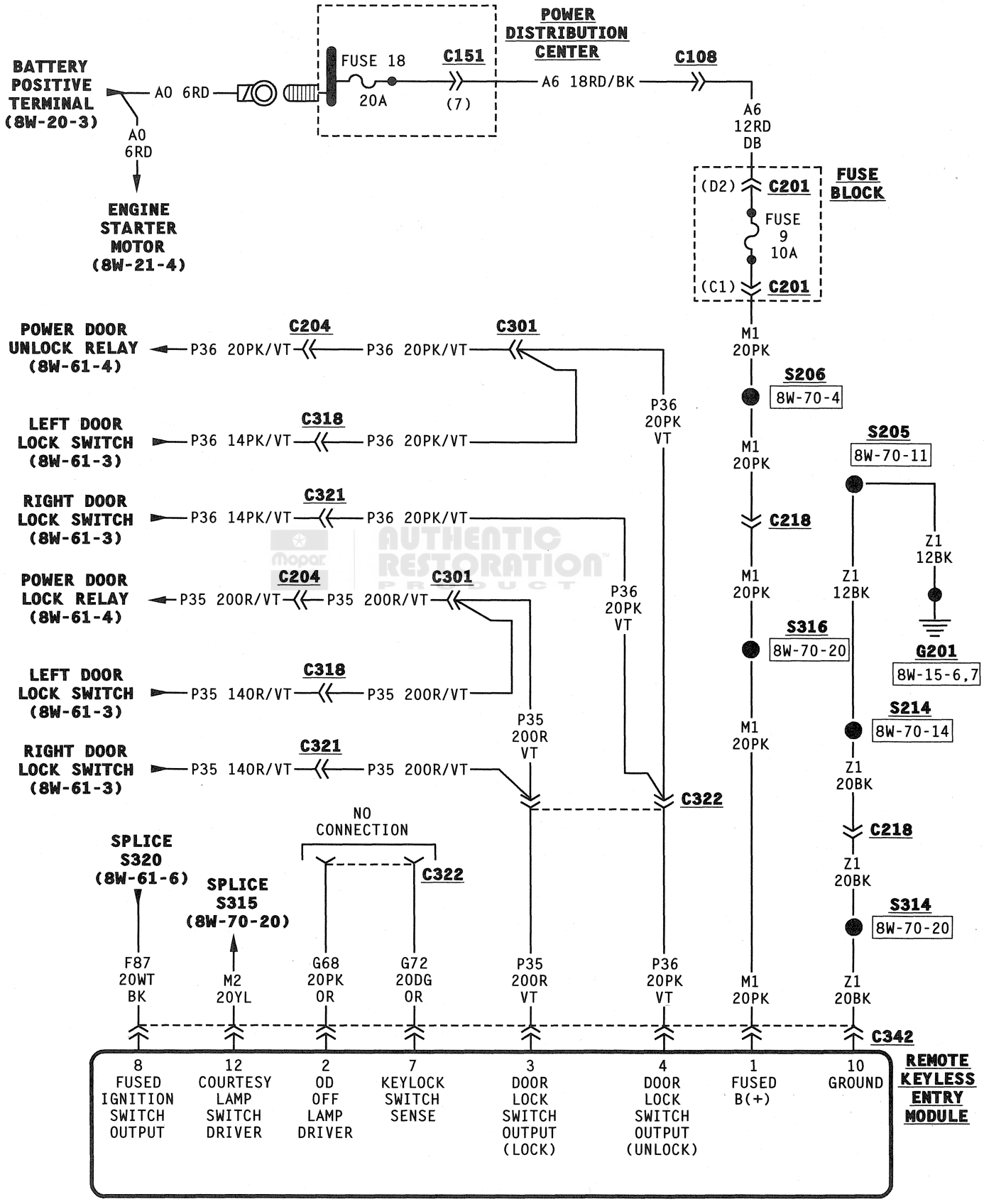


AUTHENTIC RESTORATION PRO

REMOTE KEYLESS ENTRY SYSTEM



REMOTE KEYLESS ENTRY SYSTEM



Mopar AUTHENTIC RESTORATION PRODUCT

8W-62 POWER MIRRORS

DESCRIPTION AND OPERATION

POWER MIRROR OPERATION

Four switches operate the left and right power mirrors. One switch selects right or left mirror. Each mirror has two motors; a LEFT/RIGHT motor and a UP/DOWN motor. The motors switch polarity to allow mirror adjustment.

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) supplies battery voltage to the Ignition Off Draw (IOD) fuse in cavity 9 of the fuse block. Fuse 9 supplies power to circuit M1. Circuit M1 connects to circuit P38. Circuit P38 powers the power mirror switch. Circuit Z1 connects to the power mirror switch and supplies ground for the power mirror system.

RIGHT POWER MIRROR OPERATION

In the right position, the power mirror switch supplies power to the right mirror LEFT/RIGHT motor on circuit P79 when a rightward adjustment is made. Circuit P77 provides the ground path the for rightward adjustments.

When the operator makes leftward adjustment, polarity reverses. For leftward adjustments, the switch supplies battery voltage to the right mirror LEFT/RIGHT motor on circuit P77. Circuit P79 supplies ground for leftward adjustments.

During upward adjustments, the switch supplies voltage to the right mirror UP/DOWN motor on circuit P79. Circuit P78 supplies ground during upward adjustments.

For downward adjustments, the polarity is reversed, the switch powers the right mirror UP/DOWN motor on circuit P78. Circuit P79 supplies the ground path.

LEFT POWER MIRROR OPERATION

In the left position, the power mirror switch supplies power to the left mirror LEFT/RIGHT motor on circuit P79 when a rightward adjustment is made. Circuit P81 provides the ground path the for rightward adjustments.

When the operator makes leftward adjustment, polarity reverses. For leftward adjustments, the switch supplies battery voltage the left mirror LEFT/RIGHT motor on circuit P81. Circuit P79 supplies ground for leftward adjustments.

During upward adjustments, the switch supplies voltage to the left mirror UP/DOWN motor on circuit P79. Circuit P80 supplies ground during upward adjustments.

For downward adjustments, the polarity is reversed, the switch powers the left mirror UP/DOWN motor on circuit P80. Circuit P79 supplies the ground path.

HELPFUL INFORMATION

- Check fuse 9 in the fuse block
- Check fuses 19 in the PDC

SCHEMATICS AND DIAGRAMS

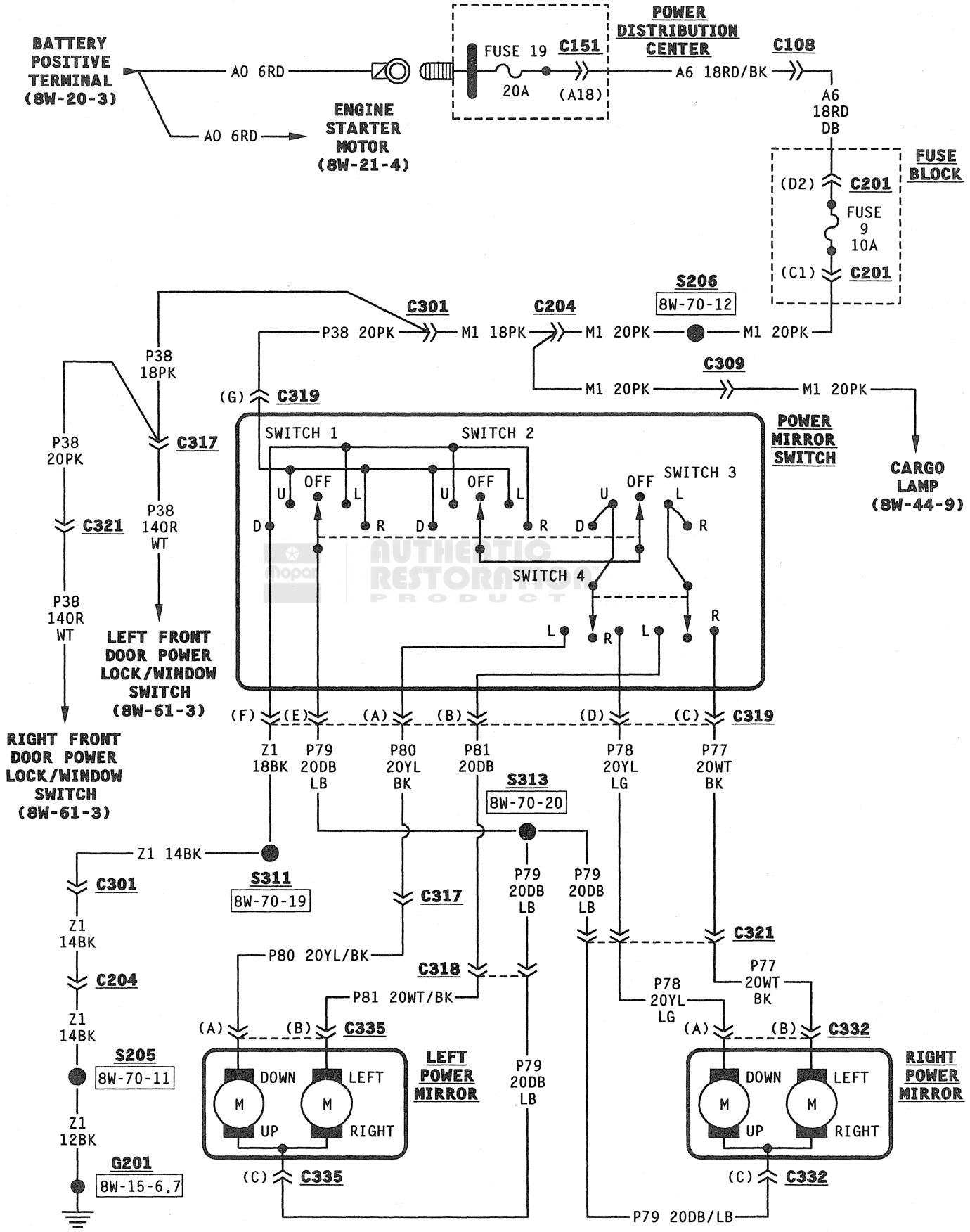
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Fuse Block	8W-62-3
Fuse 9	8W-62-3
Fuse 19 (PDC)	8W-62-3
Left Power Mirror	8W-62-3
Power Mirror Switch	8W-62-3
Right Power Mirror	8W-62-3

Mopar AUTHENTIC RESTORATION PRODUCT



AUTHENTIC RESTORATION PRODUCT

8W-63 POWER SEAT

DESCRIPTION AND OPERATION

POWER SEAT OPERATION

Battery voltage for the power seat system is supplied by circuit A11, which is HOT at all times. This circuit connects to the power accessory tap in the fuse block and circuit F35. Circuit F35 connects to the power seat switch. The circuit breaker in cavity 16 protects circuits A11 and F35.

A bus bar internal to the power seat switch connects the power from circuit F35 to the switches. Grounding for the seat system is supplied on circuit Z1.

The motors located under the seat are protected by circuit breakers wired in with the motors. Each motor has its own circuit breaker.

When the operator selects the FRONT VERTICAL UP function, power is passed on the F35 circuit through the CLOSED contacts in the switch to the P19 circuit. The P19 circuit connects to the motor. Ground is provided on the P21 circuit back to the switch. A ground bus bar internal to the switch then connects to the Z1 circuit.

For FRONT VERTICAL DOWN function the circuits are reversed. P21 is the feed and P19 is the ground.

When the operator selects the SEAT FORWARD function, power is passed on the F35 circuit through the CLOSED contacts in the switch to the P15 circuit. The P15 circuit connects to the motor. Ground is provided on the P17 circuit back to the switch. A ground bus bar internal to the switch then connects to the Z1 circuit.

For SEAT REARWARD function the circuits are reversed. P17 is the feed and P15 is the ground.

When the operator selects the REAR VERTICAL UP function, power is passed on the F35 circuit through the CLOSED contacts in the switch to the P11 circuit. The P11 circuit connects to the motor. Ground is provided on the P13 circuit back to the switch. A ground bus bar internal to the switch then connects to the Z1 circuit.

For REAR VERTICAL DOWN function the circuits are reversed. P13 is the feed and P11 is the ground.

When the operator selects the SEAT UP function power is passed on the F35 circuit through the CLOSED contacts in the switch to the P11 and P19 circuits. The P11 circuit connects to the LEFT REAR VERTICAL motor, and P19 connects to the front LEFT FRONT VERTICAL motor. Ground is provided on the P13 and P21 circuits back to the switch. A ground bus bar internal to the switch then connects to the Z1 circuit.

For SEAT DOWN function the circuits are reversed. P13 and P21 circuits are the feeds and P11 and P19 are the grounds.

HELPFUL INFORMATION

Check the 30 amp circuit breaker in located in cavity 16 of the fuse block

SCHEMATICS AND DIAGRAMS

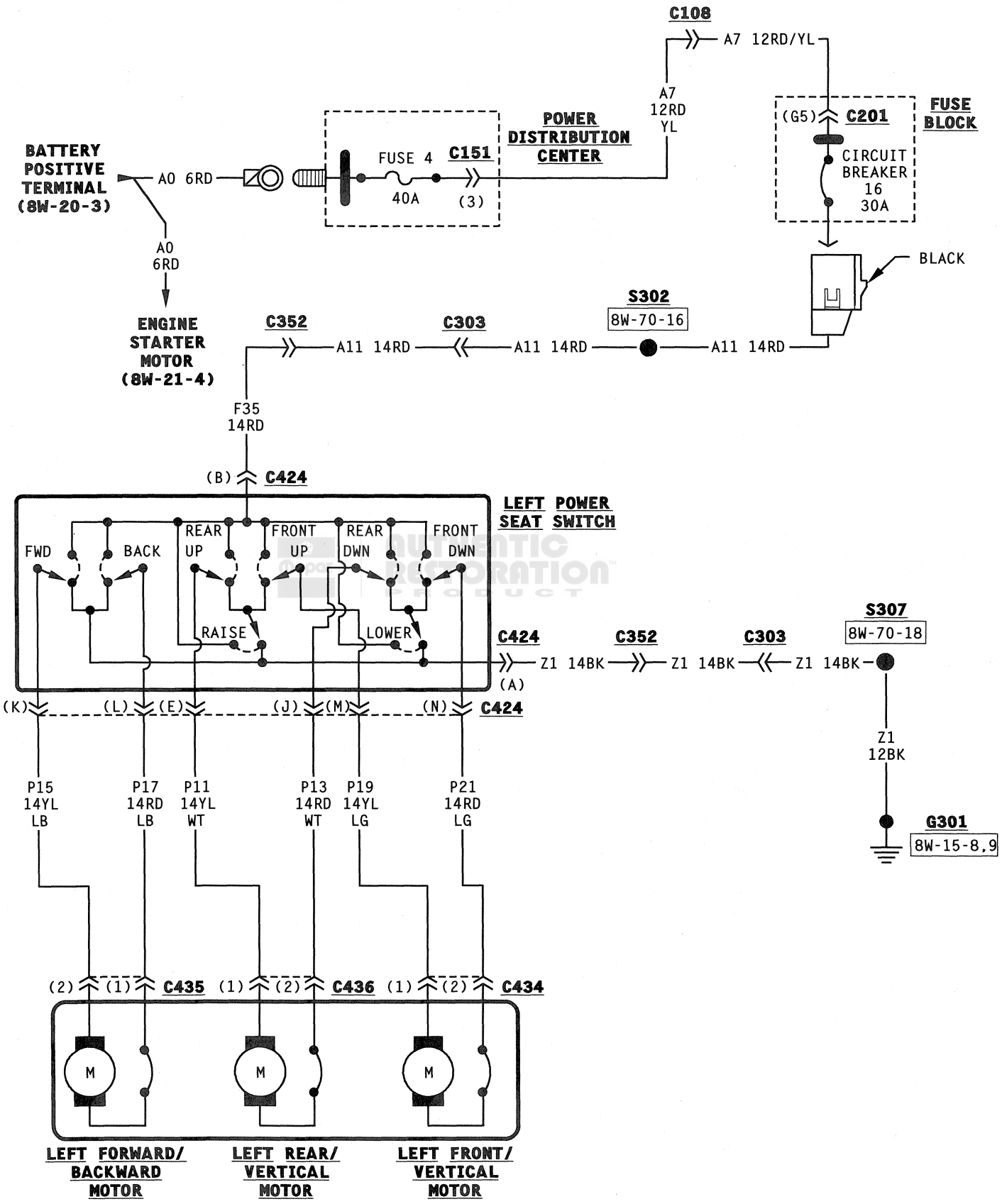
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Circuit Breaker 16 (Fuse Block)	8W-63-3
Fuse 4 (PDC)	8W-63-3
Fuse Block	8W-63-3
Left Forward/Backward Motor	8W-63-3
Left Front Vertical Motor	
Left Power Seat Switch	
Left Rear Vertical Motor	

Mopar AUTHENTIC RESTORATION PRODUCT


C108
A7 12RD/YL
A7 12RD YL
(G5) C201
FUSE BLOCK
CIRCUIT BREAKER 16 30A
BLACK
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 4
C151
40A
(3)
POWER DISTRIBUTION CENTER
A0 6RD
ENGINE STARTER MOTOR (8W-21-4)
C352
A11 14RD
C303
A11 14RD
S302
8W-70-16
A11 14RD
F35 14RD
(B) C424
LEFT POWER SEAT SWITCH
FWD
BACK
REAR UP
FRONT UP
REAR DWN
FRONT DWN
RAISE
LOWER
C424
Z1 14BK
C352
Z1 14BK
C303
Z1 14BK
S307
8W-70-18
(A)
(K) (L) (E) (J) (M) (N) C424
Z1 12BK
G301
8W-15-8,9
P15 14YL LB
P17 14RD LB
P11 14YL WT
P13 14RD WT
P19 14YL LG
P21 14RD LG
(2) (1) C435
(1) (2) C436
(1) (2) C434
M
M
M
LEFT FORWARD/ BACKWARD MOTOR
LEFT REAR/ VERTICAL MOTOR
LEFT FRONT/ VERTICAL MOTOR

8W-70 SPLICE INFORMATION

DESCRIPTION AND OPERATION

INTRODUCTION

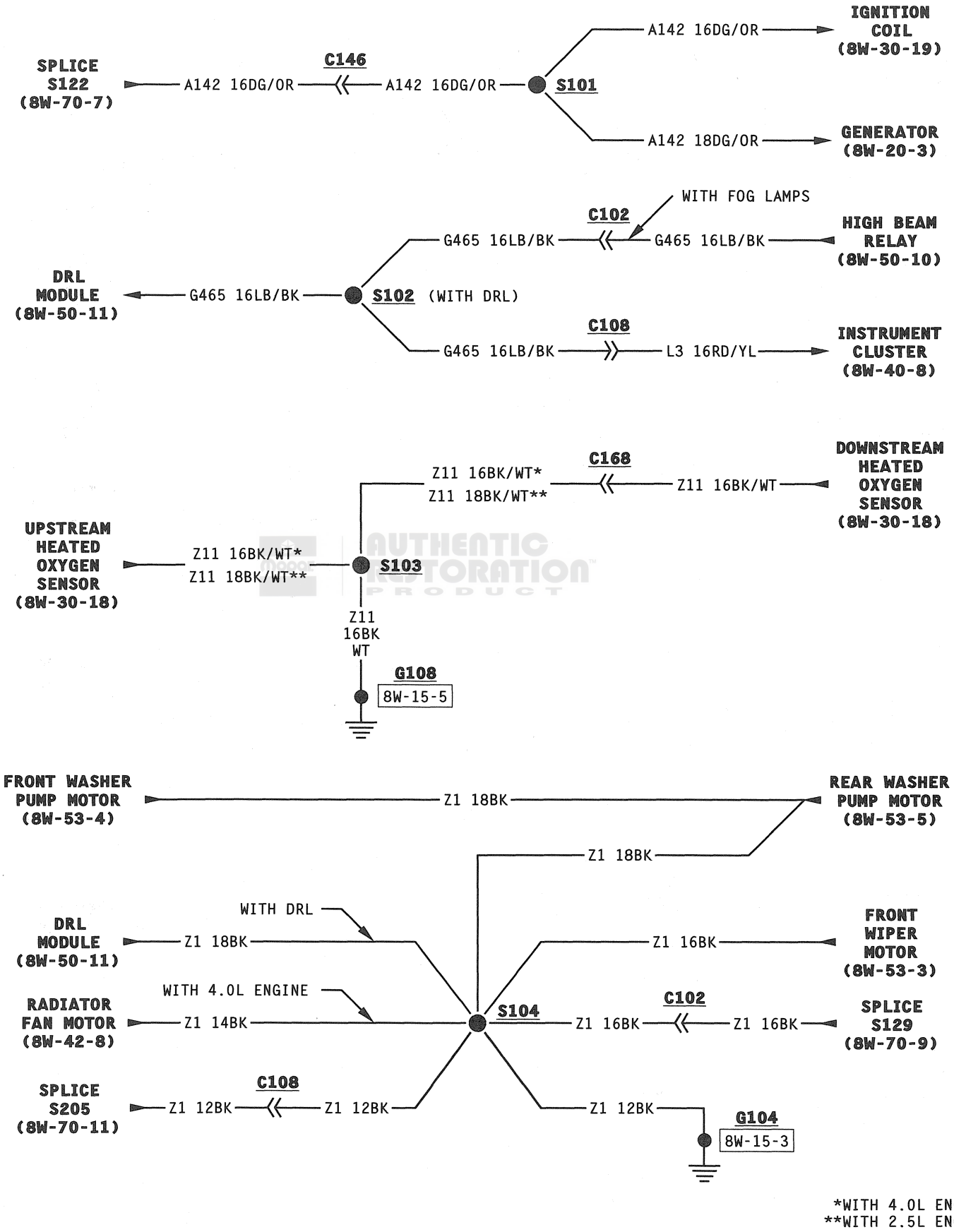
This section identifies all splices in the wiring diagrams. It also shows the splices in their entirety. All circuits that are part of the splices are shown, and the systems they affect are referenced. For viewing the location of each splice in the vehicle, refer to Section 8W-95.

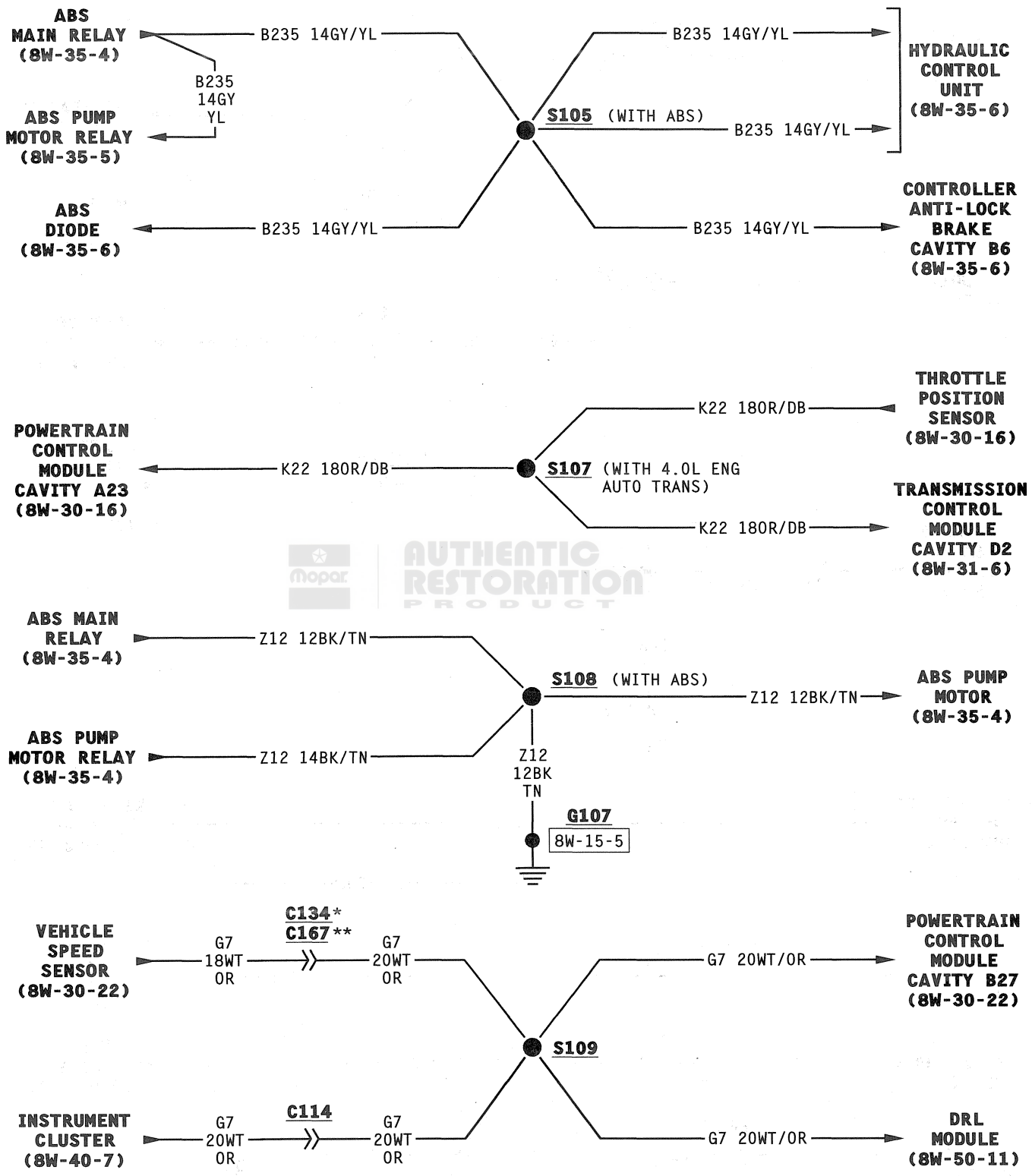
Mopar | AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

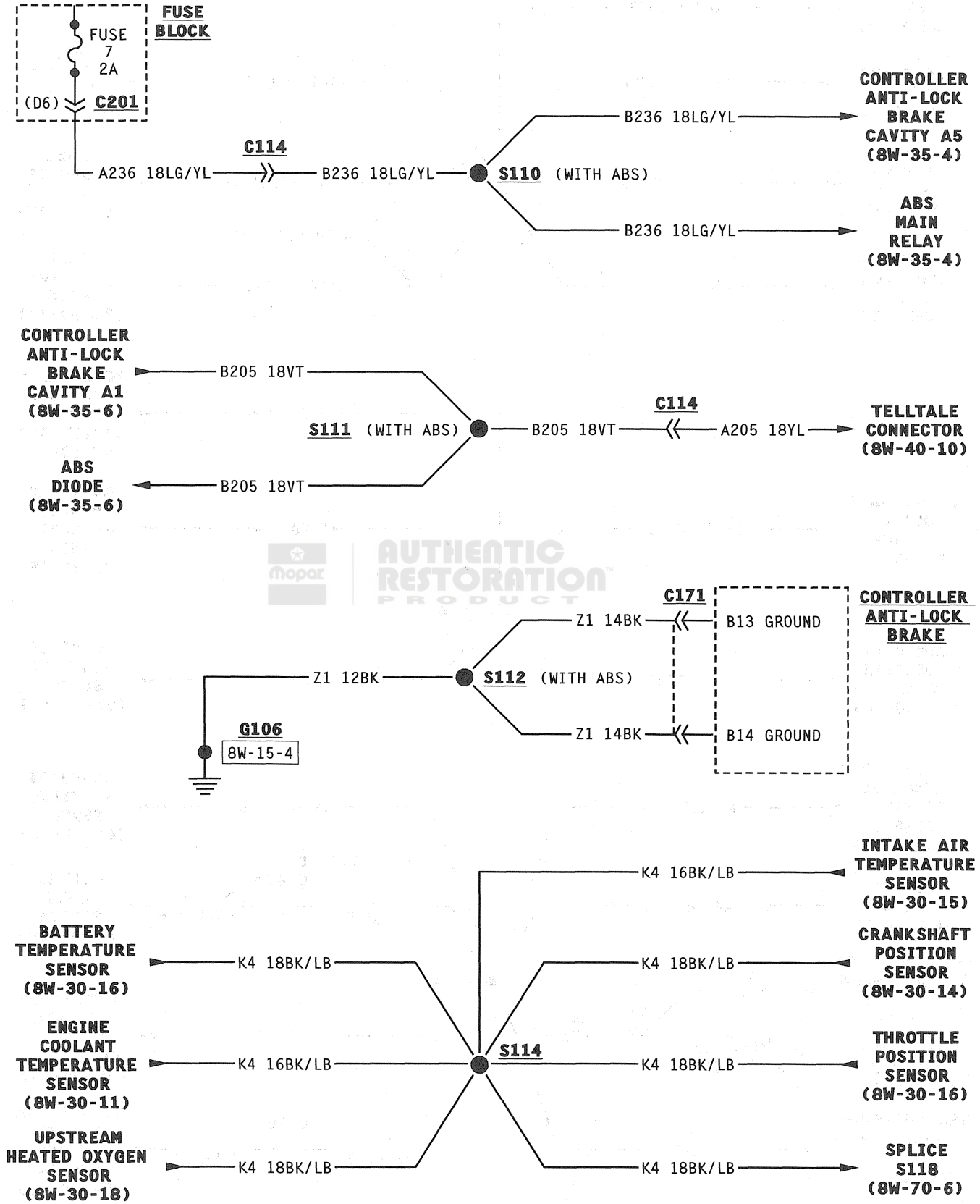
Component	Page
S101	8W-70-3
S102	8W-70-3
S103	8W-70-3
S104	8W-70-3
S105	8W-70-4
S107	8W-70-4
S108	8W-70-4
S109	8W-70-4
S110	8W-70-5
S111	8W-70-5
S112	8W-70-5
S114	8W-70-5
S115	8W-70-6
S116	8W-70-6
S118	8W-70-6
S119	8W-70-7
S120	8W-70-7
S121	8W-70-7
S122	8W-70-7
S123	8W-70-8
S124	8W-70-8
S126	8W-70-9
S128	8W-70-9
S129	8W-70-9
S130	8W-70-9
S131	8W-70-10
S201	8W-70-10
S202	8W-70-10
S203	8W-70-10
S204	8W-70-11
S205	8W-70-11
S206	8W-70-12
S207	8W-70-12
S208	8W-70-13
S209	8W-70-13
S210	8W-70-13
S212	8W-70-14
S213	8W-70-14
S214	8W-70-14
S215	8W-70-15
S216	8W-70-15
S217	8W-70-15
S301	8W-70-16
S302	8W-70-16
S303	8W-70-16
S304	8W-70-17
S306	8W-70-17
S307	8W-70-18
S308	8W-70-18
S309	8W-70-19
S310	8W-70-19
S311	8W-70-19
S312	8W-70-20
S313	8W-70-20
S314	8W-70-20
S315	8W-70-20
S316	8W-70-20
S317	8W-70-21
S318	8W-70-21
S319	8W-70-21
S320	8W-70-21
S401	8W-70-22
S402	8W-70-22
S403	8W-70-22
S404	8W-70-22

Mopar AUTHENTIC RESTORATION

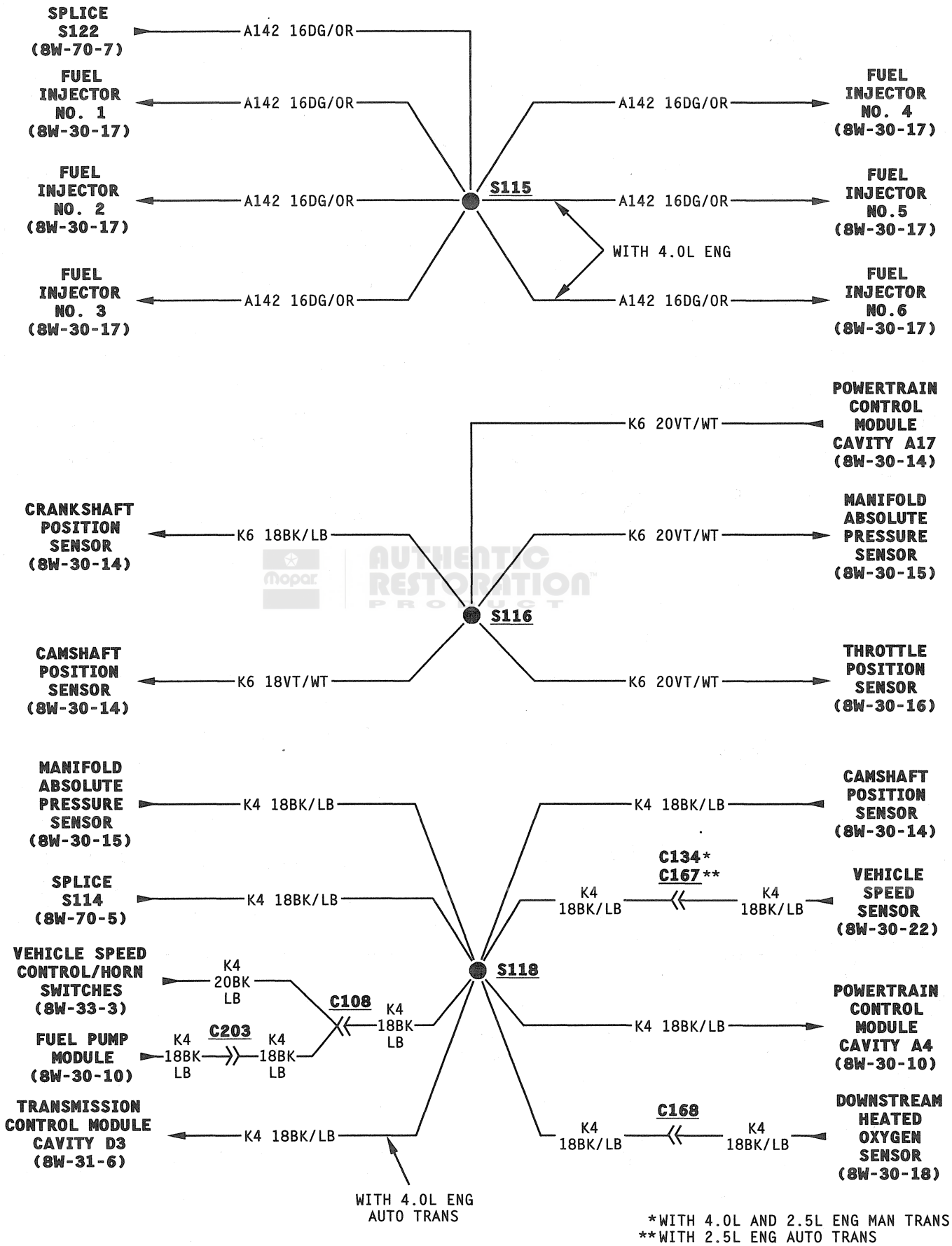

SPLICE S122 (8W-70-7)
A142 16DG/OR
C146
A142 16DG/OR
S101
A142 16DG/OR
IGNITION COIL (8W-30-19)
A142 18DG/OR
GENERATOR (8W-20-3)
WITH FOG LAMPS
C102
G465 16LB/BK
G465 16LB/BK
HIGH BEAM RELAY (8W-50-10)
DRL MODULE (8W-50-11)
G465 16LB/BK
S102 (WITH DRL)
C108
G465 16LB/BK
L3 16RD/YL
INSTRUMENT CLUSTER (8W-40-8)
C168
Z11 16BK/WT*
Z11 18BK/WT**
Z11 16BK/WT
DOWNSTREAM HEATED OXYGEN SENSOR (8W-30-18)
UPSTREAM HEATED OXYGEN SENSOR (8W-30-18)
Z11 16BK/WT*
Z11 18BK/WT**
S103
Z11 16BK WT
G108
8W-15-5
FRONT WASHER PUMP MOTOR (8W-53-4)
Z1 18BK
REAR WASHER PUMP MOTOR (8W-53-5)
Z1 18BK
WITH DRL
DRL MODULE (8W-50-11)
Z1 18BK
Z1 16BK
FRONT WIPER MOTOR (8W-53-3)
WITH 4.0L ENGINE
RADIATOR FAN MOTOR (8W-42-8)
Z1 14BK
S104
C102
Z1 16BK
Z1 16BK
SPLICE S129 (8W-70-9)
SPLICE S205 (8W-70-11)
C108
Z1 12BK
Z1 12BK
Z1 12BK
G104
8W-15-3
*WITH 4.0L ENG
**WITH 2.5L ENG

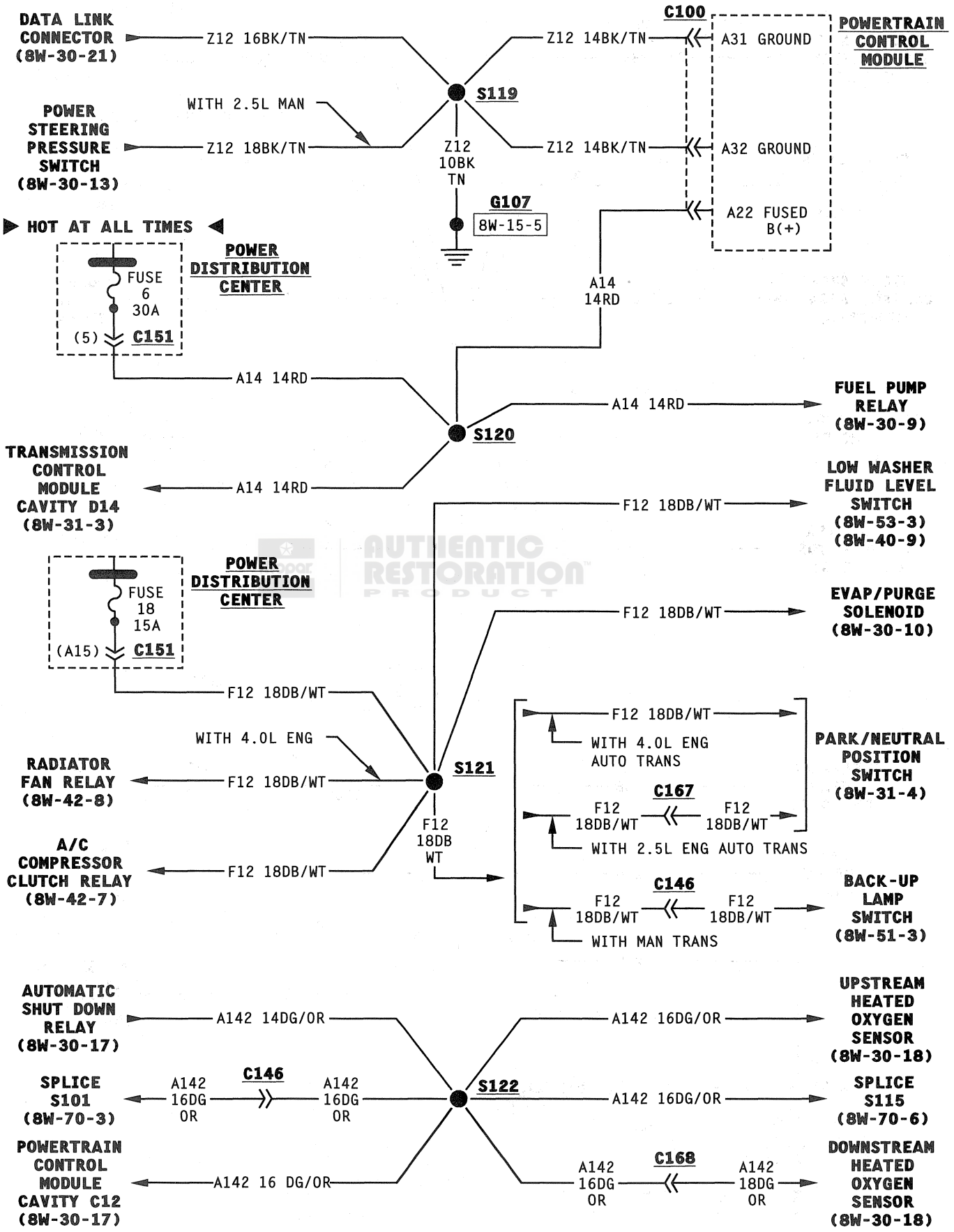


*WITH 4.0L AND 2.5L ENG MAN TRANS
**WITH 2.5L ENG AUTO TRANS

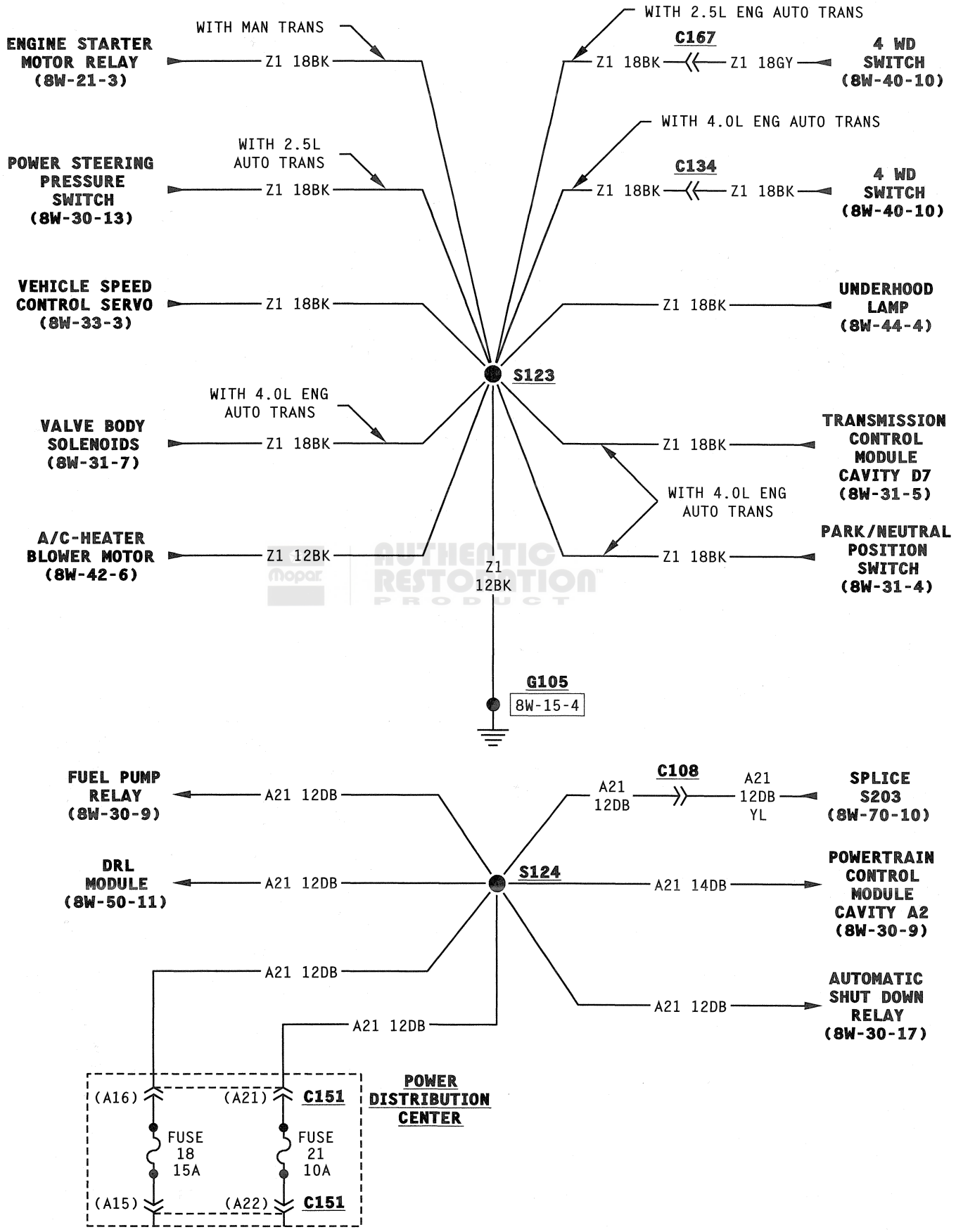


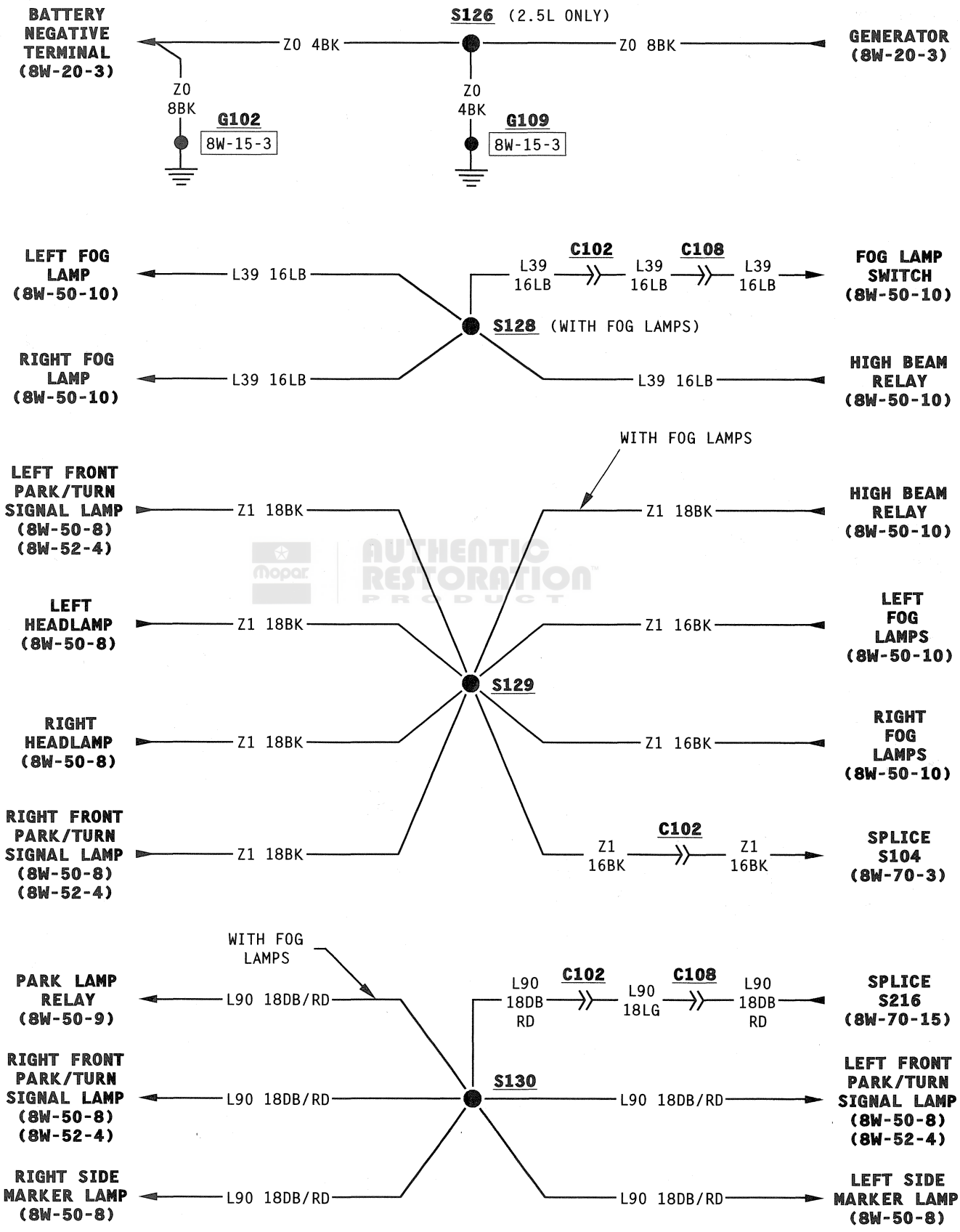
Mopar AUTHENTIC RESTORATION PRODUCT


SPLICE S122 (8W-70-7)
A142 16DG/OR
FUEL INJECTOR NO. 1 (8W-30-17)
A142 16DG/OR
FUEL INJECTOR NO. 4 (8W-30-17)
A142 16DG/OR
FUEL INJECTOR NO. 2 (8W-30-17)
A142 16DG/OR
S115
A142 16DG/OR
FUEL INJECTOR NO.5 (8W-30-17)
WITH 4.0L ENG
FUEL INJECTOR NO. 3 (8W-30-17)
A142 16DG/OR
A142 16DG/OR
FUEL INJECTOR NO.6 (8W-30-17)
POWERTRAIN CONTROL MODULE CAVITY A17 (8W-30-14)
K6 20VT/WT
CRANKSHAFT POSITION SENSOR (8W-30-14)
K6 18BK/LB
K6 20VT/WT
MANIFOLD ABSOLUTE PRESSURE SENSOR (8W-30-15)
S116
CAMSHAFT POSITION SENSOR (8W-30-14)
K6 18VT/WT
K6 20VT/WT
THROTTLE POSITION SENSOR (8W-30-16)
MANIFOLD ABSOLUTE PRESSURE SENSOR (8W-30-15)
K4 18BK/LB
K4 18BK/LB
CAMSHAFT POSITION SENSOR (8W-30-14)
C134*
C167**
SPLICE S114 (8W-70-5)
K4 18BK/LB
K4 18BK/LB
K4 18BK/LB
VEHICLE SPEED SENSOR (8W-30-22)
VEHICLE SPEED CONTROL/HORN SWITCHES (8W-33-3)
K4 20BK LB
S118
C108
K4 18BK LB
FUEL PUMP MODULE (8W-30-10)
C203
K4 18BK LB
K4 18BK LB
K4 18BK/LB
POWERTRAIN CONTROL MODULE CAVITY A4 (8W-30-10)
TRANSMISSION CONTROL MODULE CAVITY D3 (8W-31-6)
K4 18BK/LB
C168
K4 18BK/LB
K4 18BK/LB
DOWNSTREAM HEATED OXYGEN SENSOR (8W-30-18)
WITH 4.0L ENG AUTO TRANS
*WITH 4.0L AND 2.5L ENG MAN TRANS
**WITH 2.5L ENG AUTO TRANS

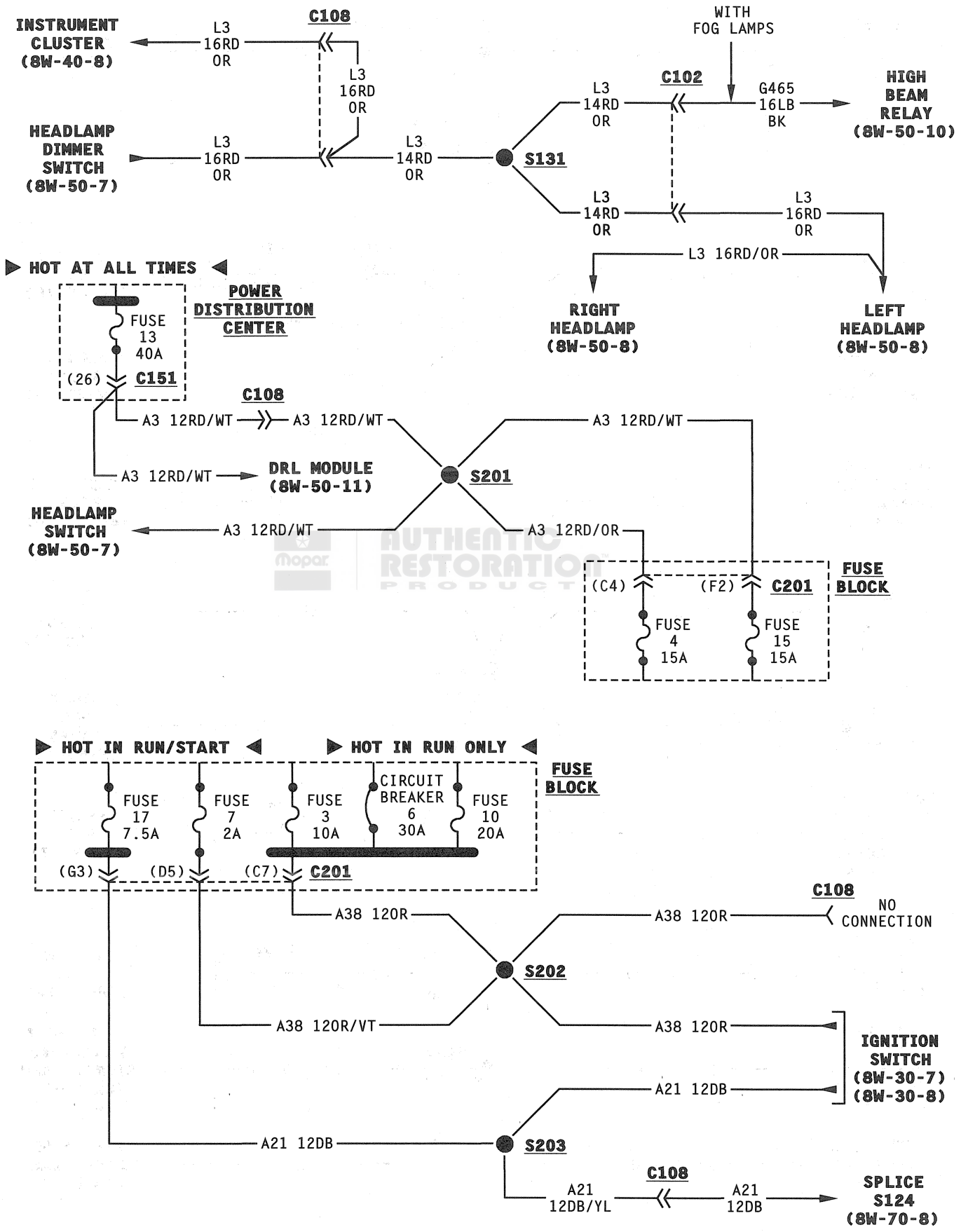


AUTHENTIC RESTORATION PRODUCT

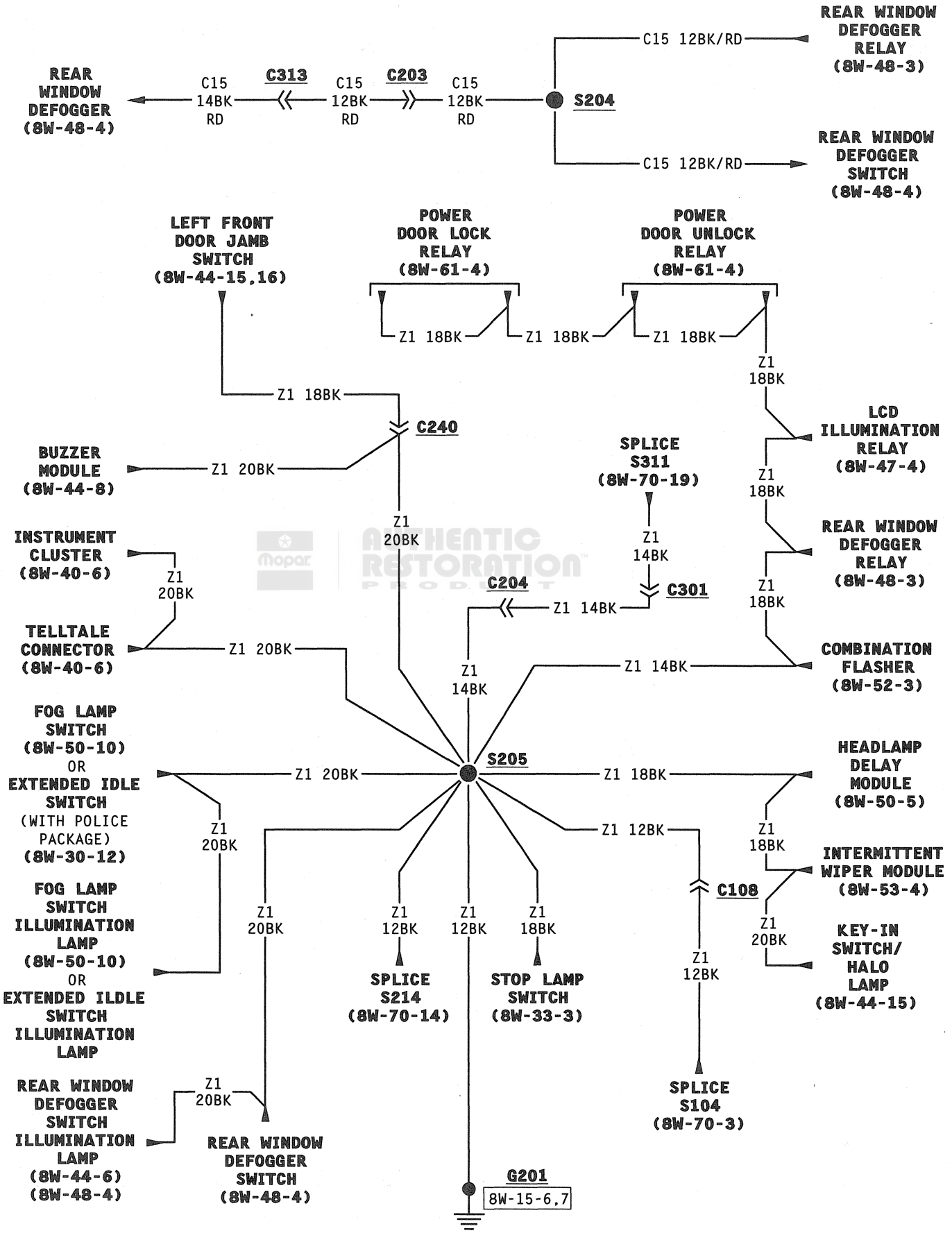

ENGINE STARTER MOTOR RELAY (8W-21-3)
WITH MAN TRANS
Z1 18BK
WITH 2.5L ENG AUTO TRANS
C167
Z1 18BK
Z1 18GY
4 WD SWITCH (8W-40-10)
WITH 4.0L ENG AUTO TRANS
POWER STEERING PRESSURE SWITCH (8W-30-13)
WITH 2.5L AUTO TRANS
Z1 18BK
C134
Z1 18BK
Z1 18BK
4 WD SWITCH (8W-40-10)
VEHICLE SPEED CONTROL SERVO (8W-33-3)
Z1 18BK
Z1 18BK
UNDERHOOD LAMP (8W-44-4)
S123
WITH 4.0L ENG AUTO TRANS
VALVE BODY SOLENOIDS (8W-31-7)
Z1 18BK
Z1 18BK
TRANSMISSION CONTROL MODULE CAVITY D7 (8W-31-5)
WITH 4.0L ENG AUTO TRANS
A/C-HEATER BLOWER MOTOR (8W-42-6)
Z1 12BK
Z1 18BK
PARK/NEUTRAL POSITION SWITCH (8W-31-4)
Z1 12BK
G105
8W-15-4
FUEL PUMP RELAY (8W-30-9)
A21 12DB
C108
A21 12DB
A21 12DB YL
SPLICE S203 (8W-70-10)
DRL MODULE (8W-50-11)
A21 12DB
S124
A21 14DB
POWERTRAIN CONTROL MODULE CAVITY A2 (8W-30-9)
A21 12DB
AUTOMATIC SHUT DOWN RELAY (8W-30-17)
A21 12DB
A21 12DB
(A16)
(A21)
C151
FUSE 18 15A
FUSE 21 10A
(A15)
(A22)
C151
POWER DISTRIBUTION CENTER

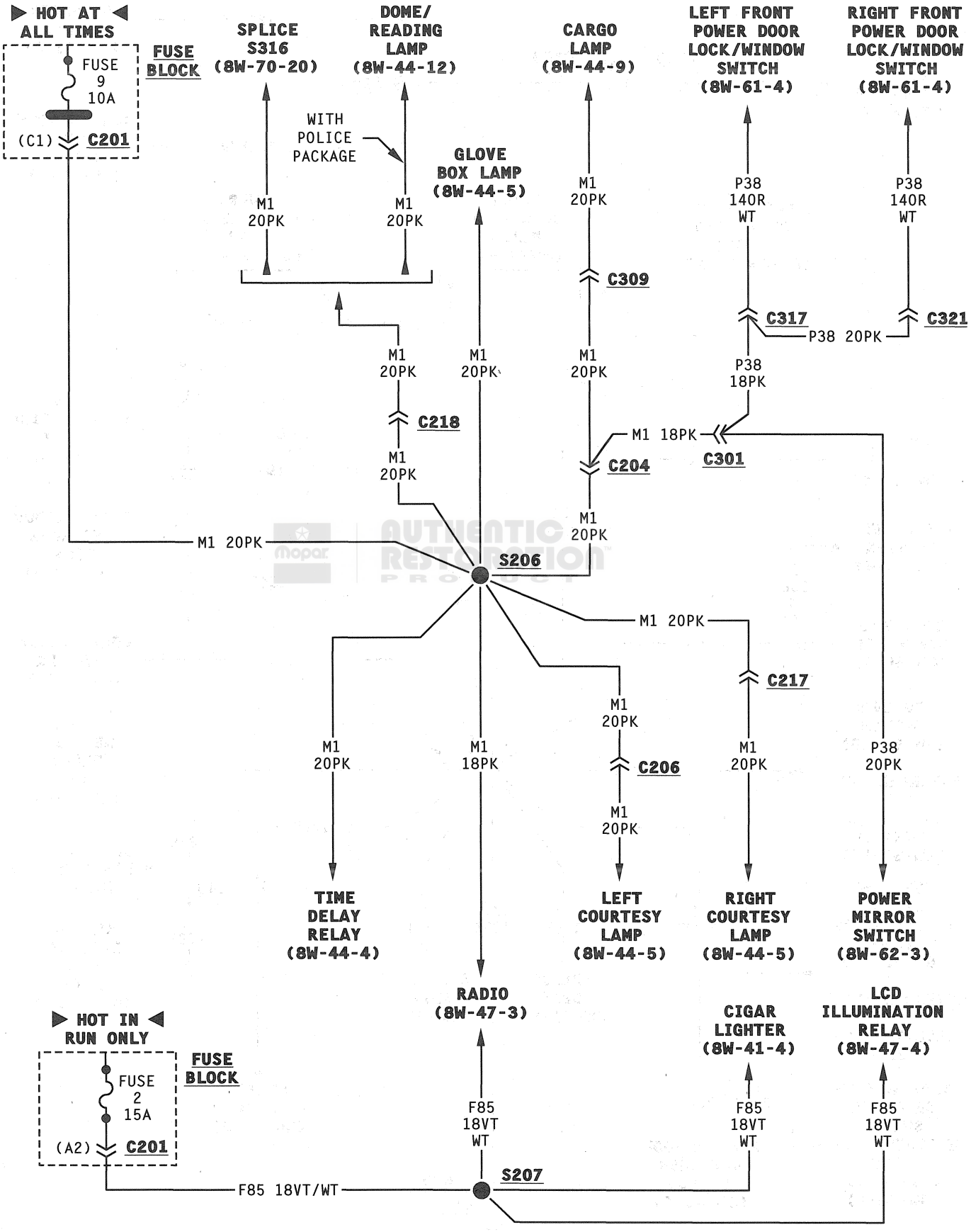


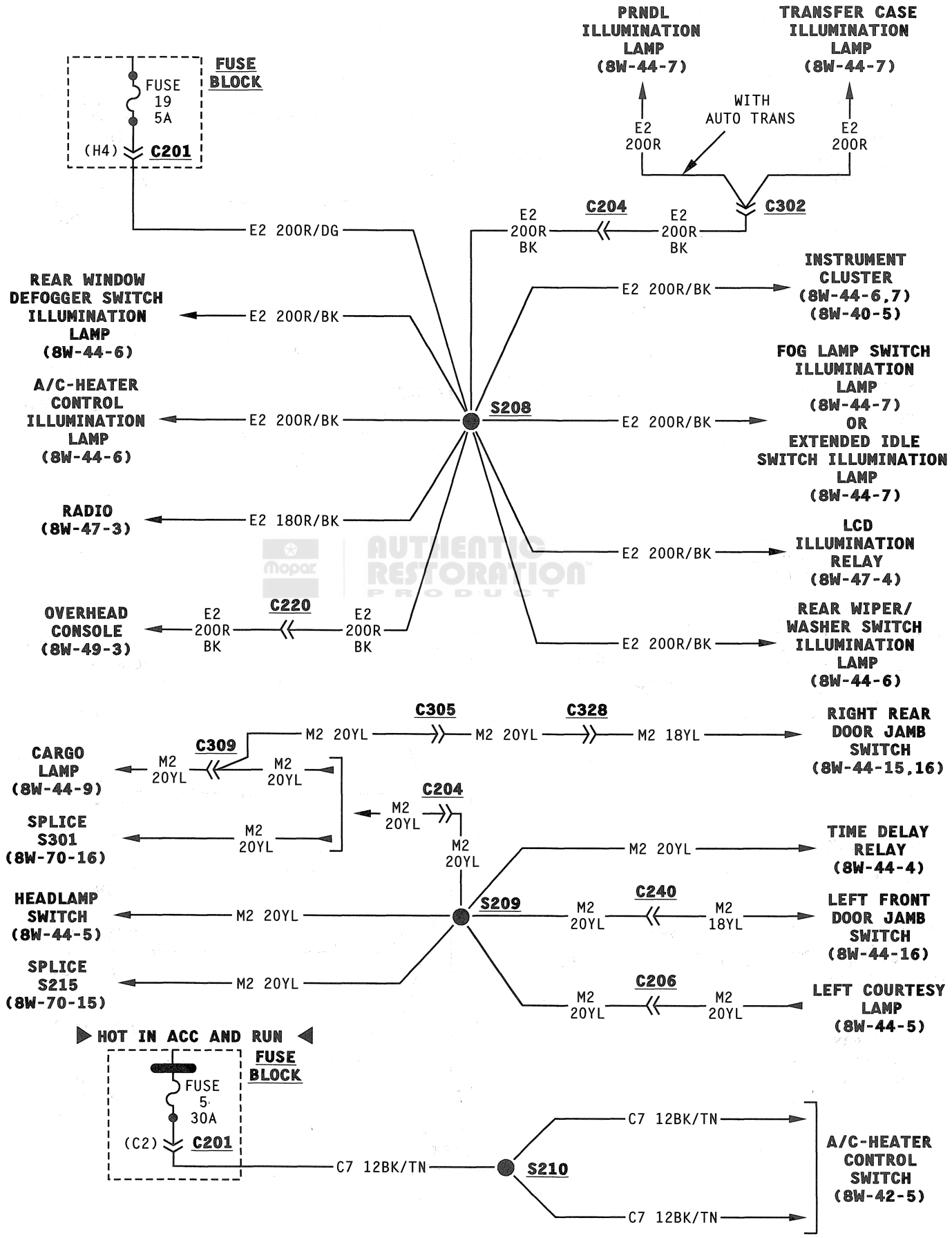
Mopar AUTHENTIC RESTORATION PRODUCT

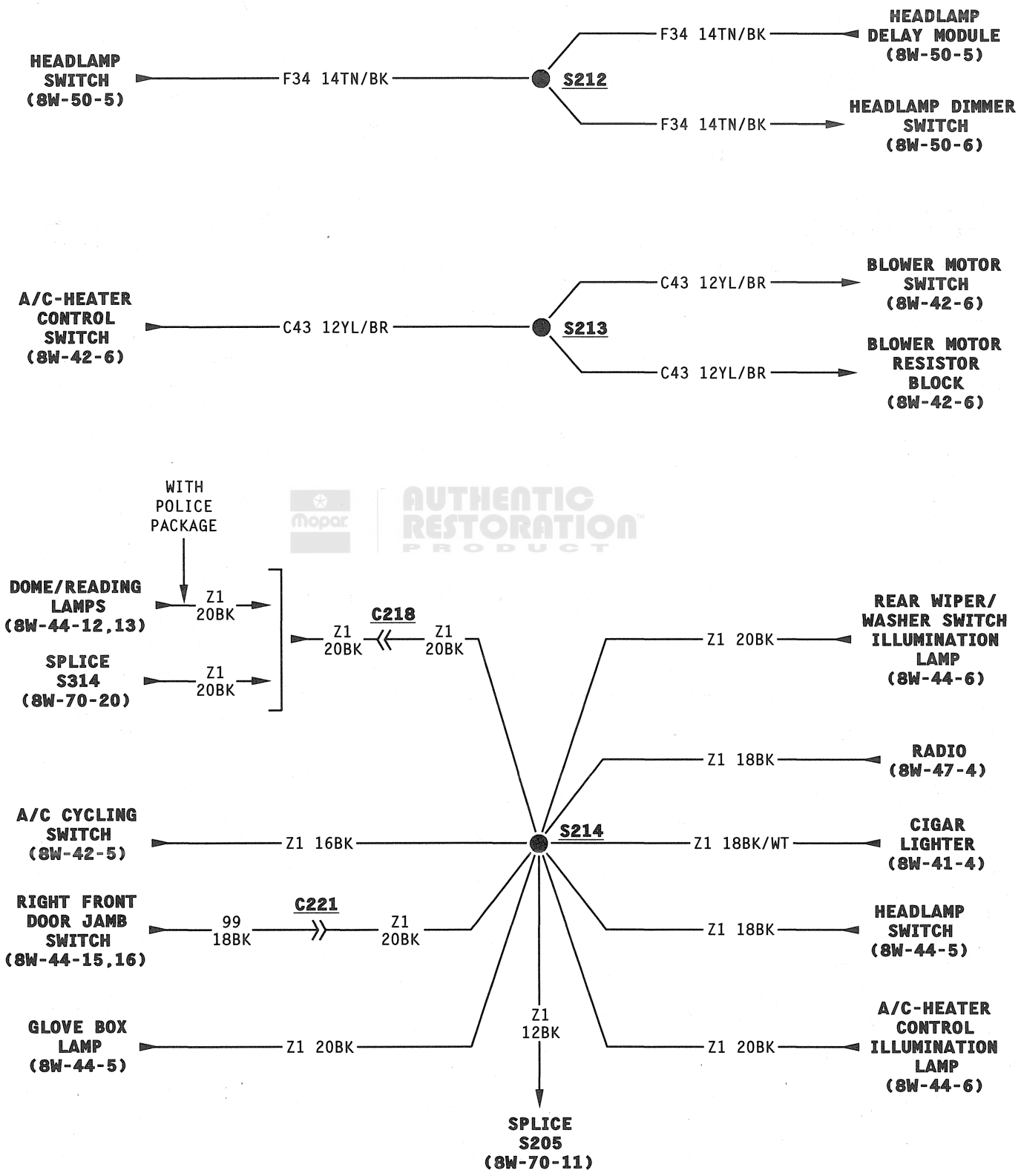


Mopar AUTHENTIC RESTORATION PRODUCT

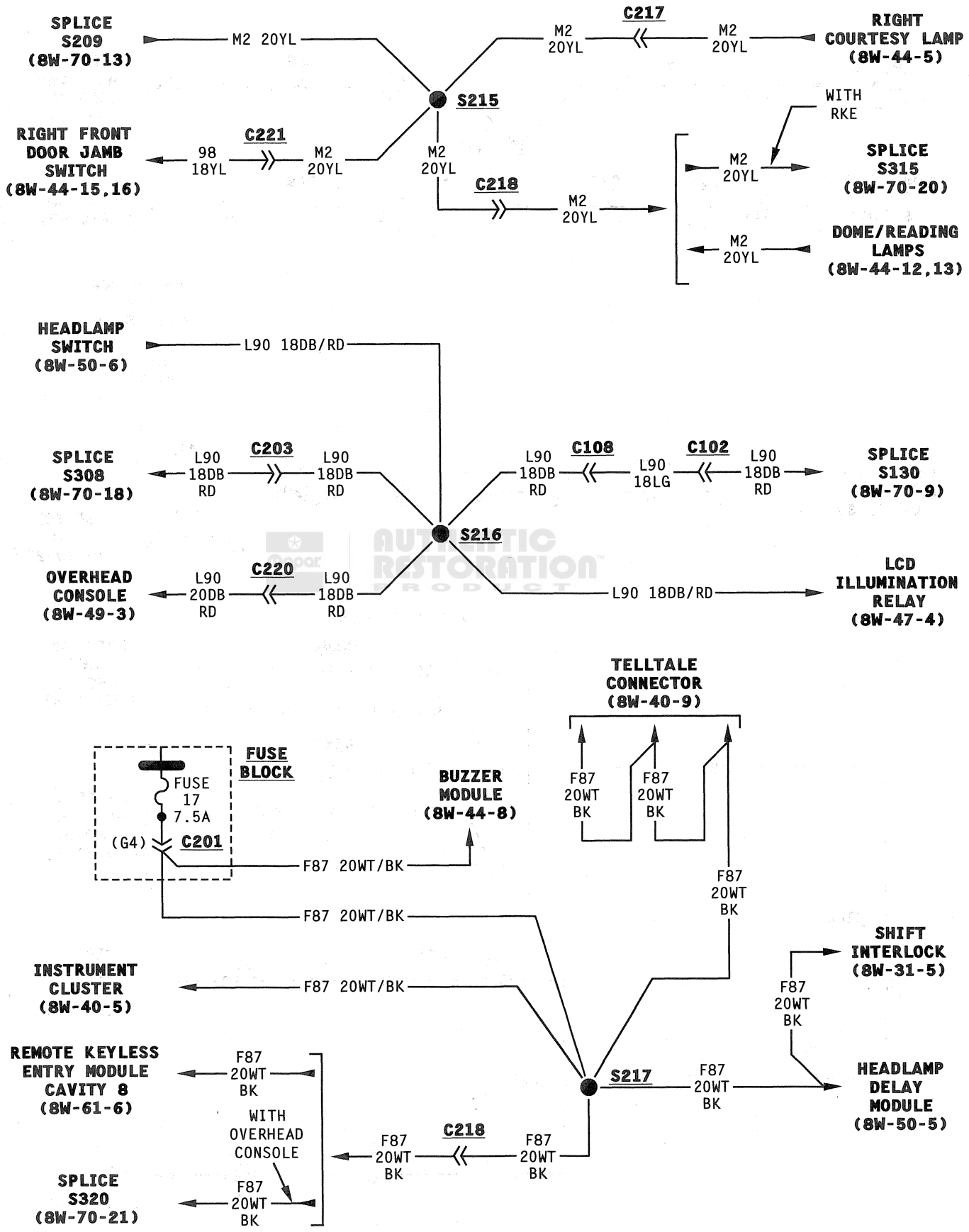

REAR WINDOW DEFOGGER RELAY (8W-48-3)
C15 12BK/RD
REAR WINDOW DEFOGGER (8W-48-4)
C15 14BK RD
C313
C15 12BK RD
C203
C15 12BK RD
S204
C15 12BK/RD
REAR WINDOW DEFOGGER SWITCH (8W-48-4)
LEFT FRONT DOOR JAMB SWITCH (8W-44-15,16)
POWER DOOR LOCK RELAY (8W-61-4)
POWER DOOR UNLOCK RELAY (8W-61-4)
Z1 18BK
Z1 18BK
Z1 18BK
Z1 18BK
Z1 18BK
C240
LCD ILLUMINATION RELAY (8W-47-4)
BUZZER MODULE (8W-44-8)
Z1 20BK
Z1 20BK
SPLICE S311 (8W-70-19)
Z1 18BK
Z1 14BK
INSTRUMENT CLUSTER (8W-40-6)
Z1 20BK
C204
Z1 14BK
C301
REAR WINDOW DEFOGGER RELAY (8W-48-3)
Z1 18BK
TELLTALE CONNECTOR (8W-40-6)
Z1 20BK
Z1 14BK
Z1 14BK
COMBINATION FLASHER (8W-52-3)
FOG LAMP SWITCH (8W-50-10) OR EXTENDED IDLE SWITCH (WITH POLICE PACKAGE) (8W-30-12)
S205
Z1 20BK
Z1 18BK
HEADLAMP DELAY MODULE (8W-50-5)
Z1 20BK
Z1 12BK
Z1 18BK
INTERMITTENT WIPER MODULE (8W-53-4)
C108
FOG LAMP SWITCH ILLUMINATION LAMP (8W-50-10) OR EXTENDED ILDLE SWITCH ILLUMINATION LAMP
Z1 20BK
Z1 12BK
Z1 12BK
Z1 18BK
Z1 20BK
KEY-IN SWITCH/ HALO LAMP (8W-44-15)
Z1 12BK
SPLICE S214 (8W-70-14)
STOP LAMP SWITCH (8W-33-3)
SPLICE S104 (8W-70-3)
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6) (8W-48-4)
Z1 20BK
REAR WINDOW DEFOGGER SWITCH (8W-48-4)
G201
8W-15-6,7

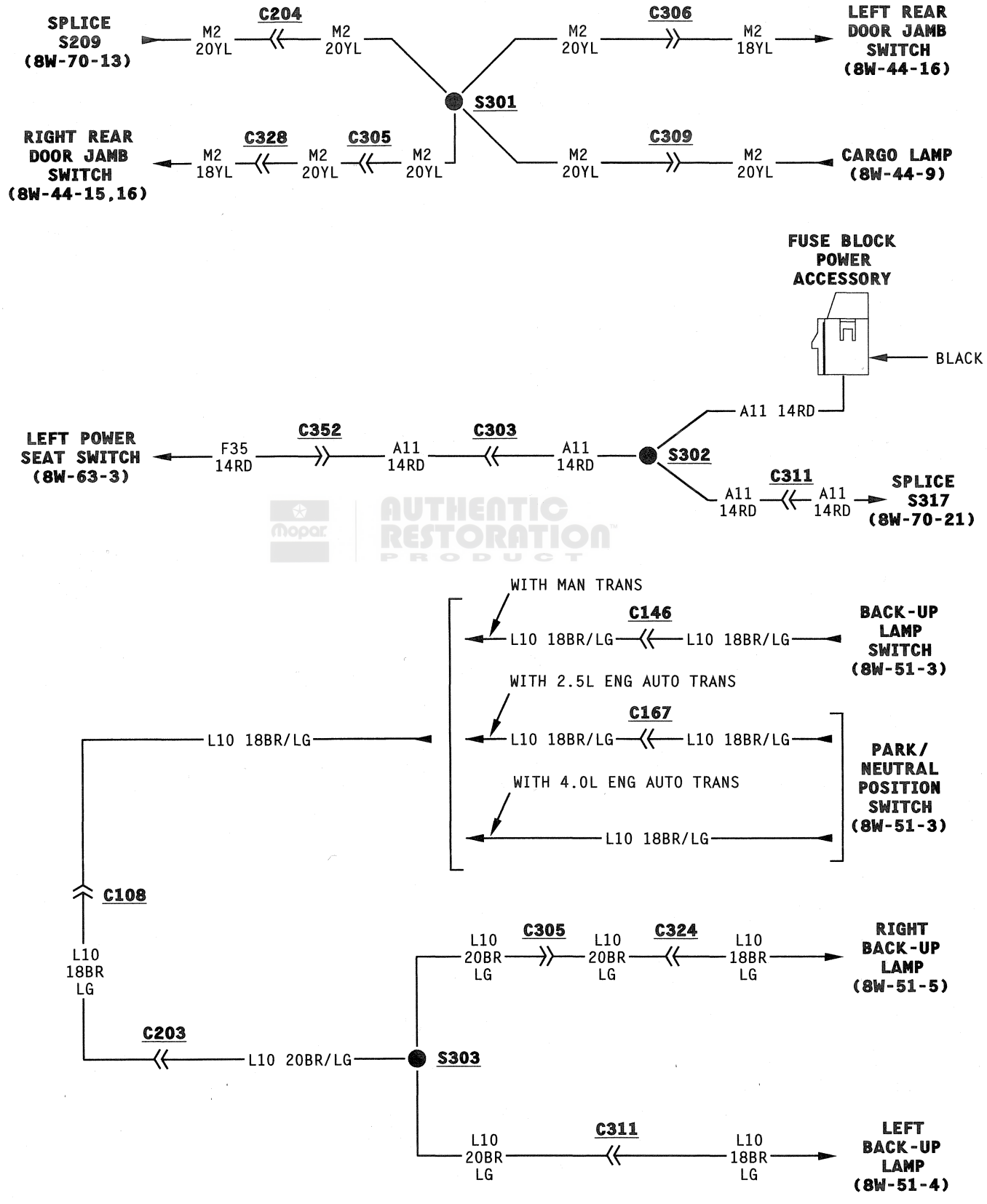

▶ HOT AT ◀ ALL TIMES
FUSE BLOCK
FUSE 9 10A
(C1) C201
SPLICE S316 (8W-70-20)
DOME/ READING LAMP (8W-44-12)
WITH POLICE PACKAGE
CARGO LAMP (8W-44-9)
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-4)
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-4)
GLOVE BOX LAMP (8W-44-5)
M1 20PK
P38 140R WT
C309
C317
C321
P38 20PK
P38 18PK
C218
M1 18PK
C301
C204
S206
C217
C206
P38 20PK
TIME DELAY RELAY (8W-44-4)
LEFT COURTESY LAMP (8W-44-5)
RIGHT COURTESY LAMP (8W-44-5)
POWER MIRROR SWITCH (8W-62-3)
RADIO (8W-47-3)
CIGAR LIGHTER (8W-41-4)
LCD ILLUMINATION RELAY (8W-47-4)
▶ HOT IN ◀ RUN ONLY
FUSE BLOCK
FUSE 2 15A
(A2) C201
F85 18VT WT
F85 18VT/WT
S207


PRNDL ILLUMINATION LAMP (8W-44-7)
TRANSFER CASE ILLUMINATION LAMP (8W-44-7)
WITH AUTO TRANS
E2 200R
E2 200R
FUSE BLOCK
FUSE 19 5A
(H4) C201
C302
C204
E2 200R BK
E2 200R BK
E2 200R/DG
E2 200R/BK
INSTRUMENT CLUSTER (8W-44-6,7) (8W-40-5)
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6)
A/C-HEATER CONTROL ILLUMINATION LAMP (8W-44-6)
S208
FOG LAMP SWITCH ILLUMINATION LAMP (8W-44-7) OR EXTENDED IDLE SWITCH ILLUMINATION LAMP (8W-44-7)
RADIO (8W-47-3)
E2 180R/BK
LCD ILLUMINATION RELAY (8W-47-4)
OVERHEAD CONSOLE (8W-49-3)
C220
REAR WIPER/ WASHER SWITCH ILLUMINATION LAMP (8W-44-6)
C305
C328
M2 20YL
M2 18YL
RIGHT REAR DOOR JAMB SWITCH (8W-44-15,16)
C309
CARGO LAMP (8W-44-9)
SPLICE S301 (8W-70-16)
C204
TIME DELAY RELAY (8W-44-4)
HEADLAMP SWITCH (8W-44-5)
S209
C240
LEFT FRONT DOOR JAMB SWITCH (8W-44-16)
SPLICE S215 (8W-70-15)
C206
LEFT COURTESY LAMP (8W-44-5)
HOT IN ACC AND RUN
FUSE BLOCK
FUSE 5 30A
(C2) C201
C7 12BK/TN
S210
A/C-HEATER CONTROL SWITCH (8W-42-5)

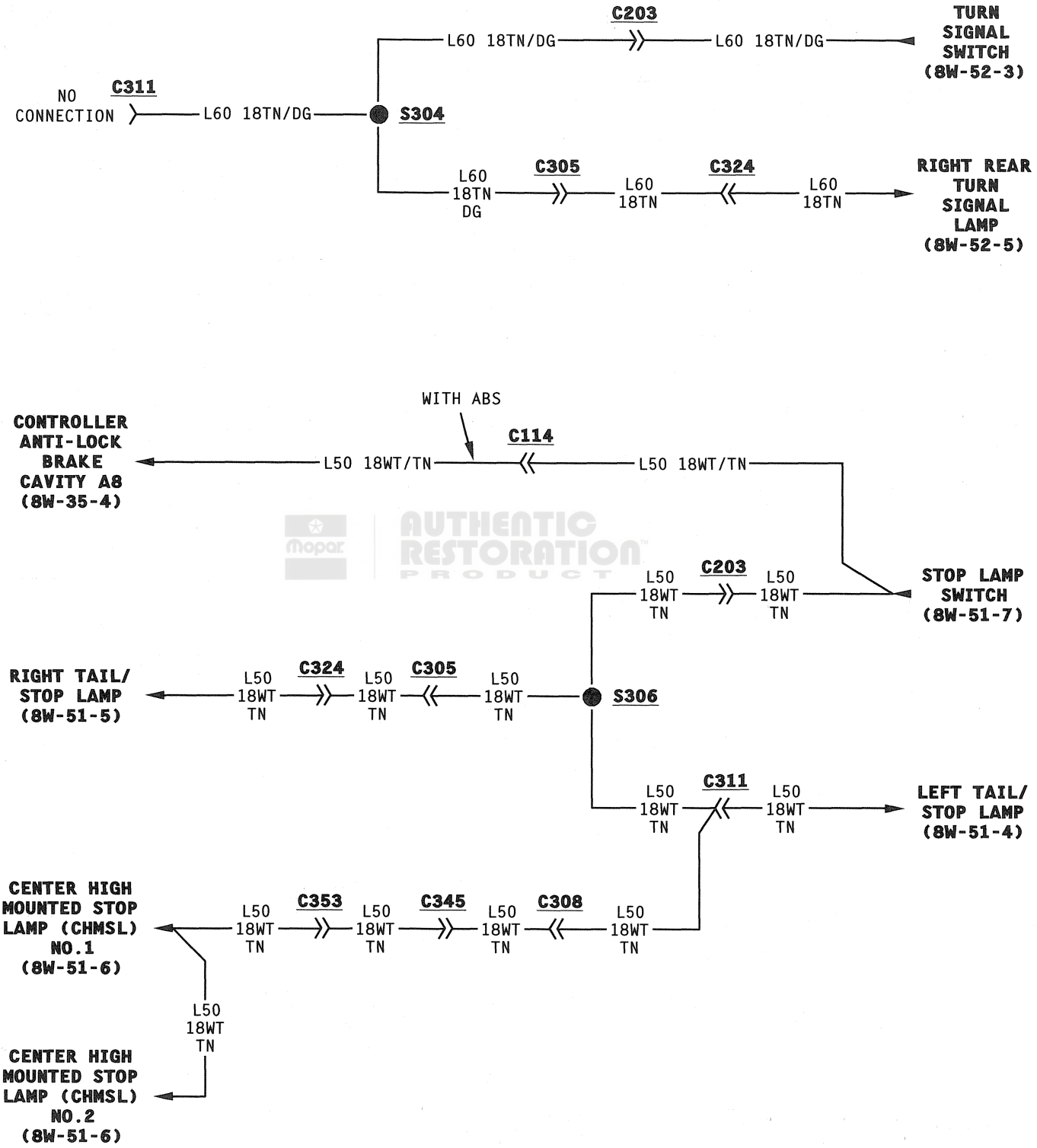


Mopar AUTHENTIC RESTORATION PRODUCT

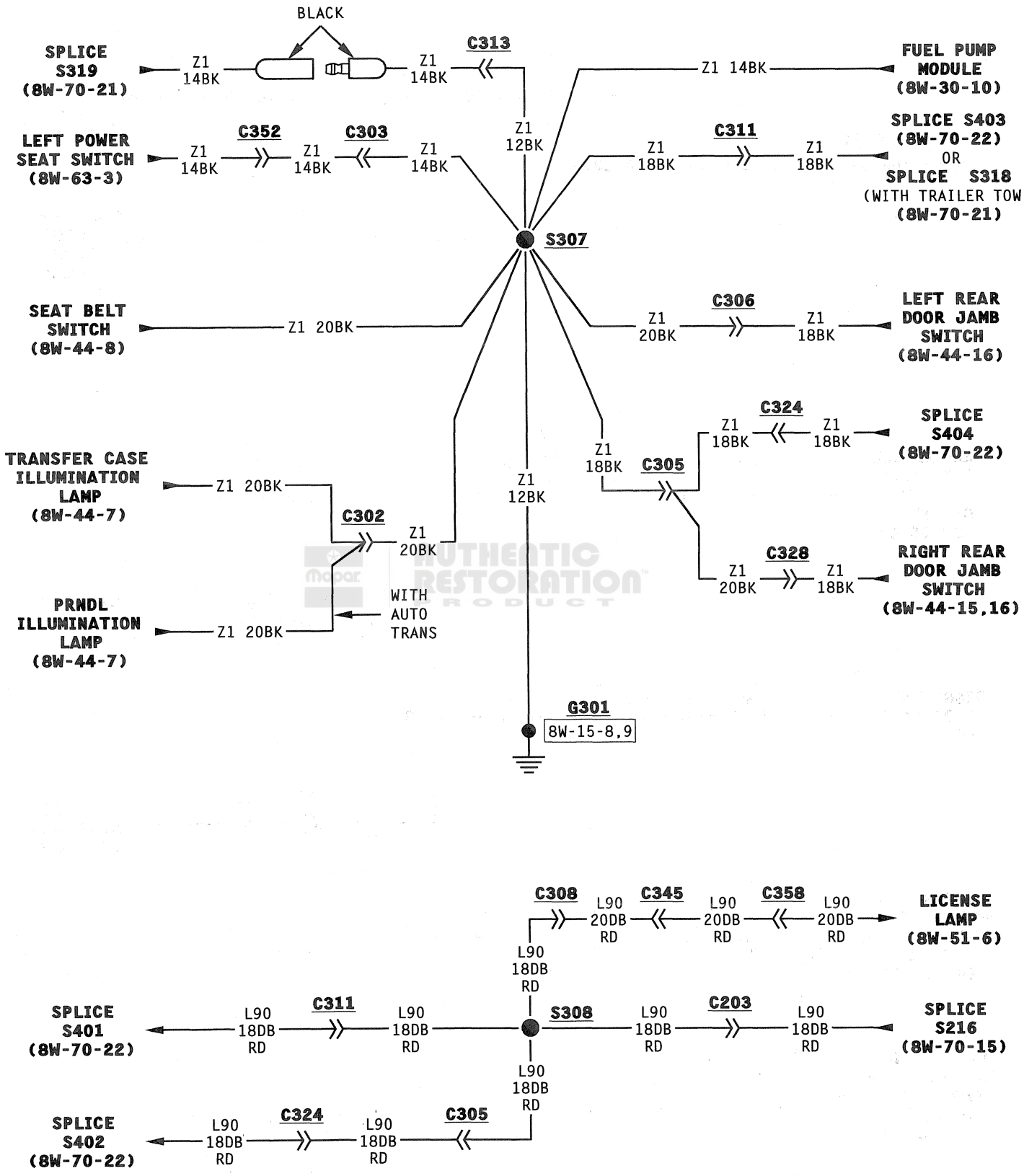

SPLICE S209 (8W-70-13)
M2 20YL
C217
M2 20YL
M2 20YL
RIGHT COURTESY LAMP (8W-44-5)
S215
WITH RKE
RIGHT FRONT DOOR JAMB SWITCH (8W-44-15,16)
98 18YL
C221
M2 20YL
M2 20YL
C218
M2 20YL
M2 20YL
SPLICE S315 (8W-70-20)
M2 20YL
DOME/READING LAMPS (8W-44-12,13)
HEADLAMP SWITCH (8W-50-6)
L90 18DB/RD
SPLICE S308 (8W-70-18)
L90 18DB RD
C203
L90 18DB RD
L90 18DB RD
C108
L90 18LG
C102
L90 18DB RD
SPLICE S130 (8W-70-9)
S216
OVERHEAD CONSOLE (8W-49-3)
L90 20DB RD
C220
L90 18DB RD
L90 18DB/RD
LCD ILLUMINATION RELAY (8W-47-4)
TELLTALE CONNECTOR (8W-40-9)
FUSE BLOCK
FUSE 17 7.5A
(G4)
C201
BUZZER MODULE (8W-44-8)
F87 20WT BK
F87 20WT BK
F87 20WT/BK
F87 20WT BK
F87 20WT/BK
SHIFT INTERLOCK (8W-31-5)
INSTRUMENT CLUSTER (8W-40-5)
F87 20WT/BK
F87 20WT BK
REMOTE KEYLESS ENTRY MODULE CAVITY 8 (8W-61-6)
F87 20WT BK
S217
F87 20WT BK
HEADLAMP DELAY MODULE (8W-50-5)
WITH OVERHEAD CONSOLE
C218
F87 20WT BK
F87 20WT BK
SPLICE S320 (8W-70-21)
F87 20WT BK

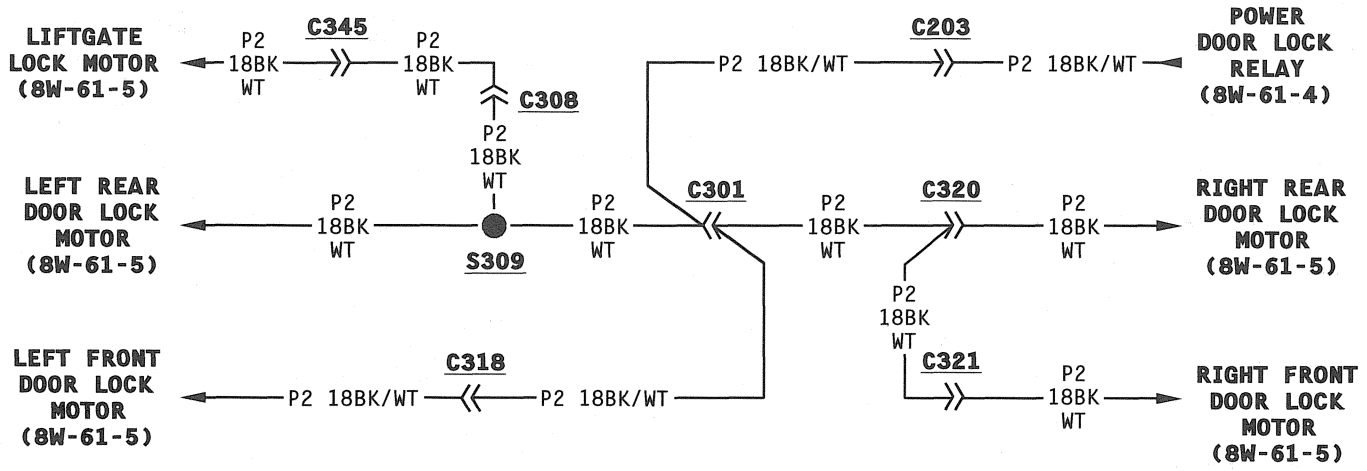


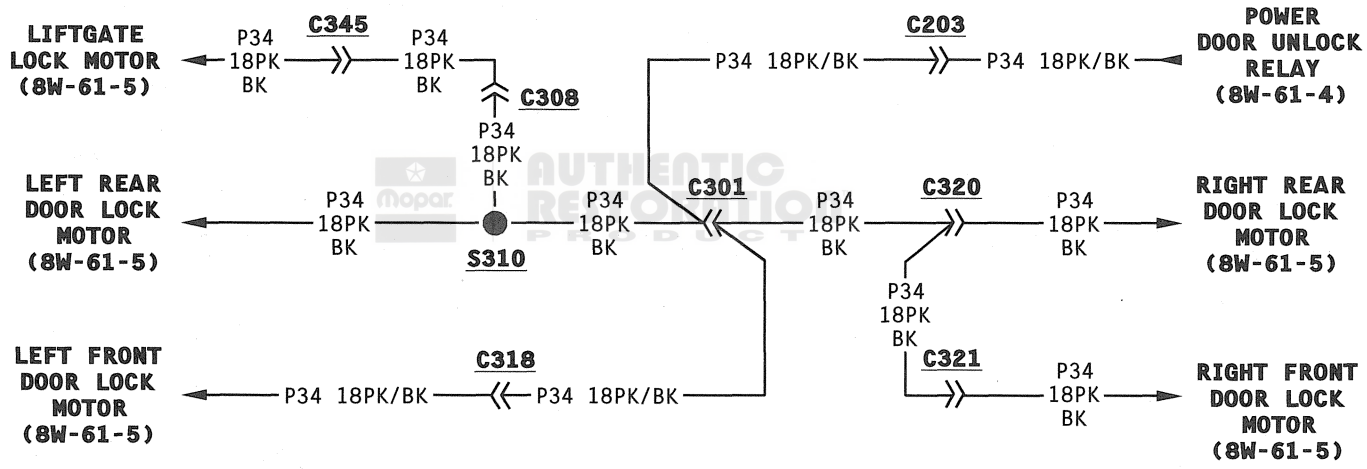
Mopar AUTHENTIC RESTORATION PRODUCT

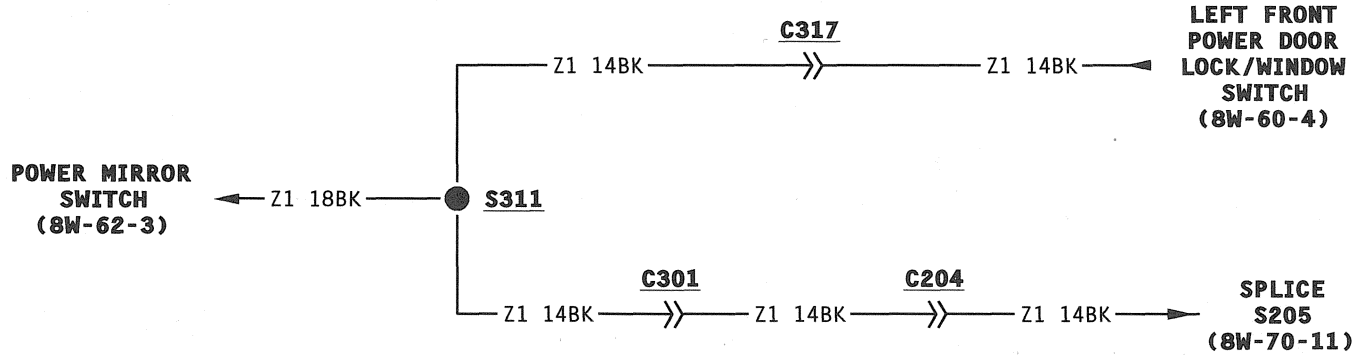


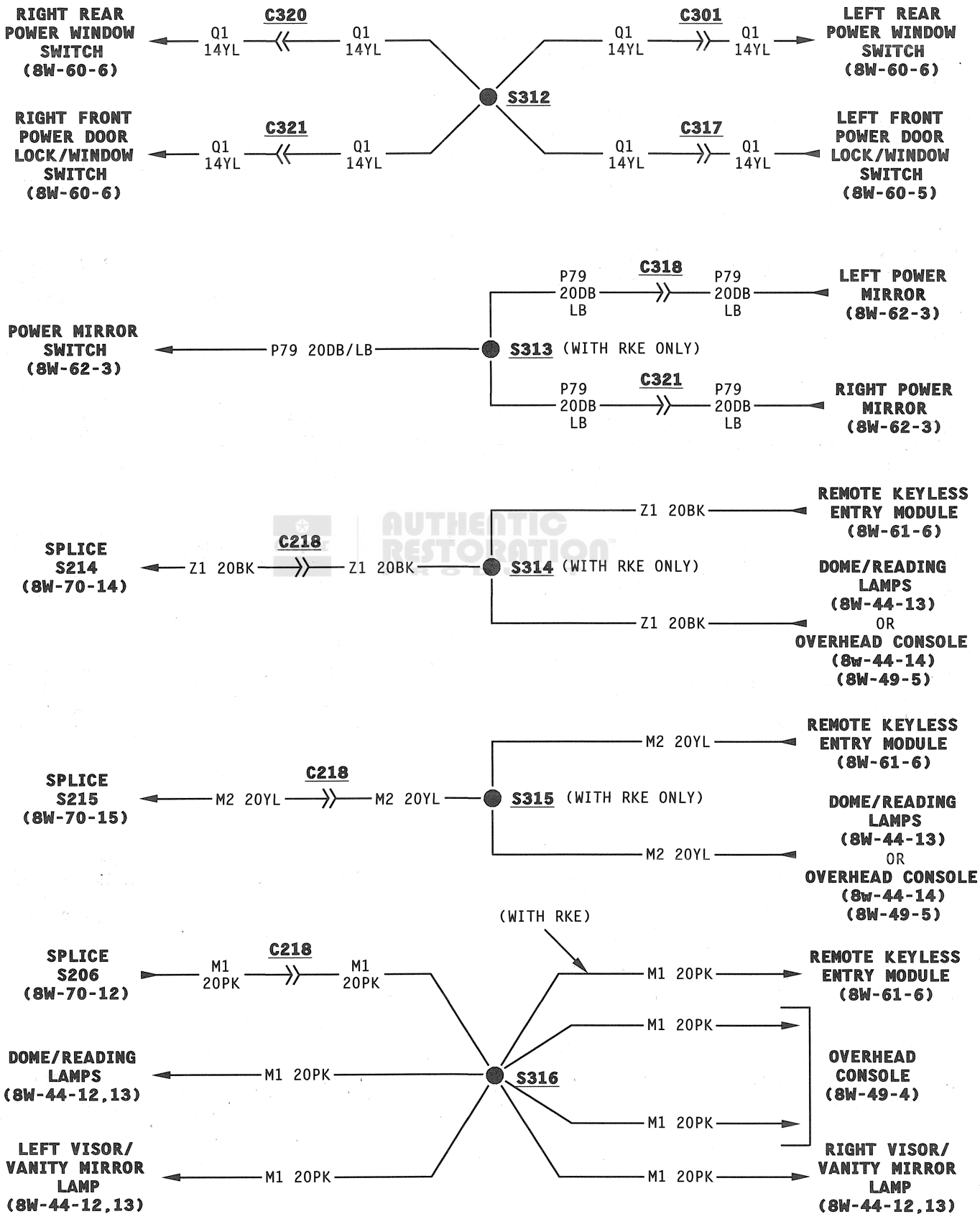
Mopar AUTHENTIC RESTORATION PRODUCT

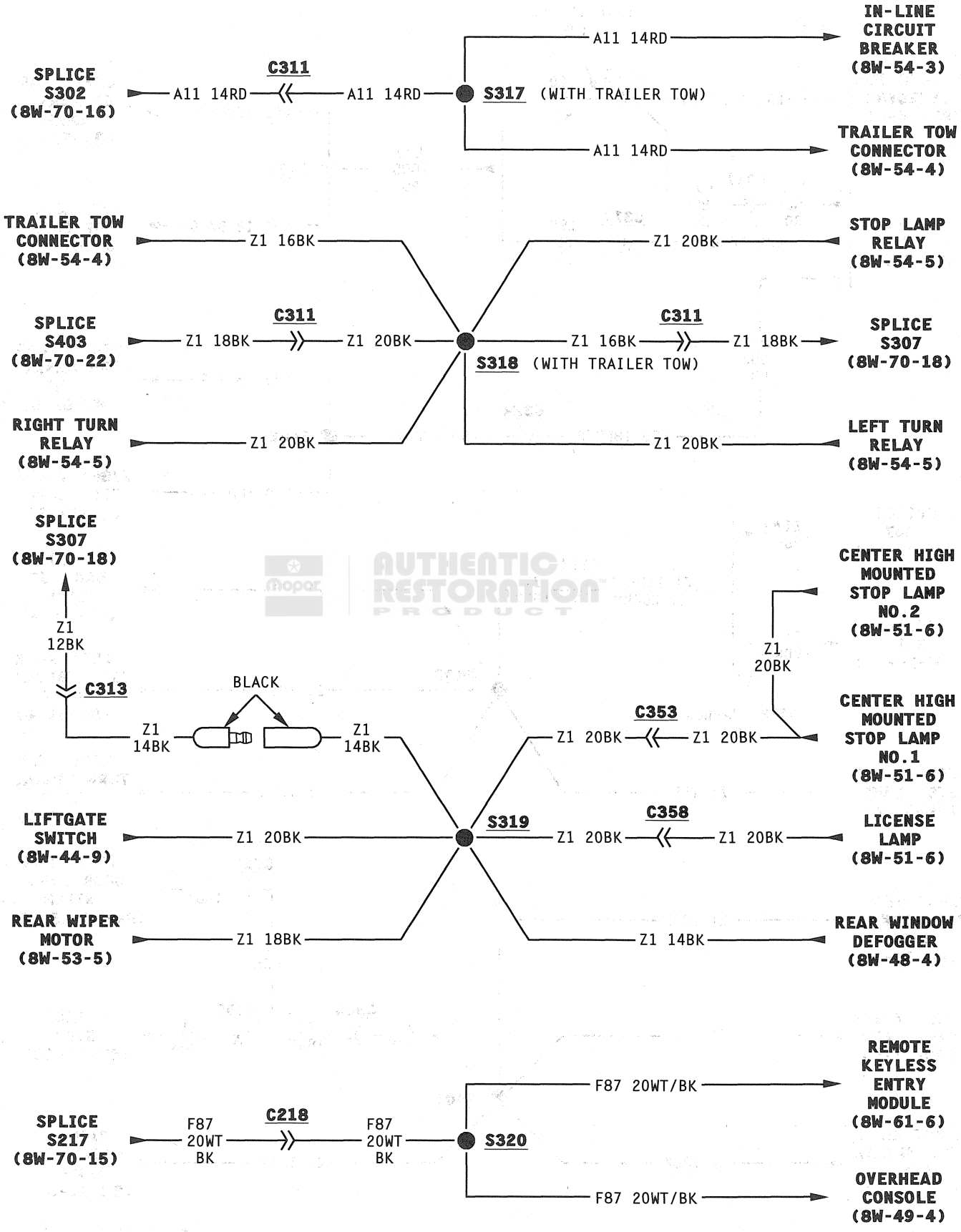

BLACK
SPLICE S319 (8W-70-21)
Z1 14BK
C313
FUEL PUMP MODULE (8W-30-10)
LEFT POWER SEAT SWITCH (8W-63-3)
C352
C303
C311
SPLICE S403 (8W-70-22) OR SPLICE S318 (WITH TRAILER TOW) (8W-70-21)
Z1 12BK
Z1 18BK
S307
SEAT BELT SWITCH (8W-44-8)
Z1 20BK
C306
LEFT REAR DOOR JAMB SWITCH (8W-44-16)
C324
SPLICE S404 (8W-70-22)
TRANSFER CASE ILLUMINATION LAMP (8W-44-7)
C305
C302
C328
RIGHT REAR DOOR JAMB SWITCH (8W-44-15,16)
PRNDL ILLUMINATION LAMP (8W-44-7)
WITH AUTO TRANS
G301
8W-15-8,9
C308
C345
C358
LICENSE LAMP (8W-51-6)
L90 20DB RD
L90 18DB RD
SPLICE S401 (8W-70-22)
S308
C203
SPLICE S216 (8W-70-15)
SPLICE S402 (8W-70-22)


LIFTGATE LOCK MOTOR (8W-61-5)
P2 18BK WT
C345
P2 18BK WT
C308
P2 18BK WT
S309
LEFT REAR DOOR LOCK MOTOR (8W-61-5)
P2 18BK WT
P2 18BK WT
C301
P2 18BK WT
C320
P2 18BK WT
RIGHT REAR DOOR LOCK MOTOR (8W-61-5)
P2 18BK WT
C321
RIGHT FRONT DOOR LOCK MOTOR (8W-61-5)
LEFT FRONT DOOR LOCK MOTOR (8W-61-5)
C318
P2 18BK/WT
P2 18BK/WT
P2 18BK/WT
C203
P2 18BK/WT
POWER DOOR LOCK RELAY (8W-61-4)

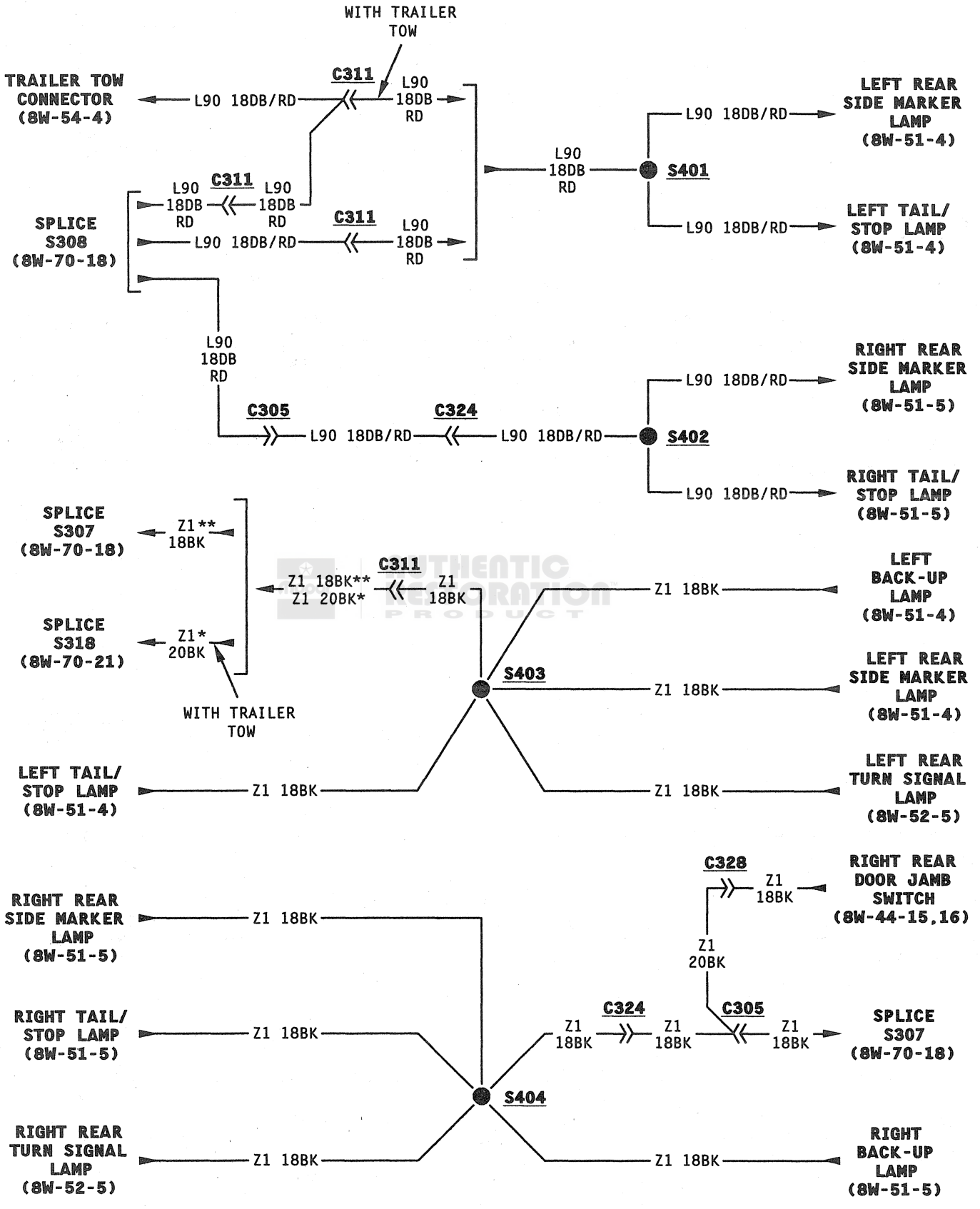

LIFTGATE LOCK MOTOR (8W-61-5)
P34 18PK BK
C345
P34 18PK BK
C308
P34 18PK BK
S310
LEFT REAR DOOR LOCK MOTOR (8W-61-5)
P34 18PK BK
P34 18PK BK
C301
P34 18PK BK
C320
P34 18PK BK
RIGHT REAR DOOR LOCK MOTOR (8W-61-5)
P34 18PK BK
C321
RIGHT FRONT DOOR LOCK MOTOR (8W-61-5)
LEFT FRONT DOOR LOCK MOTOR (8W-61-5)
C318
P34 18PK/BK
P34 18PK/BK
P34 18PK/BK
C203
P34 18PK/BK
POWER DOOR UNLOCK RELAY (8W-61-4)


POWER MIRROR SWITCH (8W-62-3)
Z1 18BK
S311
Z1 14BK
C317
Z1 14BK
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-60-4)
Z1 14BK
C301
Z1 14BK
C204
Z1 14BK
SPLICE S205 (8W-70-11)


RIGHT REAR POWER WINDOW SWITCH (8W-60-6)
Q1 14YL
C320
Q1 14YL
S312
Q1 14YL
C301
Q1 14YL
LEFT REAR POWER WINDOW SWITCH (8W-60-6)
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-60-6)
Q1 14YL
C321
Q1 14YL
Q1 14YL
C317
Q1 14YL
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-60-5)
POWER MIRROR SWITCH (8W-62-3)
P79 20DB/LB
S313 (WITH RKE ONLY)
P79 20DB LB
C318
P79 20DB LB
LEFT POWER MIRROR (8W-62-3)
P79 20DB LB
C321
P79 20DB LB
RIGHT POWER MIRROR (8W-62-3)
SPLICE S214 (8W-70-14)
Z1 20BK
C218
Z1 20BK
S314 (WITH RKE ONLY)
Z1 20BK
REMOTE KEYLESS ENTRY MODULE (8W-61-6)
DOME/READING LAMPS (8W-44-13) OR OVERHEAD CONSOLE (8w-44-14) (8W-49-5)
SPLICE S215 (8W-70-15)
M2 20YL
C218
M2 20YL
S315 (WITH RKE ONLY)
M2 20YL
REMOTE KEYLESS ENTRY MODULE (8W-61-6)
DOME/READING LAMPS (8W-44-13) OR OVERHEAD CONSOLE (8w-44-14) (8W-49-5)
(WITH RKE)
SPLICE S206 (8W-70-12)
M1 20PK
C218
M1 20PK
M1 20PK
REMOTE KEYLESS ENTRY MODULE (8W-61-6)
M1 20PK
OVERHEAD CONSOLE (8W-49-4)
DOME/READING LAMPS (8W-44-12,13)
M1 20PK
S316
M1 20PK
LEFT VISOR/ VANITY MIRROR LAMP (8W-44-12,13)
M1 20PK
M1 20PK
RIGHT VISOR/ VANITY MIRROR LAMP (8W-44-12,13)



mopar AUTHENTIC RESTORATION PRODUCT



*WITH TRAILER TOW
**WITHOUT TRAILER TOW

8W-80 CONNECTOR PIN-OUTS

DESCRIPTION AND OPERATION

INTRODUCTION

The pages referenced in this section show the connector, the circuits in the connector, and the pin that circuit occupies. Individual connector numbers are referenced on diagram pages throughout Group 8W.

Mopar AUTHENTIC RESTORATION PRODUCT

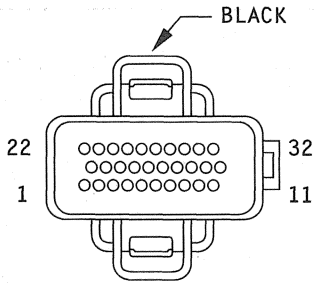
DIAGRAM INDEX

Connector	Page
C100	8W-80-4
C101	8W-80-5
C102	8W-80-6
C103	8W-80-6
C104	8W-80-6
C105	8W-80-6
C106	8W-80-7
C107	8W-80-7
C108	8W-80-8, 9, 10
C109	8W-80-11
C110	8W-80-11
C112	8W-80-11
C113	8W-80-11
C114	8W-80-12
C117	8W-80-12
C118	8W-80-12
C119	8W-80-13
C120	8W-80-13
C121	8W-80-13
C122	8W-80-13
C123	8W-80-13
C124	8W-80-13
C125	8W-80-14
C126	8W-80-14
C127	8W-80-14
C128	8W-80-14
C129	8W-80-14
C130	8W-80-14
C131	8W-80-15
C132	8W-80-15
C133	8W-80-16
C134	8W-80-16
C135	8W-80-16
C136	8W-80-16
C137	8W-80-17
C138	8W-80-17
C139	8W-80-17
C140	8W-80-17
C141	8W-80-17
C142	8W-80-17
C143	8W-80-18
C144	8W-80-18
C145	8W-80-18
C146	8W-80-18
C147	8W-80-18
C148	8W-80-18
C149	8W-80-19
C150	8W-80-19
C151	8W-80-19
C152	8W-80-19
C153	8W-80-19
C154	8W-80-20
C155	8W-80-20
C156	8W-80-20
C157	8W-80-20
C158	8W-80-21
C159	8W-80-21
C160	8W-80-21
C161	8W-80-21
C162	8W-80-21
C163	8W-80-22
C165	8W-80-22
C167	8W-80-22
C168	8W-80-23
C169	8W-80-23
C170	8W-80-23
C171	8W-80-23
C172	8W-80-24
C202	8W-80-24
C203	8W-80-24
C204	8W-80-25
C205	8W-80-25
C206	8W-80-25
C207	8W-80-26
C209	8W-80-26
C210	8W-80-26
C211	8W-80-26
C212	8W-80-27
C213	8W-80-27
C214	8W-80-27
C215	8W-80-27
C216	8W-80-27
C217	8W-80-28
C218	8W-80-28
C219	8W-80-28
C220	8W-80-28
C221	8W-80-28
C222	8W-80-29
C223	8W-80-29
C224	8W-80-29
C225	8W-80-29
C226	8W-80-29
C227	8W-80-30
C228	8W-80-30
C229	8W-80-30
C230	8W-80-31
C231	8W-80-31
C232	8W-80-31
C233	8W-80-31
C234	8W-80-32
C235	8W-80-32
C236	8W-80-32
C237	8W-80-33
C238	8W-80-33
C239	8W-80-33
C240	8W-80-33

DIAGRAM INDEX

Connector	Page
C241	8W-80-33
C243	8W-80-34
C244	8W-80-34
C301	8W-80-34
C302	8W-80-34
C303	8W-80-35
C304	8W-80-35
C305	8W-80-35
C306	8W-80-35
C307	8W-80-35
C308	8W-80-36
C309	8W-80-36
C310	8W-80-36
C311	8W-80-36
C312	8W-80-36
C313	8W-80-37
C314	8W-80-37
C315	8W-80-37
C316	8W-80-37
C317	8W-80-37
C318	8W-80-38
C319	8W-80-38
C320	8W-80-38
C321	8W-80-38
C322	8W-80-39
C323	8W-80-39
C324	8W-80-39
C325	8W-80-39
C326	8W-80-40
C327	8W-80-40
C328	8W-80-40
C329	8W-80-40
C331	8W-80-40
C332	8W-80-40
C333	8W-80-41
C334	8W-80-41
C335	8W-80-41
C336	8W-80-41
C338	8W-80-41
C339	8W-80-42
C340	8W-80-42
C341	8W-80-43
C342	8W-80-43
C343	8W-80-43
C344	8W-80-44
C345	8W-80-44
C346	8W-80-44

Connector	Page
C347	8W-80-44
C348	8W-80-45
C349	8W-80-45
C350	8W-80-45
C351	8W-80-45
C352	8W-80-45
C353	8W-80-46
C354	8W-80-46
C355	8W-80-46
C356	8W-80-46
C357	8W-80-46
C358	8W-80-46
C401	8W-80-47
C402	8W-80-47
C403	8W-80-47
C404	8W-80-47
C405	8W-80-47
C406	8W-80-48
C407	8W-80-48
C408	8W-80-48
C409	8W-80-48
C410	8W-80-48
C411	8W-80-49
C412	8W-80-49
C413	8W-80-49
C414	8W-80-49
C416	8W-80-49
C417	8W-80-49
C418	8W-80-50
C419	8W-80-50
C420	8W-80-50
C421	8W-80-50
C422	8W-80-50
C423	8W-80-50
C424	8W-80-51
C426	8W-80-51
C427	8W-80-51
C429	8W-80-51
C430	8W-80-51
C432	8W-80-52
C433	8W-80-52
C434	8W-80-52
C435	8W-80-52
C436	8W-80-52
C437	8W-80-52
C438	8W-80-52

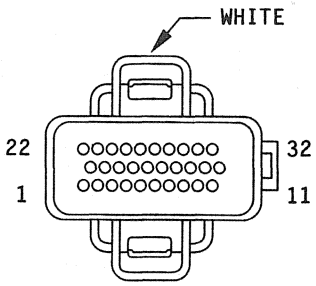


POWERTRAIN
CONTROL MODULE
(CONNECTOR A)

C100

CAV	CIRCUIT	FUNCTION
A1	–	–
A2	A21 14DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
A3	–	–
A4	K4 18BK/LB	SENSOR GROUND
A5	–	–
A6	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE*
A7	K19 18GY	IGNITION COILS NO.1, NO.6 DRIVER
A8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
A9	–	–
A10	K60 18YL/BK	IDLE AIR CONTROL MOTOR NO. 2 DRIVER
A11	K40 18BR/WT	IDLE AIR CONTROL MOTOR NO. 3 DRIVER
A12	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SIGNAL**
A13	–	–
A14	–	–
A15	K21 16BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
A16	K2 16TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
A17	K6 20VT/WT	5 VOLT SUPPLY
A18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
A19	K39 18GY/RD	IDLE AIR CONTROL MOTOR NO. 1 DRIVER
A20	K59 18VT/BK	IDLE AIR CONTROL MOTOR NO. 4 DRIVER
A21	–	–
A22	A14 14RD	FUSED B(+)
A23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
A24	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL
A25	K341 18TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL
A26	–	–
A27	K1 20DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
A28	–	–
A29	–	–
A30	–	–
A31	Z12 14BK/TN	GROUND
A32	Z12 14BK/TN	GROUND

* WITH AUTO TRANS
** WITH 2.5L ENG OR
POLICE PACKAGE



POWERTRAIN
CONTROL MODULE
(CONNECTOR B)

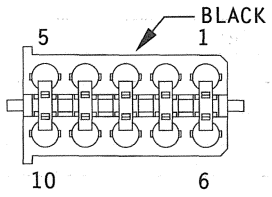
C101

CAV	CIRCUIT	FUNCTION
B1	–	–
B2	–	–
B3	–	–
B4	K11 18WT/DB	INJECTOR NO. 1 DRIVER
B5	K13 18YL/WT	INJECTOR NO. 3 DRIVER
B6	K38 18GY	INJECTOR NO. 5 DRIVER*
B7	–	–
B8	–	–
B9	–	–
B10	K20 18DG	GENERATOR FIELD DRIVER
B11	K54 20OR/BK	TORQUE CONVERTER CLUTCH SOLENOID CONTROL
B12	K58 18BR/DB	INJECTOR NO. 6 DRIVER*
B13	–	–
B14	–	–
B15	K12 18TN	INJECTOR NO. 2 DRIVER
B16	K14 18LB/BR	INJECTOR NO. 4 DRIVER
B17	–	–
B18	–	–
B19	–	–
B20	–	–
B21	–	–
B22	–	–
B23	–	–
B24	–	–
B25	–	–
B26	–	–
B27	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL
B28	–	–
B29	–	–
B30	–	–
B31	K7 18OR	5 VOLT SUPPLY
B32	–	–

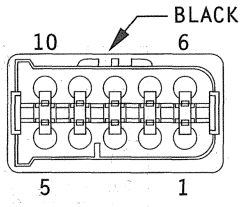
AUTHENTIC RESTORATION PARTS

* WITH 4.0L ENG

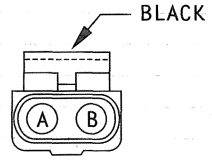
C102



CAV	CIRCUIT
1	G465 16LB/BK•
	L3 14RD/OR••
2	L3 14RD/OR
3	L61 18LG
4	L90 18LG*
	L90 18DB/RD**
5	Z1 16BK
6	F39 18PK/LG
7	L4 14VT/WT
8	L60 18TN
9	L39 16LB
10	L35 16BR/WT



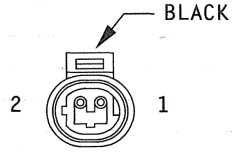
CAV	CIRCUIT
1	G465 16LB/BK*
2	L3 16RD/OR
3	L61 18LG
	L61 18LG
4	L90 18DB/RD
4	L90 18DB/RD
5	Z1 16BK
6	F39 16PK/LG*
7	L4 16VT/WT
8	L60 18TN
	L60 18TN
9	L39 16LB*
10	L35 18BR/WT*



RADIATOR FAN MOTOR

C103 (4.0L ENG. ONLY)

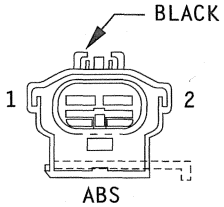
CAV	CIRCUIT	FUNCTION
A	C25 14LG	RADIATOR FAN RELAY OUTPUT
B	Z1 14BK	GROUND



LEFT FRONT WHEEL SPEED SENSOR

C104

CAV	CIRCUIT	FUNCTION
1	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
2	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR (+)

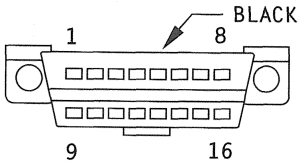


ABS PUMP MOTOR

C105

CAV	CIRCUIT	FUNCTION
1	B233 12TN/BK	ABS PUMP MOTOR RELAY OUTPUT
2	Z12 12BK/TN	GROUND

* WITH FOG LAMPS

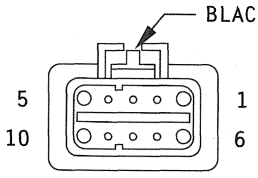


DATA LINK CONNECTOR

C106

CAV	CIRCUIT	FUNCTION
1	–	–
2	–	–
3	D1 18VT/BR	CCD BUS (+)
4	Z12 16BK/TN	GROUND
5	Z11 16BK/WT	GROUND
6	D20 20LG	SCI RECEIVE
7	D21 20PK	SCI TRANSMIT
	D21 20PK	SCI TRANSMIT**
8	–	–
8	–	–
10	–	–
11	D2 18WT/BK	CCD BUS (-)
12	–	–
13	–	–
14	–	–
15	T137 16YL/BK	TRANSMISSION DIAG SIGNAL*
16	F39 18PK/LG	FUSED B(+)

Mopar AUTHENTIC RESTORATION PRODUCT



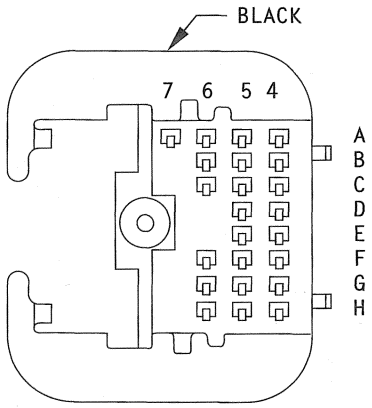
HYDRAULIC CONTROL UNIT

C107

CAV	CIRCUIT	FUNCTION
1	B235 14GY/YL	ABS MAIN RELAY OUTPUT
2	B251 16WT/BK	REAR ISOLATION VALVE CONTROL
3	B249 16WT/TN	RIGHT FRONT ISOLATION VALVE CONTROL
4	B245 16WT/LG	LEFT FRONT ISOLATION VALVE CONTROL
5	–	–
6	–	–
7	B254 16DG/OR	REAR DUMP VALVE CONTROL
8	B248 16DG/WT	RIGHT FRONT DUMP VALVE CONTROL
9	B243 16DG/BK	LEFT FRONT DUMP VALVE CONTROL
10	B235 14GY/YL	ABS MAIN RELAY OUTPUT

* WITH 4.0L ENG AUTO TRANS
** WITH ABS

C108 (BULKHEAD HIGH)



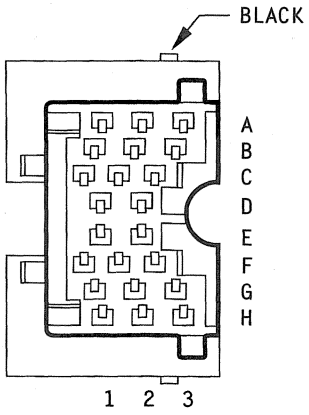
BULKHEAD-HIGH
(HEADLAMP/DASH
HARNESS)

CAV	CIRCUIT
A4	L9 18BK/WT
A5	C90 14LG
A6	A6 18RD/BK
A7	G3 20BK/PK
B4	G21 20GY/LB
B5	G106 20BK/YL •
B6	A21 12DB
C4	A141 14DG/WT
C5	L10 18BR/LG
C6	G6 20GY
D4	L39 16LB
D5	L4 14VT/WT
	L4 16VT/WT**
E4	A1 10RD
E5	C1 12DG
F4	G9 20GY/WT
F5	G9 20GY/BK
F6	K10 18DB/OR*
G4	Z1 12BK
G5	–
G6	–
H4	L3 14RD/OR
	L3 16RD/OR
H5	V20 18BK/WT
H6	G29 20BK/TN

Mopar AUTHENTIC RESTORATION Product

* WITH 2.5L ENG
** WITH DRL
• WITH 4.0L ENG AUTO TRANS

C108 (BULKHEAD LOW)

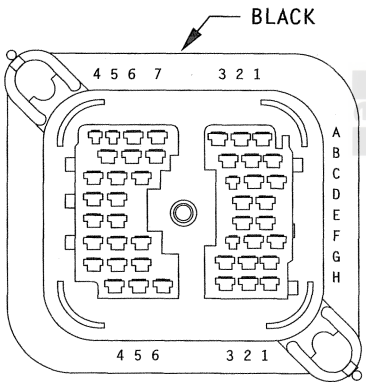


BULKHEAD LOW
(HEADLAMP/DASH
HARNESS)

CAV	CIRCUIT
A1	L61 18LG
A2	K54 20OR/BK
A3	F86 18LG/BK
B1	L90 18LG•
B1	L90 18DB/RD••
B2	V10 20BR
B3	V4 18RD/YL
C1	G107 20BK/RD*
	G107 20BK/RD
C2	G4 18DB
C3	K4 18BK/LB
D1	A3 12RD/WT
D2	A4 12BK/RD
D3	–
E1	A7 12RD/YL
E2	X2 18DG/RD
	X2 18DG/RD
E3	–
F1	L3 16RD/OR
F1	G465 16LB/BK**
F2	L60 18TN
F3	G20 18VT/YL
G1	L35 16BR/WT
G2	G14 20PK/BK
G3	V3 18BR/WT
H1	C21 14DB/OR
H2	A41 14YL
H3	V55 18TN/RD

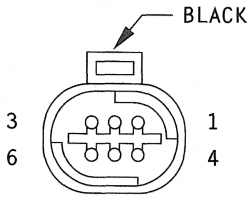
* WITH 4.0L ENG AUTO TRANS
** WITH DRL
• WITH 2.5 L ENG
•• WITH 4.0L ENG

C108



CAV	CIRCUIT
A1	L61 18LG
	L61 18LG
A2	K54 20LG/OR
A3	F86 18LG/BK
A4	L9 16PK/BK
	L9 16PK/BK
A5	C90 14LG/WT
A6	A6 18RD/DB
A7	G3 20BK/PK
B1	L90 18DB/RD
B2	V11 18BR*
B3	V4 18RD/BK
B4	G21 20GY/LB
B5	G106 20BK/YL
B6	A21 12DB/YL
C1	G107 20BK/LB
C2	G4 18DB/WT
C3	K4 20BK/LB
	K4 18BK/LB
C4	A241 14DG/TN
C5	L10 18BR/LG
C6	G6 20GY
D1	A3 12RD/WT
D2	A4 12BK/RD
D4	L39 16LB**
D5	L4 16VT/WT
E1	A7 12RD/YL
E2	X2 16DG/RD
E4	A1 12RD
	A1 12RD
E5	C1 12DG
F1	L3 16RD/YL
F2	L60 18TN
	L60 18TN
F3	G20 20VT/YL
F4	G9 18GY/OR
F5	G9 20GY/WT
F6	K10 18VT*
G1	L35 16BR/WT**
G2	G14 20PK/BK
G3	V3 18BR/TN
G4	Z1 12BK
G5	–
G6	A38 12OR
H1	C21 14DB/OR
H2	A41 14YL
H3	V6 18DB
H4	L3 16RD/OR
H5	V20 18BK/WT
	V20 18BK/WT
H6	G29 20BK/TN

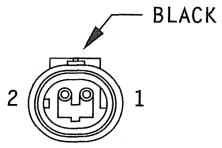
* WITH POLICE PACKAGE
** DELETE WITH POLICE PACKAGE



FRONT WIPER MOTOR

C109

CAV	CIRCUIT	FUNCTION
1	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
2	V55 18TN/RD	WIPER PARK SWITCH SENSE
3	–	–
4	Z1 16BK	GROUND
5	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
6	V4 18RD/YL	WIPER SWITCH HIGH SPEED OUTPUT

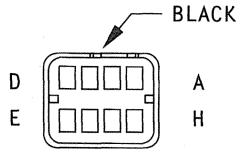


EVAP/PURGE SOLENOID

C110

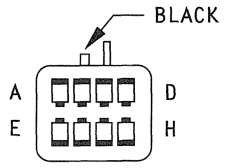
CAV	CIRCUIT	FUNCTION
1	K52 20PK/BK	EVAP/PURGE SOLENOID CONTROL
2	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)

Mopar AUTHENTIC RESTORATION PRODUCT

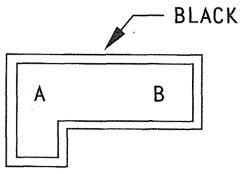


C112

CAV	CIRCUIT
A	B515 18YL/VT
B	B516 18TN/WT
C	B517 18PK/OR
D	B1 18YL/DB
E	B2 18YL
F	B3 18LG/DB
G	B4 18LG
H	–



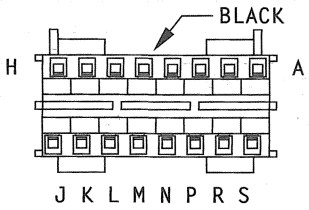
CAV	CIRCUIT
A	B515 18YL/VT
B	B516 18TN/WT
C	B517 18PK/OR
D	B1 18YL/DB
E	B2 18YL
F	B3 18LG/DB
G	B4 18LG
H	–



ABS DIODE

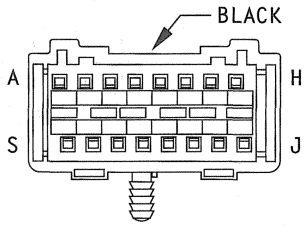
C113

CAV	CIRCUIT	FUNCTION
A	B235 14GY/YL	ABS MAIN RELAY OUTPUT
B	B205 18VT	ABS LAMP DRIVER



C114

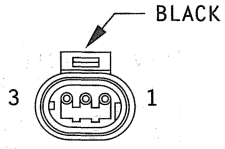
CAV	CIRCUIT
A	V30 20DB/RD
B	V33 20WT/LG
C	B205 18VT*
D	–
E	–
F	Z2 18BK/OR
G	K29 18WT/PK**
	K29 18WT/PK
H	G7 20WT/OR
J	G31 18VT/LG
K	G32 18BK/LB
L	–
M	–
N	–
P	B236 18LG/YL
R	L50 18WT/TN
S	V32 20YL/RD



C114

CAV	CIRCUIT
A	V30 20DB/RD
B	V33 20WT/LG
C	A205 18YL °
D	–
E	–
F	Z2 18BK/LG
	Z2 18BK/LG
G	K29 18WT/PK
H	G7 20WT/OR
J	G31 20BK/LB
K	G32 20VT/LB
L	–
M	–
N	–
P	A236 18LG/YL
R	L50 18WT/TN
S	V32 20YL/RD
	V32 20YL/RD

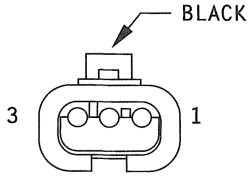
Mopar AUTHENTIC RESTORATION PRODUCT



CRANKSHAFT POSITION SENSOR

C117

CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL

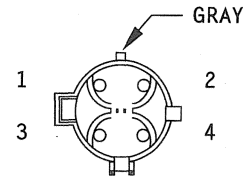


THROTTLE POSITION SENSOR

C118

CAV	CIRCUIT	FUNCTION
1	K6 20VT/WT	5 VOLT SUPPLY
2	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND

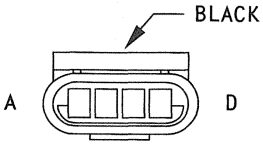
* WITH ABS
** WITH 4.0L ENG AUTO TRANS
° WITH POLICE PACKAGE



UPSTREAM HEATED OXYGEN SENSOR

C119

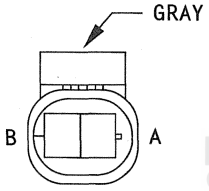
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	FUEL PUMP RELAY OUTPUT
2	Z11 18BK/WT*	GROUND
2	Z11 16BK/WT**	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL



IDLE AIR CONTROL MOTOR

C120

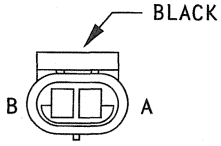
CAV	CIRCUIT	FUNCTION
A	K59 18VT/BK	IDLE AIR CONTROL MOTOR DRIVER NO. 4
B	K40 18BR/WT	IDLE AIR CONTROL MOTOR DRIVER NO. 3
C	K60 18YL/BK	IDLE AIR CONTROL MOTOR DRIVER NO. 2
D	K39 18GY/RD	IDLE AIR CONTROL MOTOR DRIVER NO. 1



INTAKE AIR TEMPERATURE SENSOR

C121

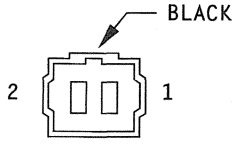
CAV	CIRCUIT	FUNCTION
A	K4 16BK/LB	SENSOR GROUND
B	K21 16BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL



ENGINE COOLANT TEMPERATURE SENSOR

C122

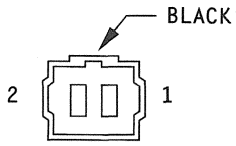
CAV	CIRCUIT	FUNCTION
A	K4 16BK/LB	SENSOR GROUND
B	K2 16TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



INJECTOR NO. 1

C123

CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	INJECTOR NO. 1 DRIVER

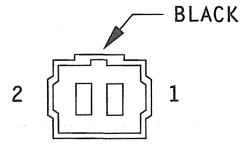


INJECTOR NO. 2

C124

CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	INJECTOR NO. 2 DRIVER

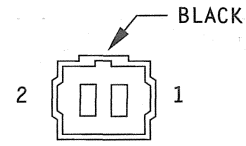
* WITH 2.5L ENG
** WITH 4.0L ENG



INJECTOR NO. 3

C125

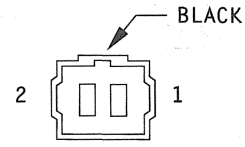
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	INJECTOR NO. 3 DRIVER



INJECTOR NO. 4

C126

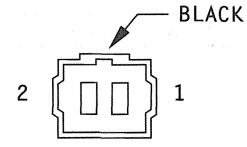
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	INJECTOR NO. 4 DRIVER



INJECTOR NO. 5

C127

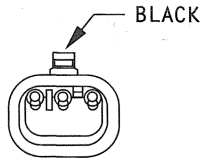
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K38 18GY	INJECTOR NO. 5 DRIVER



INJECTOR NO. 6

C128

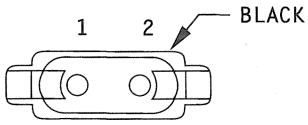
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K58 18BR/DB	INJECTOR NO. 6 DRIVER



MAP SENSOR

C129

CAV	CIRCUIT	FUNCTION
1	K6 20VT/WT	5 VOLT SUPPLY
2	K1 20DG/RD	MAP SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND

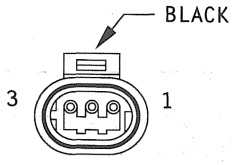


BRAKE PRESSURE SWITCH

C130

CAV	CIRCUIT	FUNCTION
1	G9 20GY/BK	BRAKE WARNING LAMP DRIVER
2	G9 20GY/WT	BRAKE WARNING LAMP DRIVER

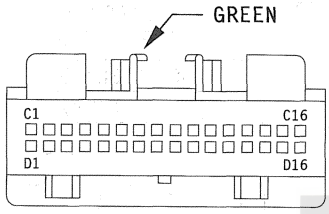
Mopar AUTHENTIC RESTORATION PRODUCT



CAMSHAFT
POSITION
SENSOR

C131

CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL

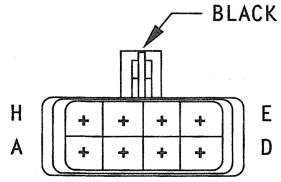


TRANSMISSION
CONTROL
MODULE

C132

CAV	CIRCUIT	FUNCTION
C1	–	–
C2	–	–
C3	T505 18TN/BK	TRANS SPEED SENSOR SIGNAL
C4	T137 16YL/BK	TRANS DIAG SIGNAL
C5	–	–
C6	–	–
C7	–	–
C8	T506 18LG/BK	1-2 GEAR SENSE
C9	T507 18GY/BK	DRIVE GEAR SENSE
C10	K29 18WT/PK	STOP LAMP SWITCH SENSE
C11	–	–
C12	–	–
C13	–	–
C14	T508 18WT/BK	SOLENOID S3 CONTROL
C15	T509 18VT/WT	SOLENOID S2 CONTROL
C16	T510 18DB/WT	SOLENOID S1 CONTROL
D1	–	–
D2	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
D3	K4 18BK/LB	SENSOR GROUND
D4	–	–
D5	–	–
D6	–	–
D7	Z1 18BK	GROUND
D8	–	–
D9	–	–
D10	–	–
D11	–	–
D12	–	–
D13	–	–
D14	A14 14RD	FUSED B(+)
D15	–	–
D16	T17 18YL	FUSED B(+)

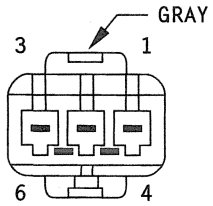
Mopar AUTHENTIC RESTORATION



PARK/NEUTRAL POSITION SWITCH

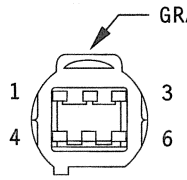
C133

CAV	CIRCUIT	FUNCTION
A	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE
C	Z1 18BK	GROUND
D	–	–
E	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT
F	–	–
G	T507 18GY/BK	DRIVE GEAR SENSE
H	T506 18LG/BK	1-2 GEAR SENSE



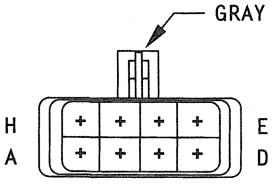
C134

CAV	CIRCUIT
1	G7 20WT/OR
2	K4 18BK/LB
3	G107 20BK/RD
4	Z1 18BK
5	–
6	K7 18OR



CAV	CIRCUIT
1	G7 18WT/OR
2	K4 18BK/LB
3	G107 18BK/RD*
4	Z1 18BK*
5	–
6	K7 18OR

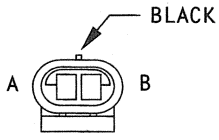
Mopar AUTHENTIC RESTORATION PRODUCT



TRANSMISSION SOLENOID ASSEMBLY

C135

CAV	CIRCUIT	FUNCTION
A	G106 20BK/YL	4WD FULL TIME
B	Z1 18BK	GROUND
C	T505 18TN/BK	TRANSMISSION SPEED SENSOR SIGNAL
D	–	–
E	T508 18WT/BK	SOLENOID S3 CONTROL
F	T509 18VT/WT	SOLENOID S2 CONTROL
G	T510 18DB/WT	SOLENOID S1 CONTROL
H	G107 20BK/RD	4WD LOCK

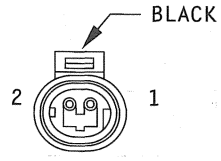


LOW WASHER FLUID LEVEL SWITCH

C136

CAV	CIRCUIT	FUNCTION
A	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B	G29 20BK/TN	WASHER FLUID SWITCH SENSE

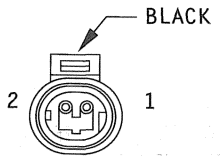
* WITH 4.0L ENG AND 231 TRANSFER CASE



UNDERHOOD LAMP

C137

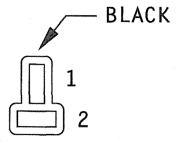
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	A6 18RD/BK	FUSED B(+)



RIGHT FRONT WHEEL SPEED SENSOR

C138

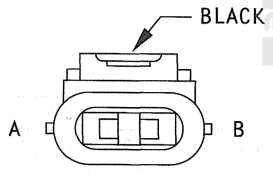
CAV	CIRCUIT	FUNCTION
1	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR (+)



REAR WASHER PUMP MOTOR

C139

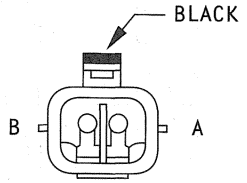
CAV	CIRCUIT	FUNCTION
1	V20 18BK/WT	REAR WASHER PUMP MOTOR CONTROL
2	Z1 18BK	GROUND
	Z1 18BK	GROUND



FRONT WASHER PUMP MOTOR

C140

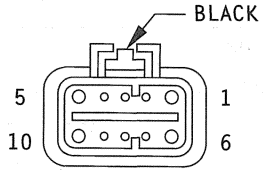
CAV	CIRCUIT	FUNCTION
A	V10 20BR	WINDSHIELD WASHER SWITCH OUTPUT
B	Z1 18BK	GROUND



A/C HEATER BLOWER MOTOR

C141

CAV	CIRCUIT	FUNCTION
A	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
B	Z1 12BK	GROUND

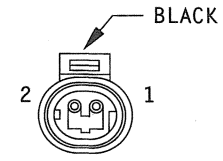


DAYTIME RUNNING LAMP MODULE

C142

CAV	CIRCUIT	FUNCTION
1	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
2	–	–
3	–	–
4	G465 16LB/BK	HIGH BEAM INDICATOR DRIVER
5	A21 12DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
6	A3 12RD/WT	FUSED B(+)
7	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL
8	Z1 18BK	GROUND
9	–	–
10	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT

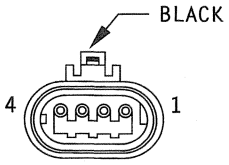
Mopar AUTHENTIC RESTORATION PROJECT



A/C LOW PRESSURE SWITCH

C143

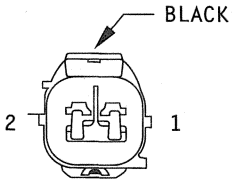
CAV	CIRCUIT	FUNCTION
1	C21 14DB/OR	A/C SWITCH SENSE
2	C21 14DB/OR	A/C LOW PRESSURE SWITCH OUTPUT



VEHICLE SPEED CONTROL SERVO

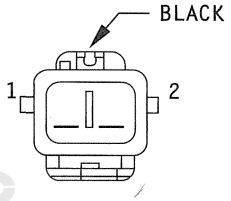
C144

CAV	CIRCUIT	FUNCTION
1	V36 20TN/RD	VEHICLE SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 20LG/RD	VEHICLE SPEED CONTROL VENT SOLENOID CONTROL
3	V30 20DB/RD	VEHICLE SPEED CONTROL BRAKE SWITCH OUTPUT
4	Z1 18BK	GROUND



C145

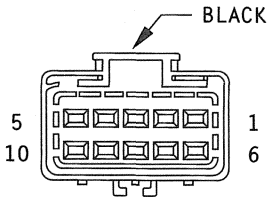
CAV	CIRCUIT
1	G31 18VT/LG
2	G32 18BK/LB



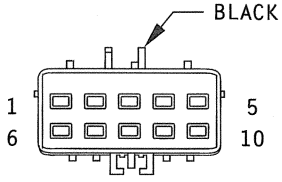
CAV	CIRCUIT
1	G31 18VT/LG
2	G32 18BK/LB

Mopar AUTHENTIC RESTORATION PRODUCT

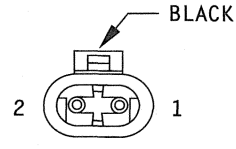
C146



CAV	CIRCUIT
1	T40 14BR**
2	K19 18GY
3	L10 18BR/LG*
4	F12 18DB/WT*
5	C3 14DB/BK
6	–
7	G6 20GY
8	–
9	K20 18DG
10	A142 16DG/OR



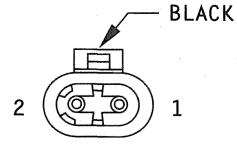
CAV	CIRCUIT
1	T40 14BR**
2	K19 18BK/GY
3	L10 18BR/LG*
4	F12 18DB/WT*
5	C3 14DB/BK
6	–
7	G6 18GY
8	–
9	K20 18DG
10	A142 16DG/OR



ENGINE OIL PRESSURE SWITCH

C147

CAV	CIRCUIT	FUNCTION
1	G6 18GY	ENGINE OIL PRESSURE SWITCH SENSE
2	–	–

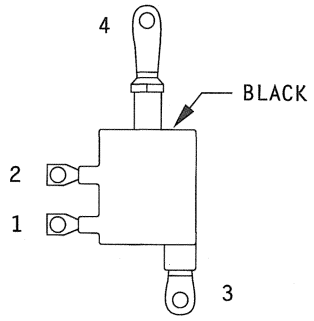


IGNITION COIL

C148

CAV	CIRCUIT	FUNCTION
1	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
2	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT

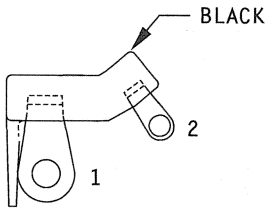
* WITH MAN TRANS
** WITH 2.5L ENG



GENERATOR

C149

CAV	CIRCUIT	FUNCTION
1	K20 18DG	GENERATOR FIELD DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	–	–
4	Z0 8BK	GROUND

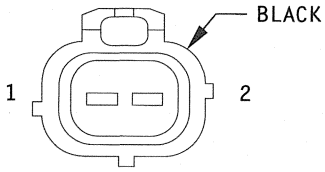


ENGINE STARTER MOTOR

C150 (4.0L ENG)

CAV	CIRCUIT	FUNCTION
1	A0 6RD	B(+)
2	T40 14LG/BK	ENGINE STARTER MOTOR RELAY OUTPUT

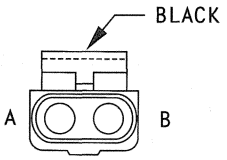
C151
POWER DISTRIBUTION CENTER
(8W-11-2)



POWER STEERING PRESSURE SWITCH

C152 (WITH 2.5L ENG)

CAV	CIRCUIT	FUNCTION
1	Z12 18BK/TN*	GROUND
1	Z1 18BK**	GROUND
2	K10 18DB/OR	POWER STEERING PRESSURE SWITCH SENSE

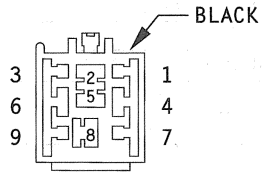


BACK-UP LAMP SWITCH

C153 (WITH MAN TRANS)

CAV	CIRCUIT	FUNCTION
A	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
B	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT

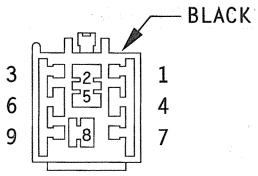
* WITH 2.5L ENG MAN TRANS
** WITH 2.5L ENG AUTO TRANS



PARK LAMP
RELAY

C154 (WITH FOG LAMPS)

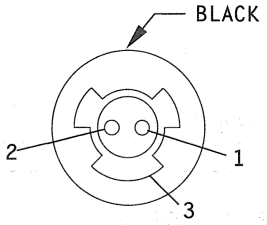
CAV	CIRCUIT	FUNCTION
1	–	–
2	F39 16PK/LG	FUSED B(+)
3	–	–
4	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
5	–	–
6	L35 18BR/WT	PARK LAMP RELAY CONTROL
7	–	–
8	F39 16PK/LG	FUSED B(+)
9	–	–



HIGH BEAM
RELAY

C155 (WITH FOG LAMPS)

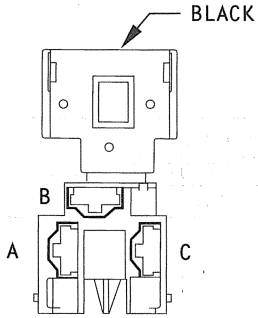
CAV	CIRCUIT	FUNCTION
1	–	–
2	–	–
3	–	–
4	G465 16LB/BK	HIGH BEAM INDICATOR DRIVER
5	L39 16LB	HIGH BEAM RELAY OUTPUT
6	Z1 18BK	GROUND
7	–	–
8	F39 16PK/LG	FUSED B(+)
9	–	–



LEFT FRONT PARK/
TURN SIGNAL LAMP

C156

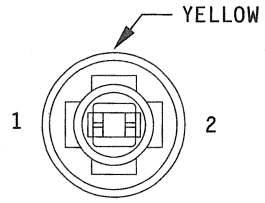
CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



LEFT
HEADLAMP

C157

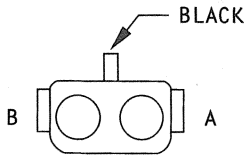
CAV	CIRCUIT	FUNCTION
A	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
B	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
C	Z1 18BK	GROUND



LEFT FRONT SIDE
MARKER LAMP

C158

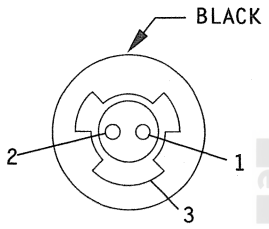
CAV	CIRCUIT	FUNCTION
1	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
2	L61 18LG	LEFT TURN SIGNAL



LEFT
FOG LAMP

C159

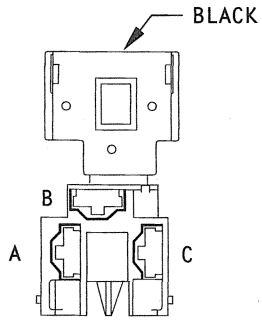
CAV	CIRCUIT	FUNCTION
A	Z1 16BK	GROUND
B	L39 16LB	FOG LAMP SWITCH OUTPUT



RIGHT FRONT PARK/
TURN SIGNAL LAMP

C160

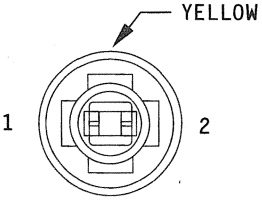
CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



RIGHT
HEADLAMP

C161

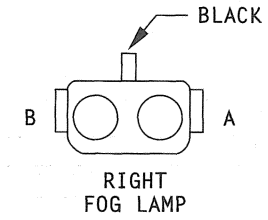
CAV	CIRCUIT	FUNCTION
A	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
B	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
C	Z1 18BK	GROUND



RIGHT FRONT SIDE
MARKER LAMP

C162

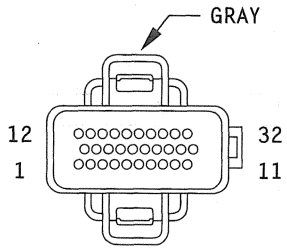
CAV	CIRCUIT	FUNCTION
1	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
2	L60 18TN	RIGHT TURN SIGNAL



RIGHT
FOG LAMP

C163

CAV	CIRCUIT	FUNCTION
A	Z1 16BK	GROUND
B	L39 16LB	FOG LAMP SWITCH OUTPUT

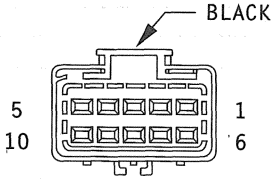


POWERTRAIN
CONTROL
MODULE
(CONNECTOR C)

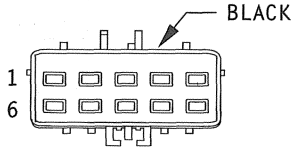
C165

CAV	CIRCUIT	FUNCTION
C1	C13 20DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
C2	C27 20DB/PK	RADIATOR FAN RELAY CONTROL*
C3	K51 20DB/YL	AUTOMATIC SHUT DOWN RELAY CONTROL
C4	V36 20TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
C5	V35 20LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
C6	–	–
C7	–	–
C8	–	–
C9	–	–
C10	–	–
C11	V32 20YL/RD	12 VOLT SUPPLY
C12	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
C13	–	–
C14	–	–
C15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
C16	G14 20PK/BK	GENERATOR LAMP DRIVER
C17	G3 20BK/PK	MALFUNCTION INDICATOR LAMP DRIVER
C18	–	–
C19	K31 20BR	FUEL PUMP RELAY CONTROL
C20	K52 20PK/BK	EVAP/PURGE SOLENOID CONTROL
C21	–	–
C22	C21 14DB/OR	A/C SWITCH SENSE
C23	C90 14LG	A/C SELECT SIGNAL
C24	K29 18WT/PK	STOP LAMP SWITCH SENSE
C25	–	–
C26	G4 18DB	FUEL LEVEL SENSE
C27	D21 20PK	SCI TRANSMIT
C28	D2 18WT/BK	CCD BUS (-)
C29	D20 20LG	SCI RECEIVE
C30	D1 18VT/BR	CCD BUS (+)
C31	G21 20GY/LB	TACHOMETER SIGNAL
C32	V33 20WT/LG	SPEED CONTROL SWITCH SENSE

C167 (WITH 2.5L ENG AUTO TRANS)

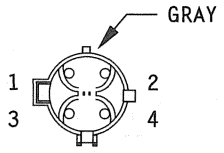


CAV	CIRCUIT
1	G7 20WT/OR
2	K4 18BK/LB
3	G107 20BK/RD
4	Z1 18BK
5	F12 18DB/WT
6	K7 18OR
7	T41 18BR/YL
8	L10 18BR/LG
9	K54 20OR/BK
10	T22 14DB/WT

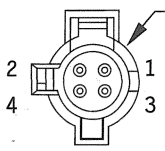


CAV	CIRCUIT
1	G7 18WT/OR
2	K4 18BK/LB
3	G107 18BK/RD
4	Z1 18GY
5	F12 18DB/WT
6	K7 18OR
7	T41 18BR/YL
8	L10 18BR/LG
9	K54 18OR/BK
10	T22 18DB/WT

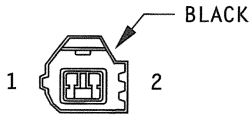
* WITH 4.0L ENG



CAV	CIRCUIT
1	A142 16DG/OR
2	Z11 16BK/WT*
2	Z11 18BK/WT**
3	K4 18BK/LB
4	K341 18TN/WT

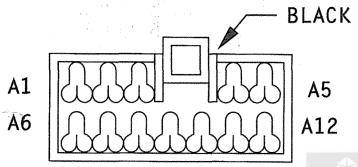


CAV	CIRCUIT
1	A142 18DG/OR
2	Z11 16BK/WT
3	K4 18BK/LB
4	K341 18TN/WT



C169

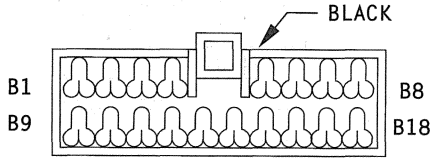
CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND



CONTROLLER
ANTI-LOCK
BRAKE

C170

CAV	CIRCUIT	FUNCTION
A1	B205 18VT	ABS WARNING LAMP DRIVER
A2	B517 18PK/OR	G-SWITCH GROUND
A3	D21 20PK	SCI TRANSMIT
A4	–	–
A5	B236 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
A6	B515 18YL/VT	G-SWITCH NO. 1 SENSE
A7	B516 18TN/WT	G-SWITCH NO. 2 SENSE
A8	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
A9	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
A10	B4 18LG	LEFT REAR WHEEL SPEED SENSOR (+)
A11	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR (+)
A12	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)

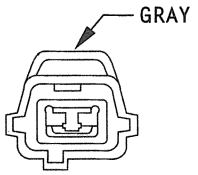


CONTROLLER
ANTI-LOCK
BRAKE

C171

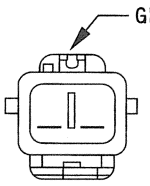
CAV	CIRCUIT	FUNCTION
B1	B7 18WT	RIGHT FRONT WHEEL SENSOR (+)
B2	B6 18WT/DB	RIGHT FRONT WHEEL SENSOR (-)
B3	B233 14TN/BK	ABS PUMP RELAY OUTPUT
B4	B251 16WT/BK	REAR ISOLATION VALVE CONTROL
B5	B235 14GY/YL	ABS MAIN RELAY OUTPUT
B6	B248 16DG/WT	RIGHT FRONT DUMP VALVE CONTROL
B7	B116 18GY	ABS MAIN RELAY CONTROL
B8	B243 16DG/BK	LEFT FRONT DUMP VALVE CONTROL
B9	B9 18RD	LEFT FRONT WHEEL SENSOR (+)
B10	B8 18RD/DB	LEFT FRONT WHEEL SENSOR (-)
B11	B207 18PK	ABS MAIN RELAY CONTROL
B12	B254 16DG/OR	REAR DUMP VALVE CONTROL
B13	Z1 14BK	GROUND
B14	Z1 14BK	GROUND
B15	B249 16WT/TN	RIGHT FRONT ISOLATION VALVE CONTROL
B16	–	–
B17	–	–
B18	B245 16WT/LG	LEFT FRONT ISOLATION VALVE CONTROL

* WITH 4.0L ENG
** WITH 2.5L ENG



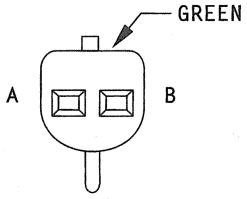
C172

CAV	CIRCUIT
1	T40 14LG/BK



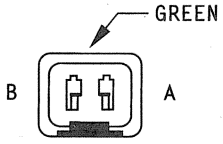
CAV	CIRCUIT
1	T40 14BR

C201
FUSE/FUSE BLOCK
(8W-10-2)



C202

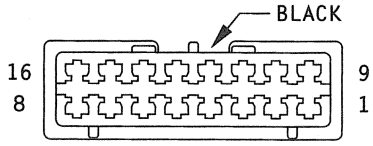
CAV	CIRCUIT
A	X53 20DG
B	X55 20BR/RD



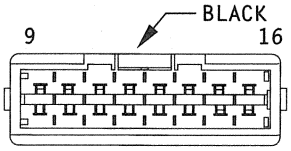
CAV	CIRCUIT
A	X53 20DG
B	X55 20BR/RD

Mopar AUTHENTIC RESTORATION PRODUCT

C203

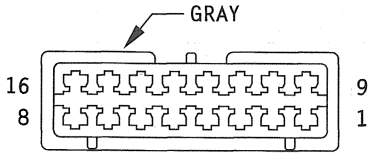


CAV	CIRCUIT
1	A241 14DG/TN
2	L60 18TN/DG
3	L90 18DB/RD
4	G4 20DB
5	L10 20BR/LG
6	L61 18LG
7	G9 18GY/OR
	A203 18DG
8	C15 12BK/RD
9	–
10	V20 18BK/WT
11	L50 18WT/TN
12	P2 18BK/WT
13	P34 18PK/BK
14	G4 18DB/WT
15	K4 18BK/LB
16	–

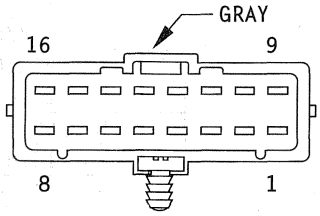


CAV	CIRCUIT
1	A241 14DG/RD
2	L60 18TN/DG
3	L90 18DB/RD
4	G4 20DB
5	L10 20BR/LG
6	L61 18LG
7	G9 20GY/BK
8	C15 12BK/RD
9	L34 18LG/BK
10	V20 18BK/YL
11	L50 18WT/TN
12	P2 18BK/WT
13	P34 18PK/BK
14	G4 18DB/WT
15	K4 18BK/LB
16	–

C204

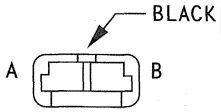


CAV	CIRCUIT
1	X58 18DB/OR
2	X52 18DB/WT
3	E2 200R/BK
4	Z1 14BK
5	M1 20PK
6	X57 18BR/LB
7	X51 18BR/YL
8	–
9	M2 20YL
10	G10 18LG
11	V13 18BR/RD
12	F20 18WT
13	P35 200R/VT
14	P36 20PK/VT
15	–
16	–



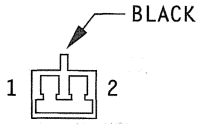
CAV	CIRCUIT
1	X58 20DB/OR
2	X52 20DB/WT
3	E2 200R/BK
4	Z1 14BK
5	M1 20PK M1 18PK
6	X57 20BR/LB
7	X51 20BR/YL
8	–
9	M2 20YL
10	G10 18LG/WT
11	V13 18BR/RD
12	F20 18WT
13	P35 200R/VT
14	P36 20PK/VT
15	–
16	–

C205



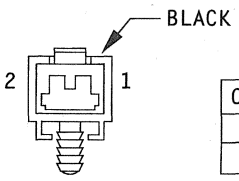
LEFT INSTRUMENT PANEL SPEAKER

CAV	CIRCUIT	FUNCTION
A	X53 20DG	LEFT FRONT SPEAKER (+)
	X53 18DG	LEFT FRONT SPEAKER (+)
B	X55 20BR/RD	LEFT FRONT SPEAKER (-)
	X55 18BR/RD	LEFT FRONT SPEAKER (-)

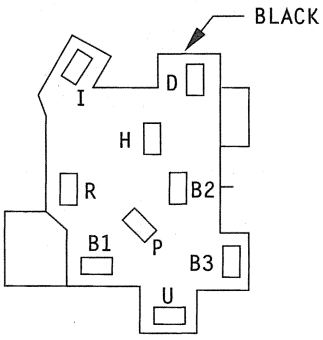


C206

CAV	CIRCUIT
1	M1 20PK
2	M2 20YL



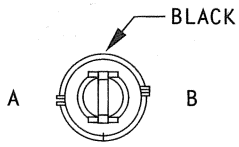
CAV	CIRCUIT
1	M1 20PK
2	M2 20YL



HEADLAMP SWITCH

C207

CAV	CIRCUIT	FUNCTION
B1	A3 12RD/WT	FUSED B(+)
B2	L7 18BK/OR	FUSED B(+)
	L7 18BK/OR	FUSED B(+)
B3	G26 20LB	KEY-IN IGNITION SWITCH SENSE
D	M2 20YL	COURTESY LAMP DRIVER
H	F34 14TN/BK	FUSED B(+)
I	E2 200R/BK	FUSED PANEL LAMPS DIMMER SW SIGNAL
P	–	–
R	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
U	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT
	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT

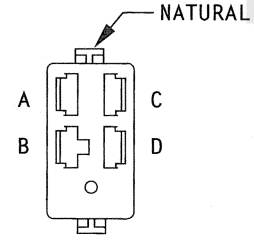


REAR WIPER/WASHER SWITCH ILLUMINATION LAMP

C209

CAV	CIRCUIT	FUNCTION
A	E2 200R/BK	FUSED PANEL LAMPS DIMMER SW SIGNAL
B	Z1 20BK	GROUND

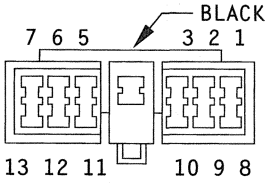
Mopar AUTHENTIC RESTORATION PRODUCT



REAR WIPER/ WASHER SWITCH

C210

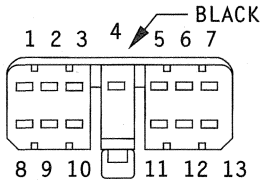
CAV	CIRCUIT	FUNCTION
A	V20 18BK/WT	REAR WASHER PUMP MOTOR CONTROL
B	V15 18LB/RD	FUSED IGNITION SWITCH OUTPUT (RUN)
C	V13 18BR/RD	REAR WIPER MOTOR CONTROL
D	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)



RADIO (6 SPEAKER SYSTEM) (FOR CIRCUIT/ FUNCTIONS SEE CONNECTOR C403)

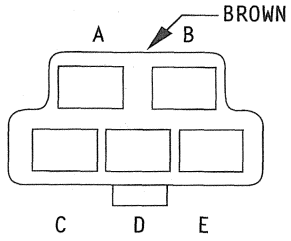
C211

CAV	CIRCUIT
1	X51 18BR/YL
2	X53 18DG
3	–
4	M1 18PK
5	F85 18VT/WT
6	X54 18VT
7	X52 18DB/WT
8	X57 18BR/LB
9	X55 18BR/RD
10	X5 18LB/RD
11	E2 180R/BK
12	X56 18DB/RD
13	X58 18DB/OR



RADIO (2 AND 4 SPEAKER SYSTEM)

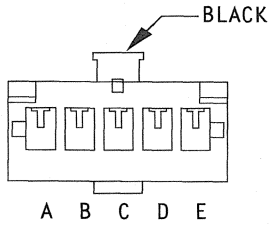
CAV	CIRCUIT
1	–
2	X51 18DG
	X53 18DG
3	–
4	M1 18PK
5	F85 18WT
6	X52 18VT
	X54 18VT
7	–
8	–
9	X55 18BR
	X57 18BR
10	X5 18LB
11	E2 180R
12	X56 18DB
	X58 18DB
13	–



BLOWER MOTOR
SWTICH

C212

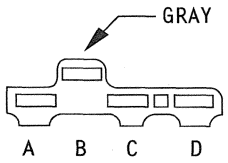
CAV	CIRCUIT	FUNCTION
A	C4 12TN	LOW MOTOR BLOWER DRIVER
B	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
C	C43 12YL/BR	A/C-HEATER CONTROL SWITCH SIGNAL
D	C6 12LB	M2 BLOWER MOTOR DRIVER
E	–	–



A/C HEATER
CONTROL SWITCH

C213

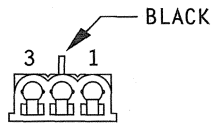
CAV	CIRCUIT	FUNCTION
A	C90 14LG/WT	A/C SELECT SIGNAL
	C90 14LG/WT	A/C SELECT SIGNAL
B	C7 12BK/TN	HIGH BLOWER MOTOR DRIVER
C	–	–
D	C7 12BK/TN	HIGH BLOWER MOTOR DRIVER
E	C43 12YL/BR	A/C-HEATER CONTROL SWITCH SIGNAL



BLOWER MOTOR
RESISTOR BLOCK

C214

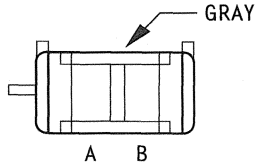
CAV	CIRCUIT	FUNCTION
A	C6 12LB	M2 BLOWER MOTOR DRIVER
B	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
C	C4 12TN	LOW BLOWER MOTOR DRIVER
D	C43 12YL/BR	A/C-HEATER CONTROL SWITCH SIGNAL



A/C
CYCLING SWITCH

C215

CAV	CIRCUIT	FUNCTION
1	C21 14DB/OR	A/C SWITCH SENSE
2	C90 14LG/WT	A/C SELECT SIGNAL
3	Z1 16BK	GROUND

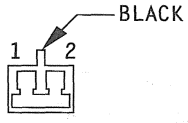


GLOVE BOX
LAMP

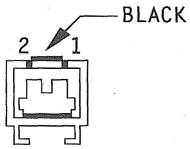
C216

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	Z1 20BK	GROUND

C217

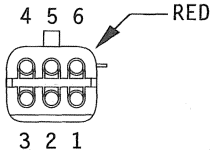


CAV	CIRCUIT
1	M1 20PK
2	M2 20YL

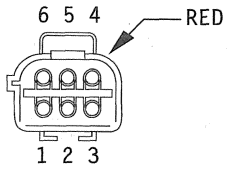


CAV	CIRCUIT
1	M1 20PK
2	M2 20YL

C218

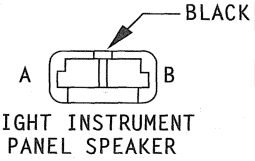


CAV	CIRCUIT
1	M2 20YL
2	M1 20PK
3	Z1 20BK Z1 20BK**
4	M9 20DB/OR*
5	F87 20WT/BK*
6	–



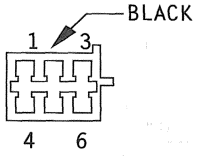
CAV	CIRCUIT
1	M2 20YL
2	M1 20PK
3	Z1 20BK
4	–
5	F87 20WT/BK*
6	–

C219

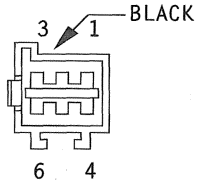


CAV	CIRCUIT	FUNCTION
A	X54 20VT	RIGHT FRONT SPEAKER (+)
	X54 18VT	RIGHT FRONT SPEAKER (+)
B	X56 20DB/RD	RIGHT FRONT SPEAKER (–)
	X56 18DB/RD	RIGHT FRONT SPEAKER (–)

C220

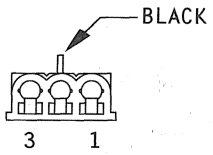


CAV	CIRCUIT
1	E2 20OR/BK
2	L90 20DB/RD
3	G32 20VT/LG
4	G31 20BK/LB
5	Z2 18BK/LG
6	–

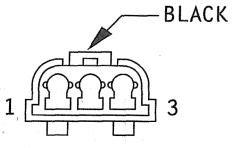


CAV	CIRCUIT
1	E2 20OR/BK
2	L90 18DB/RD
3	G32 20VT/LG
4	G31 20BK/LB
5	Z2 18BK/LG
6	–

C221

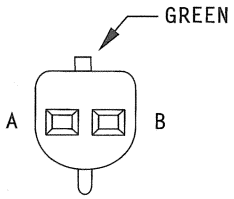


CAV	CIRCUIT
1	M2 20YL
2	–
3	Z1 20BK



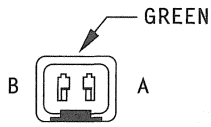
CAV	CIRCUIT
1	M2 18YL
2	–
3	Z1 18BK

* DELETE WITH POLICE PACKAGE
** WITH POLICE PACKAGE

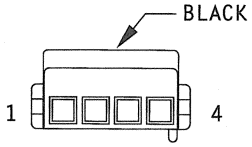


C222

CAV	CIRCUIT
A	X54 20VT
B	X56 20DB/RD



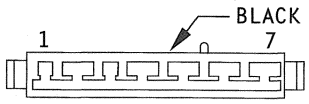
CAV	CIRCUIT
A	X54 20VT
B	X56 20DB/RD



KEY-IN SWITCH/HALO LAMP

C223

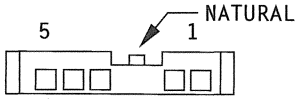
CAV	CIRCUIT	FUNCTION
1	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT
2	G26 20LB	KEY-IN IGNITION SWITCH SENSE
3	Z1 20BK	GROUND
4	M50 20YL/RD	KEY-IN LAMP DRIVER



IGNITION SWITCH

C224

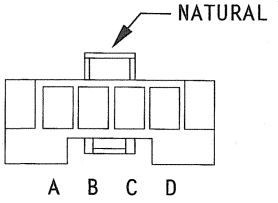
CAV	CIRCUIT	FUNCTION
1	A41 14YL	FUSED IGNITION SWITCH OUTPUT (START)
2	A21 12DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
3	G9 20GY/WT	BRAKE WARNING LAMP DRIVER
4	A1 12RD	FUSED B(+)
5	A38 12OR	FUSED IGNITION SWITCH OUTPUT (RUN)
6	A48 12VT	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
7	A1 12RD	FUSED B(+)



VEHICLE SPEED CONTROL AND HORN SWITCHES

C225

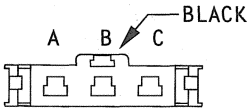
CAV	CIRCUIT	FUNCTION
1	V32 20YL/RD	VEHICLE SPEED CONTROL ON/OFF SWITCH SENSE
2	–	–
3	K4 20BK/LB	SENSOR GROUND
4	V33 20WT/LG	VEHICLE SPEED CONTROL RESUME SWITCH SENSE
5	X3 20BK/RD	HORN RELAY CONTROL



FRONT WIPER MOTOR CIRCUIT BREAKER

C226

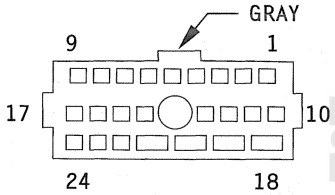
CAV	CIRCUIT	FUNCTION
A	–	–
B	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
C	–	–
D	A48 12VT/BR	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)



EXTENDED
IDLE SWITCH

C227 (WITH POLICE PACKAGE)

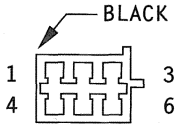
CAV	CIRCUIT	FUNCTION
A	F60 18RD/WT	FUSED B(+)
B	Z1 20BK	GROUND
	Z1 20BK	GROUND
C	K10 18VT	EXTENDED IDLE SOLENOID CONTROL



MULTI-FUNCTION
SWITCH

C228

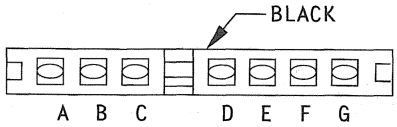
CAV	CIRCUIT	FUNCTION
1	V50 18LG	WIPER SWITCH DELAY OUTPUT
2	V51 18WT	INTERMITTENT WIPER DELAY
3	V11 18BK/TN	LOW WASHER FLUID SENSE
4	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
5	V4 18RD/YL	WIPER SWITCH HIGH SPEED OUTPUT
6	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
7	V6 18DB	WIPER MOTOR PARK SIGNAL
8	–	–
9	–	–
10	–	–
11	L60 18TN	RIGHT TURN SIGNAL
12	L60 18TN/DG	RIGHT TURN SIGNAL
13	L12 18VT/TN	COMBINATION FLASHER OUTPUT (HAZARD SIGNAL)
14	–	–
15	L61 18LG/BK	LEFT TURN SIGNAL
16	L61 18LG	LEFT TURN SIGNAL
17	L5 18GY	COMBINATION FLASHER OUTPUT (TURN SIGNALS)
18	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
19	F34 14TN/BK	FUSED B(+)
20	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
21	L11 16PK/LG	FLASH TO PASS
22	–	–
23	–	–
24	–	–



STOP LAMP
SWITCH

C229

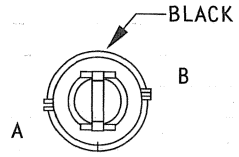
CAV	CIRCUIT	FUNCTION
1	V32 20YL/RD	VEHICLE SPEED CONTROL ON/OFF SWITCH SENSE
2	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
3	K29 18WT/PK	STOP LAMP SWITCH SENSE
	K29 18WT/PK	STOP LAMP SWITCH SENSE
4	V30 20DB/RD	VEHICLE SPEED CONTROL BRAKE SWITCH OUTPUT
5	L9 16PK/BK	FUSED B(+)
6	Z1 18BK	GROUND



INTERMITTENT WIPER
CONTROL MODULE

C230

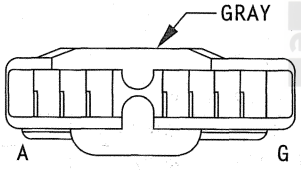
CAV	CIRCUIT	FUNCTION
A	V51 18WT	INTERMITTENT WIPER DELAY
B	V11 18BK/TN	LOW WASHER FLUID SENSE
C	V4 18RD/YL	WIPER SWITCH HIGH SPEED OUTPUT
D	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
E	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
F	V6 18DB	WIPER MOTOR PARK SIGNAL
G	V50 18LG	WIPER SWITCH DELAY OUTPUT



A/C-HEATER CONTROL
ILLUMINATION LAMP

C231

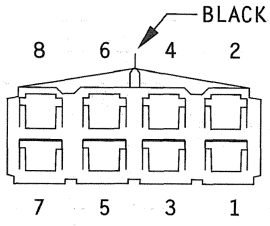
CAV	CIRCUIT	FUNCTION
A	E2 20OR/BK	FUSED PANEL LAMPS DIMMER SIWTCH OUTPUT
B	Z1 20BK	GROUND



WIPER/WASHER SWITCH
OR
INTERMITTENT WIPER
CONTROL MODULE

C232

CAV	CIRCUIT	FUNCTION
A	–	–
B	V11 18BR	LOW WASHER FLUID SENSE
B	V11 20BR*	LOW WASHER FLUID SENSE
C	V4 18RD/BK	WIPER SWITCH HIGH SPEED OUTPUT
D	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
E	V3 18BR/TN	WIPER SWITCH LOW SPEED OUTPUT
F	V6 18DB	WIPER MOTOR PARK SIGNAL
G	Z1 18BK	GROUND
	Z1 20BK	GROUND

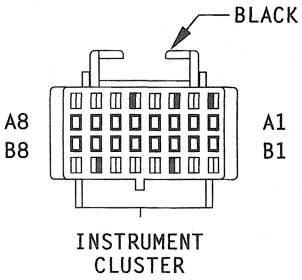


HEADLAMP
DELAY MODULE

C233

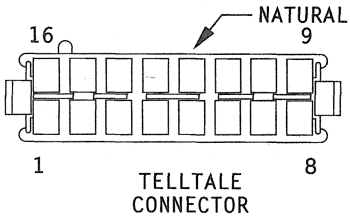
CAV	CIRCUIT	FUNCTION
1	–	–
2	X4 16GY/OR	FUSED B(+)
3	–	–
4	Z1 18BK	GROUND
	Z1 18BK	GROUND
5	–	–
6	F34 14TN/BK	HEADLAMP SWITCH OUTPUT
7	–	–
8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)

* WITH POLICE PACKAGE



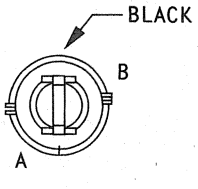
C234

CAV	CIRCUIT	FUNCTION
A1	G20 20VT/YL	ECT GAUGE SENSOR SIGNAL
A2	L61 18LG	LEFT TURN SIGNAL
A3	Z1 20BK	GROUND
A4	L3 16RD/YL	DIMMER SWITCH HIGH BEAM OUTPUT
A5	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL
A6	G21 20GY/LB	TACHOMETER SIGNAL
A7	E2 200R/BK	PANEL LAMPS DRIVER
A8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT
B1	G4 20DB	FUEL LEVEL SENSOR SIGNAL
B2	Z2 18BK/LG	GROUND
B3	–	–
B4	–	–
B5	–	–
B6	L60 18TN	RIGHT TURN SIGNAL
B7	G6 20GY	ENGINE OIL PRESSURE SWITCH SENSE
B8	–	–



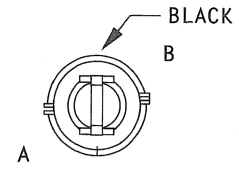
C235

CAV	CIRCUIT	FUNCTION
1	G29 20BK/TN	WASHER FLUID SWITCH SENSE
2	G3 20BK/PK	MALFUNCTION INDICATOR LAMP DRIVER
3	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
4	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
5	–	–
6	A205 18YL	ABS LAMP DRIVER
7	K54 20LG/OR	UP-SHIFT LAMP DRIVER
8	A203 18DG	BRAKE WARNING/PARK BRAKE LAMP DRIVER
9	–	–
10	–	–
11	G106 20BK/YL	4WD FULL TIME
12	G107 20BK/LB	4WD LOCK
13	G14 20PK/BK	GENERATOR LAMP DRIVER
14	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
15	G11 20WT	SEAT BELT WARNING LAMP DRIVER
16	Z1 20BK	GROUND
	Z1 20BK	GROUND



C236

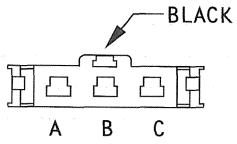
CAV	CIRCUIT	FUNCTION
A	E2 200R/BK	FUSED PANEL LAMPS DIMMER SWITCH OUTPUT
B	Z1 20BK	GROUND



FOG LAMP SWITCH
ILLUMINATION LAMP
OR
EXTENDED IDLE
SWITCH ILLUMINATION LAMP

C237

CAV	CIRCUIT	FUNCTION
A	E2 20OR/BK	FUSED PANEL LAMPS DIMMER SWITCH OUTPUT
B	Z1 20BK	GROUND

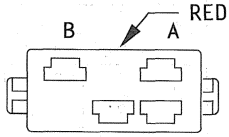


FOG LAMP
SWITCH

C238

CAV	CIRCUIT	FUNCTION
A	L39 16LB	FOG LAMP SWITCH OUTPUT
B	L35 16BR/WT	FOG LAMP SWITCH CONTROL
C	Z1 20BK	GROUND
	Z1 20BK	GROUND

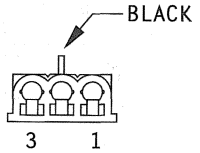
Mopar AUTHENTIC RESTORATION PRODUCT



REAR WINDOW
DEFOGGER
SWITCH

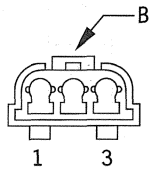
C239

CAV	CIRCUIT	FUNCTION
A	–	–
B	C15 12BK/RD	REAR WINDOW DEFOGGER RELAY OUTPUT
C	Z1 20BK	GROUND
	Z1 20BK	GROUND
D	C80 18DB/WT	REAR WINDOW DEFOGGER RELAY CONTROL

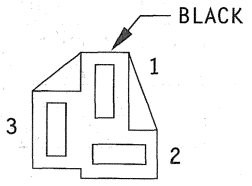


C240

CAV	CIRCUIT
1	M2 20YL
2	G26 20LB
	G26 20LB
3	Z1 20BK
	Z1 20BK



CAV	CIRCUIT
1	M2 18YL
2	M2 18YL
3	Z1 18BK

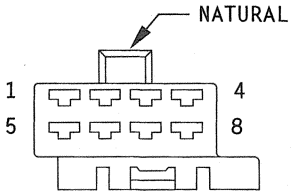


TIME DELAY
RELAY

C241

CAV	CIRCUIT	FUNCTION
1	M50 20YL/RD	KEY-IN LAMP DRIVER
2	M1 20PK	FUSED B(+)
3	M2 20YL	COURTESY LAMP DRIVER

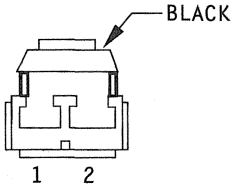
C242
RELAY BANK
(8W-11-16)



BUZZER MODULE

C243

CAV	CIRCUIT	FUNCTION
1	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
2	G11 20WT	SEAT BELT WARNING LAMP DRIVER
3	Z1 20BK	GROUND
4	G10 18LG	SEAT BELT SWITCH SENSE
5	–	–
6	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT
7	L7 18BK/OR	FUSED B(+)
8	–	–



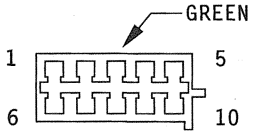
SHIFT INTERLOCK

C244

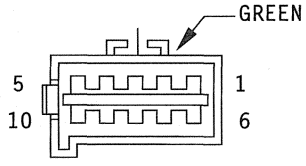
CAV	CIRCUIT	FUNCTION
1	K29 18WT/PK	STOP LAMP SWITCH SENSE
2	F87 20WT/BK	FUSED IGNITION

Mopar AUTHENTIC RESTORATION PRODUCT

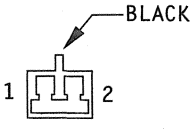
C301



CAV	CIRCUIT
1	Q17 14DB/WT
2	Q27 14RD/BK
3	P2 18BK/WT
	P2 18BK/WT
4	–
5	M1 18PK
6	P34 18PK/BK
	P34 18PK/BK
7	Z1 14BK
8	Q1 14YL*
9	P35 20OR/VT
10	P36 20PK/VT

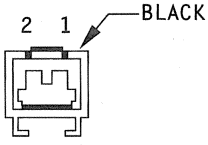


CAV	CIRCUIT
1	Q17 14DB/WT
2	Q27 14RD/BK
3	P2 18BK/WT
	P2 18BK/WT
4	–
5	P38 18PK
	P38 20PK
6	P34 18PK/BK
	P34 18PK/BK
7	Z1 14BK
8	Q1 14YL
9	P35 20OR/VT
	P35 20OR/VT
10	P36 20PK/VT
	P36 20PK/VT



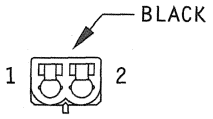
C302

CAV	CIRCUIT
1	E2 20OR/BK
2	Z1 20BK



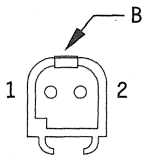
CAV	CIRCUIT
1	E2 20OR
	E2 20OR**
2	Z1 20BK
	Z1 20BK**

** WITH AUTO TRANS

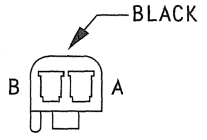


C303

CAV	CIRCUIT
1	A11 14RD
2	Z1 14BK



CAV	CIRCUIT
1	A11 14RD
2	Z1 14BK

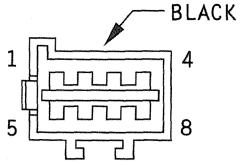


SEAT BELT SWITCH

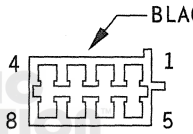
C304

CAV	CIRCUIT	FUNCTION
A	G10 18LG/WT	SEAT BELT SWITCH SENSE
B	Z1 20BK	GROUND

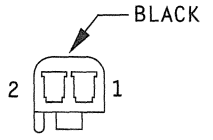
C305



CAV	CIRCUIT
1	L34 18LG/BK
2	Z1 18BK
	Z1 20BK
3	L60 18TN
4	L10 20BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	M2 20YL
8	–

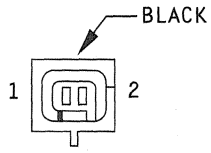


CAV	CIRCUIT
1	L34 18LG/BK
2	Z1 18BK
3	L60 18TN/DG
4	L10 20BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	M2 20YL
8	–



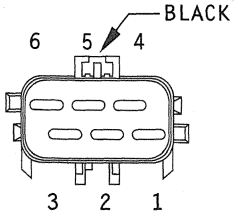
C306

CAV	CIRCUIT
A	M2 18YL
B	Z1 18BK



CAV	CIRCUIT
1	M2 20YL
2	Z1 20BK

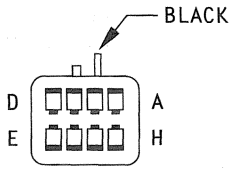
C307



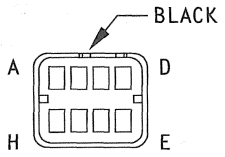
FUEL PUMP MODULE

CAV	CIRCUIT	FUNCTION
1	A241 14DG/RD	FUEL PUMP RELAY OUTPUT
2	K4 18BK/LB	SENSOR GROUND
3	G4 20DB	FUEL LEVEL SENSOR SIGNAL
4	–	–
5	G4 18DB/WT	LOW FUEL SENSE
6	Z1 14BK	GROUND

C308

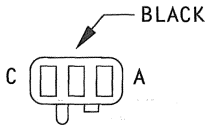


CAV	CIRCUIT
A	P2 18BK/WT**
B	P34 18PK/BK**
C	M4 20VT/YL
D	L50 18WT/TN
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 18DB/RD

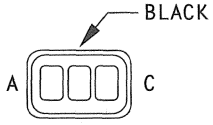


CAV	CIRCUIT
A	P2 18BK/WT**
B	P34 18PK/BK**
C	M4 20VT/YL
D	L50 18WT/TN
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 18DB/RD

C309

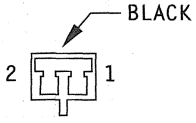


CAV	CIRCUIT
A	M1 20PK
B	M2 20YL
C	G71 20VT/YL

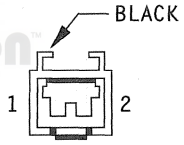


CAV	CIRCUIT
A	M1 20PK
B	M2 20YL
	M2 20YL*
C	M4 20VT/YL

C310

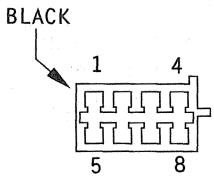


CAV	CIRCUIT
1	B40 14LB
2	–

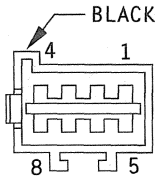


CAV	CIRCUIT
1	B40 14LB
2	–

C311

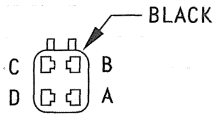


CAV	CIRCUIT
1	L36 18LG/BK
2	Z1 18BK
3	L61 18LG
4	L10 20BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
	L50 18WT/TN
7	A11 14RD
8	L60 18TN/DG

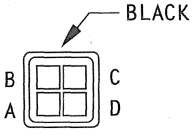


CAV	CIRCUIT
1	–
2	Z1 18BK
3	L60 18TN
4	L10 18BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	–
8	–

C312

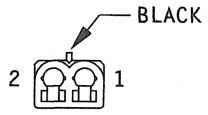


CAV	CIRCUIT
A	X58 20DB/OR
B	X52 20DB/WT
C	X57 20BR/LB
D	X51 20BR/YL



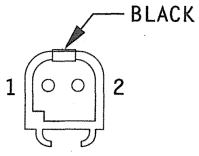
CAV	CIRCUIT
A	X58 20DB/OR
B	X52 20DB/WT
C	X57 20BR/LB
D	X51 20BR/YL

* WITHOUT POWER GROUP OPTION
** WITH POWER DOOR LOCKS

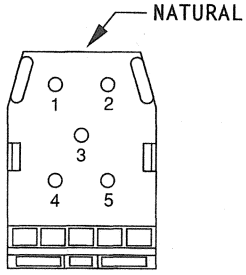


C313

CAV	CIRCUIT
1	C15 14BK/RD
2	Z1 14BK



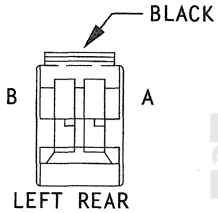
CAV	CIRCUIT
1	C15 12BK/RD
2	Z1 12BK



LEFT REAR POWER WINDOW SWITCH

C314

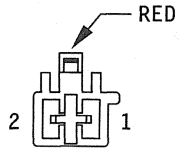
CAV	CIRCUIT	FUNCTION
1	Q12 14BR	POWER WINDOW MOTOR UP CONTROL
2	Q27 14RD/BK	LEFT REAR POWER WINDOW UP CONTROL
3	Q1 14YL	LEFT FRT DOOR POWER LOCK/WINDOW SW OUTPUT
4	Q17 14DB/WT	LEFT REAR POWER WINDOW MOTOR DOWN CONTROL
5	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL



LEFT REAR DOOR LOCK MOTOR

C315

CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT

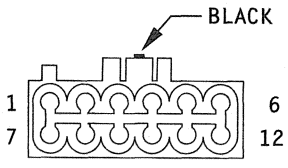


LEFT REAR POWER WINDOW MOTOR

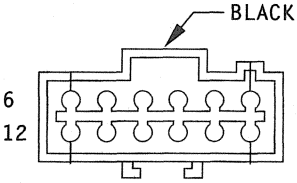
C316

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL
2	Q12 14BR	POWER WINDOW MOTOR UP CONTROL

C317



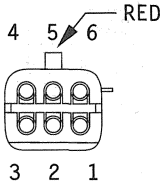
CAV	CIRCUIT
1	Q16 14BR/WT
2	Q26 14VT/WT
3	F81 12TN
4	Q1 14YL
5	Q18 14GY/BK*
6	Q17 14DB/WT*
7	Q28 14DG/WT*
8	Q27 14RD/BK*
9	P38 18PK P38 20PK
10	Z1 14BK
11	P80 20YL/BK
12	–



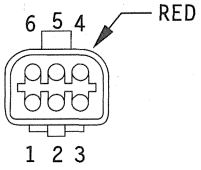
CAV	CIRCUIT
1	Q16 14BR/WT
2	Q26 14VT/WT
3	F81 12TN
4	Q1 14YL
5	Q18 14GY/BK*
6	Q17 14DB/WT*
7	Q28 14DG/WT*
8	Q27 14RD/BK*
9	P38 140R/WT
10	Z1 14BK
11	P80 20YL/BK
12	–

* WITH 4 DOOR ONLY

C318

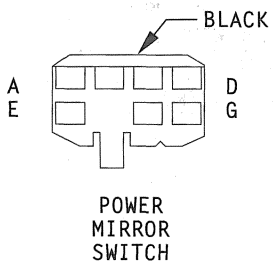


CAV	CIRCUIT
1	P79 20DB/LB
2	P81 20DB
3	P35 20OR/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	P36 20PK/VT



CAV	CIRCUIT
1	P79 20DB/LB
2	P81 20WT/BK
3	P35 14OR/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	P36 14PK/VT

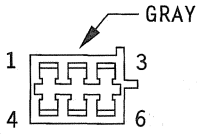
C319



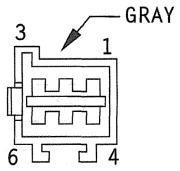
CAV	CIRCUIT	FUNCTION
A	P80 20YL/BK	POWER MIRROR LEFT/RIGHT UP CONTROL
B	P81 20DB	POWER MIRROR LEFT/RIGHT LEFT CONTROL
C	P77 20WT/BK	POWER MIRROR LEFT/RIGHT RIGHT CONTROL
D	P78 20YL/LG	POWER MIRROR LEFT/RIGHT DOWN CONTROL
E	P79 20DB/LB	POWER MIRROR CONTROL
F	Z1 18BK	GROUND
G	P38 20PK	FUSED B(+)

Mopar AUTHENTIC RESTORATION PRODUCT

C320

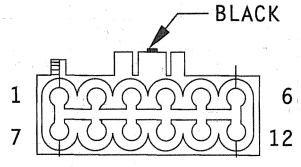


CAV	CIRCUIT
1	P2 18BK/WT
2	P34 18PK/BK
3	–
4	Q33 14BR/LB
5	Q28 14DG/WT
6	Q1 14YL

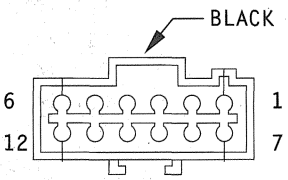


CAV	CIRCUIT
1	P2 18BK/WT
	P2 18BK/WT
2	P34 18PK/BK
	P34 18PK/BK
3	–
4	Q18 14GY/BK
5	Q28 14DG/WT
6	Q1 14YL

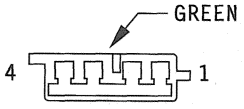
C321



CAV	CIRCUIT
1	P38 14OR/WT
2	P35 14OR/VT
3	P36 14PK/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	Q1 14YL
7	Q26 14VT/WT
8	Q16 14BR/WT
9	P78 20YL/LG
10	P77 20WT/BK
11	P79 20DB/LB
12	–

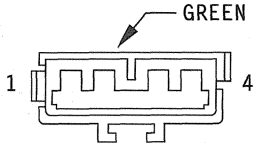


CAV	CIRCUIT
1	P38 20PK
2	P35 20OR/VT
3	P36 20PK/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	Q1 14YL
7	Q26 14VT/WT
8	Q16 14BR/WT
9	P78 20YL/LG
10	P77 20WT/BK
11	P79 20DB/LB
12	–

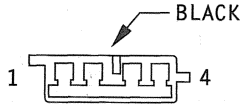


C322

CAV	CIRCUIT
1	G68 20PK/OR
2	P35 20OR/VT
3	P36 20PK/VT
4	G72 20DG/OR



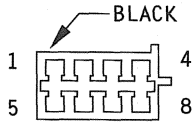
CAV	CIRCUIT
1	–
2	P35 20OR/VT
	P35 20OR/VT
3	P36 20PK/VT
	P36 20PK/VT
4	–



REAR WIPER MOTOR

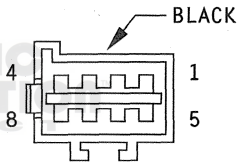
C323

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	V20 18BK/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
3	V13 18BR/RD	REAR WIPER MOTOR CONTROL
4	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)

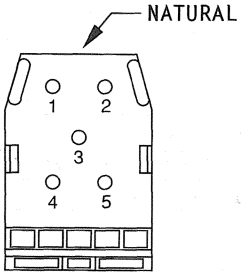


C324

CAV	CIRCUIT
1	L34 18LG/BK
2	Z1 18BK
3	L60 18TN
4	L10 20BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	–
8	–



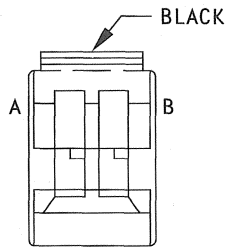
CAV	CIRCUIT
1	–
2	Z1 18BK
3	L60 18TN
4	L10 18BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	–
8	–



RIGHT REAR POWER WINDOW SWITCH

C325

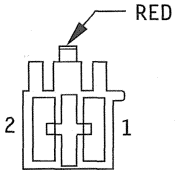
CAV	CIRCUIT	FUNCTION
1	Q12 14BR	RIGHT REAR POWER WINDOW MOTOR UP CONTROL
2	Q28 14DG/WT	LT FRT DOOR PWR LOCK/WINDOW SW RT REAR UP CNTRL
3	Q1 14YL	LEFT FRONT DOOR POWER LOCK/WINDOW SWITCH OUTPUT
4	Q33 14BR/LB	RIGHT REAR POWER WINDOW DOWN CONTROL
5	Q22 14VT	RIGHT REAR POWER WINDOW MOTOR DOWN CONTROL



RIGHT REAR DOOR LOCK MOTOR

C326

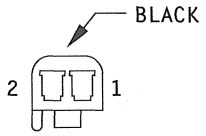
CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT



RIGHT REAR WINDOW MOTOR

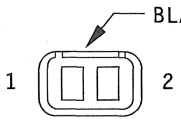
C327

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	RIGHT REAR POWER WINDOW MOTOR DOWN CONTROL
2	Q12 14BR	RIGHT REAR POWER WINDOW MOTOR UP CONTROL

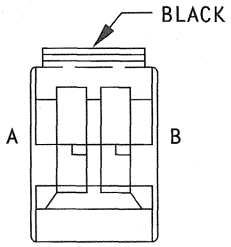


C328

CAV	CIRCUIT
1	M2 20YL
2	Z1 20BK



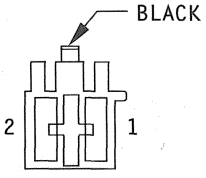
CAV	CIRCUIT
1	M2 18YL
2	Z1 18BK



RIGHT FRONT DOOR LOCK MOTOR

C329

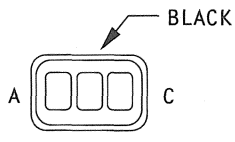
CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT



RIGHT FRONT WINDOW MOTOR

C331

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	RIGHT FRONT POWER WINDOW MOTOR DOWN CONTROL
2	Q12 14BR	RIGHT FRONT POWER WINDOW MOTOR UP CONTROL

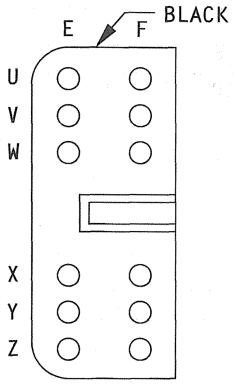


RIGHT POWER MIRROR

C332

CAV	CIRCUIT	FUNCTION
A	P78 20YL/LG	RIGHT POWER MIRROR UP/DOWN CONTROL
B	P77 20WT/BK	RIGHT POWER MIRROR RIGHT/LEFT CONTROL
C	P79 20DB/LB	GROUND

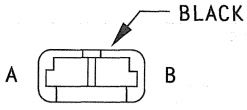
Mopar AUTHENTIC RESTORATION PRODUCT



RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH

C333

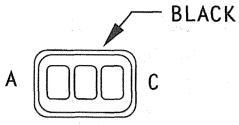
CAV	CIRCUIT	FUNCTION
UE	–	–
UF	–	–
VE	P35 14OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
VF	P36 14PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
WE	–	–
WF	P38 14OR/WT	DOOR LOCK RELAY CONTROL
XE	Q1 14YL	LEFT FRONT DOOR POWER LOCK/WINDOW SW OUTPUT
XF	Q26 14VT/WT	LT FRT DOOR PWR LOCK/WINDOW SW RT FRT DWN CNTRL
YE	Q12 14BR	POWER WINDOW MOTOR UP CONTROL
YF	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL
ZE	Q16 14BR/WT	LT FRT DOOR PWR LOCK/WINDOW SW RT FRT UP CNTRL
ZF	–	–



RIGHT FRONT DOOR SPEAKER

C334

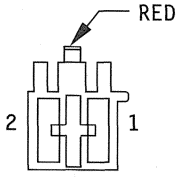
CAV	CIRCUIT	FUNCTION
A	X54 20VT	RIGHT FRONT DOOR SPEAKER (+)
B	X56 20DB/RD	RIGHT FRONT DOOR SPEAKER (-)



LEFT POWER MIRROR

C335

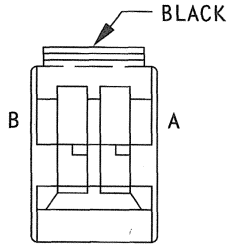
CAV	CIRCUIT	FUNCTION
A	P80 20YL/BK	LEFT POWER MIRROR UP/DOWN CONTROL
B	P81 20WT/BK	LEFT POWER MIRROR LEFT/RIGHT CONTROL
C	P79 20DB/LB	GROUND



LEFT FRONT WINDOW MOTOR

C336

CAV	CIRCUIT	FUNCTION
1	Q21 14WT	LEFT FRONT POWER WINDOW MOTOR UP CONTROL
2	Q11 14LB	LEFT FRONT POWER WINDOW MOTOR DOWN CONTROL

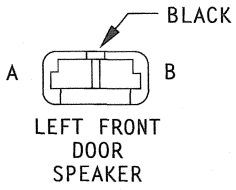


LEFT FRONT DOOR LOCK MOTOR

C338

CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT

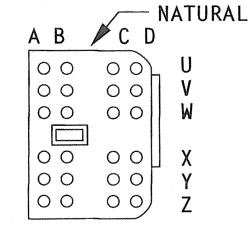
Mopar AUTHENTIC RESTORATION PRODUCT



LEFT FRONT DOOR SPEAKER

C339

CAV	CIRCUIT	FUNCTION
A	X53 20DG	LEFT FRONT DOOR SPEAKER (+)
B	X55 20BR/RD	LEFT FRONT DOOR SPEAKER (-)

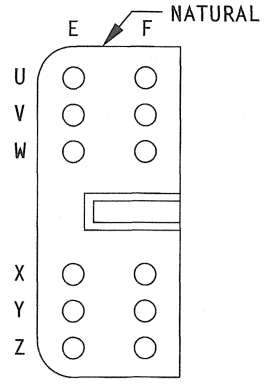


LEFT FRONT DOOR POWER LOCK/ WINDOW SWITCH

C340

CAV	CIRCUIT	FUNCTION
UA	–	–
UB	–	–
UC	–	–
UD	–	–
VA	P35 14OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
VB	P36 14PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
VC	Q11 14LB	LEFT FRONT POWER WINDOW MOTOR DOWN CONTROL
VD	Q21 14WT	LEFT FRONT POWER WINDOW MOTOR UP CONTROL
WA	–	–
WB	P38 14OR/WT	DOOR LOCK RELAY CONTROL
WC	–	–
WD	–	–
XA	–	–
XB	–	–
XC	–	–
XD	Z1 14BK	GROUND
YA	Q1 14YL	LT FT DR POWER LOCK/WINDOW SWITCH OUTPUT
YB	F81 12TN	FUSED IGNITION SWITCH OUTPUT (RUN)
YC	Q17 14DB/WT	LEFT REAR POWER WINDOW DOWN CONTROL
YD	Q27 14RD/BK	LEFT REAR POWER WINDOW UP CONTROL
ZA	–	–
ZB	–	–
ZC	–	–
ZD	–	–

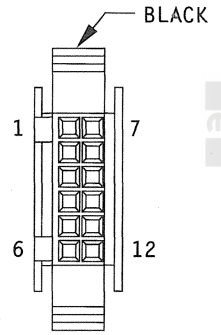
AUTHENTIC RESTORATION PRODUCT



LEFT FRONT DOOR RIGHT POWER WINDOW SWITCH

C341

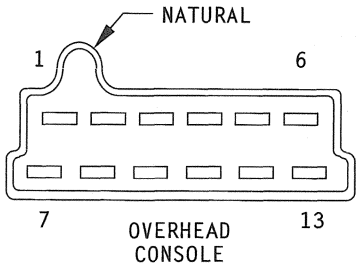
CAV	CIRCUIT	FUNCTION
UE	–	–
UF	–	–
VE	Q16 14BR/WT	LT FRT DOOR PWR LOCK/WINDOW SW RT FRT UP CNTRL
VF	Q26 14VT/WT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
WE	–	–
WF	–	–
XE	–	–
XF	–	–
YE	Q18 14GY/BK	LT FRT DOOR PWR LOCK/WINDOW SW RT RR DWN CNTRL
YF	Q28 14DG/WT	LT FRT DOOR PWR LOCK/WINDOW SW RT RR UP CNTRL
ZE	–	–
ZF	–	–



REMOTE KEYLESS ENTRY MODULE

C342*

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	G68 20PK/OR	OVERDRIVE OFF LAMP DRIVER
3	P35 20OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
4	P36 20PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
5	M9 20DB/OR	RKE ARM SIGNAL
6	–	–
7	G72 20DG/OR	KEYLOCK SWITCH SENSE
8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
9	–	–
10	Z1 20BK	GROUND
11	–	–
12	M2 20YL	COURTESY LAMP SWITCH OUTPUT

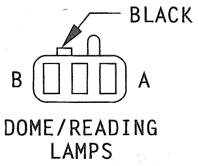


OVERHEAD CONSOLE

C343

CAV	CIRCUIT	FUNCTION
1	–	–
2	Z2 18BK/LG	GROUND
3	–	–
4	Z1 20BK	GROUND
5	M1 20PK	FUSED B(+)
6	M1 20PK	FUSED B(+)
7	E2 20OR/BK	FUSED PANEL LAMPS DIMMER SWITCH OUTPUT
8	L90 20DB/RD	PARK LAMP SWITCH OUTPUT
9	–	–
10	G32 20VT/LG	SENSOR GROUND
11	G31 20BK/LB	AMBIENT AIR TEMPERATURE SENSOR SIGNAL
12	M2 20YL	COURTESY LAMP SWITCH OUTPUT
13	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT

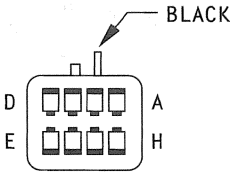
* DELETE WITH POLICE PACKAGE



DOME/READING LAMPS

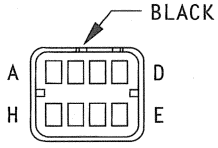
C344

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	M2 20YL	COURTESY LAMP SWITCH OUTPUT
C	Z1 20BK	GROUND

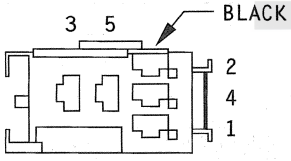


C345

CAV	CIRCUIT
A	M4 20VT/YL
B	L50 18WT/TN
C	P2 18BK/WT*
D	P34 18PK/BK*
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 20DB/RD



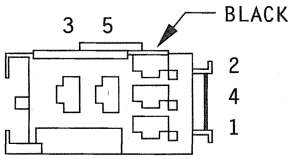
CAV	CIRCUIT
A	M4 20VT/YL
B	L50 18WT/TN
C	P2 18BK/WT*
D	P34 18PK/BK*
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 20DB/RD



RIGHT TURN RELAY

C346

CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	Z1 20BK	GROUND
3	L60 18TN	RIGHT TURN SIGNAL
4	L495 18PK	STOP LAMP RELAY OUTPUT
5	L494 18DG	STOP LAMP RELAY OUTPUT

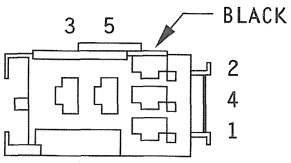


LEFT TURN RELAY

C347

CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	Z1 20BK	GROUND
3	L61 18LG	LEFT TURN SIGNAL
4	L495 18PK	STOP LAMP RELAY OUTPUT
	L495 18PK	STOP LAMP RELAY OUTPUT
5	L494 18DG	STOP LAMP RELAY OUTPUT
	L494 18DG	STOP LAMP RELAY OUTPUT

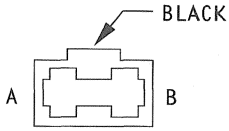
* WITH POWER LOCKS



STOP LAMP RELAY

C348

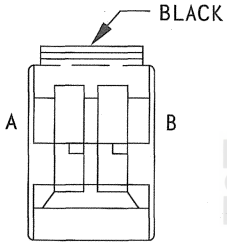
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND
3	A11 18RD/BK	GENERATOR OUTPUT
4	L494 18DG	STOP LAMP RELAY OUTPUT
5	L495 18PK	STOP LAMP RELAY OUTPUT



IN-LINE CIRCUIT BREAKER

C349

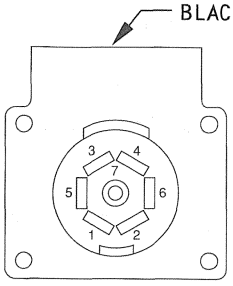
CAV	CIRCUIT	FUNCTION
A	A11 14RD	GENERATOR OUTPUT
B	A11 18RD/BK	GENERATOR OUTPUT



LIFTGATE LOCK MOTOR

C350

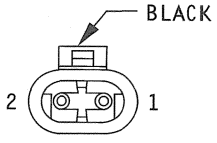
CAV	CIRCUIT	FUNCTION
A	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT
B	P2 18BK/WT	DOOR LOCK RELAY OUTPUT



TRAILER TOW CONNECTOR

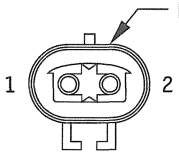
C351

CAV	CIRCUIT	FUNCTION
1	Z1 16BK	GROUND
2	B40 14LB	ELECTRIC BRAKE FEED
3	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
4	A11 14RD	GENERATOR OUTPUT
5	L61 18LG	LEFT TURN SIGNAL
6	L60 18TN	RIGHT TURN SIGNAL
7	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT

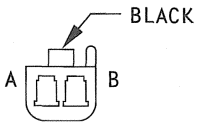


C352

CAV	CIRCUIT
1	A11 14RD
2	Z1 14BK

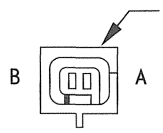


CAV	CIRCUIT
1	F35 14RD
2	Z1 14BK

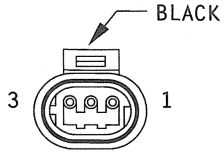


C353

CAV	CIRCUIT
A	L50 18WT/TN
B	Z1 20BK



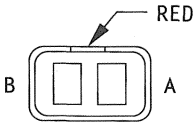
CAV	CIRCUIT
A	L50 18WT/TN
B	Z1 20BK



G-SENSOR

C354

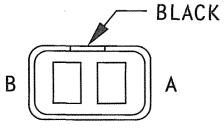
CAV	CIRCUIT	FUNCTION
1	B517 18PK/OR	G-SENSOR GROUND
2	B515 18YL/VT	G-SENSOR NO. 1 SENSE
3	B516 18TN/WT	G-SENSOR NO. 2 SENSE



RIGHT REAR WHEEL SPEED SENSOR

C355

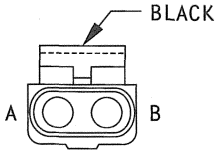
CAV	CIRCUIT	FUNCTION
A	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR (+)
B	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)



LEFT REAR WHEEL SPEED SENSOR

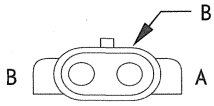
C356

CAV	CIRCUIT	FUNCTION
A	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
B	B4 18LG	LEFT REAR WHEEL SPEED SENSOR (+)

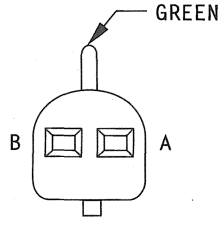


C357

CAV	CIRCUIT
A	G107 18BK/RD
B	G106 18GY/YL

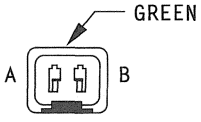


CAV	CIRCUIT
A	G107 20BK/RD
B	G106 20GY/YL

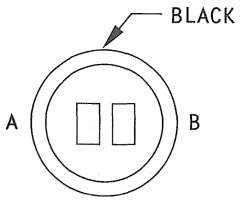


C358

CAV	CIRCUIT
A	L90 20DB/RD
B	Z1 20BK



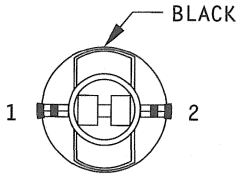
CAV	CIRCUIT
A	D4 18WT
	D4 18WT
B	Z1 20BK
	Z1 20BK



PRNDL ILLUMINATION LAMP

C401*

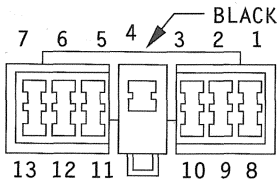
CAV	CIRCUIT	FUNCTION
A	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH OUTPUT
B	Z1 20BK	GROUND



TRANSFER CASE ILLUMINATION LAMP

C402

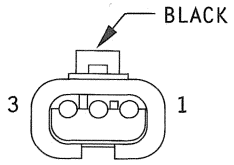
CAV	CIRCUIT	FUNCTION
1	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH OUTPUT
2	Z1 20BK	GROUND



RADIO (2 AND 4 SPEAKER SYSTEM)

C403

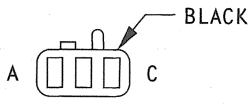
CAV	CIRCUIT	FUNCTION
1	X51 18DG	LEFT SOUND BAR SPEAKER (+)
2	X53 18DG	LEFT FRONT SPEAKER (+)
3	–	–
4	M1 18PK	FUSED B(+)
5	F85 18WT	FUSED IGNITION SWITCH OUTPUT
6	X54 18VT	RIGHT FRONT SPEAKER (+)
7	X52 18VT	RIGHT SOUND BAR SPEAKER (+)
8	X57 18BR	LEFT SOUND BAR SPEAKER (-)
9	X55 18BR	LEFT FRONT SPEAKER (-)
10	X5 18LB	RADIO DISPLAY OUTPUT
11	E2 18OR	PANEL LAMPS DRIVER
12	X56 18DB	RIGHT FRONT SPEAKER (-)
13	X58 18DB	RIGHT SOUND BAR SPEAKER (-)



VEHICLE SPEED SENSOR

C404

CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	G7 18WT/OR	VEHICLE SPEED SENSOR SIGNAL

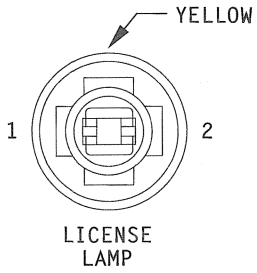


CARGO LAMP

C405

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	M2 20YL	COURTESY LAMPS DRIVER
C	G71 20VT/YL	LIFTGATE LATCH SWITCH SENSE

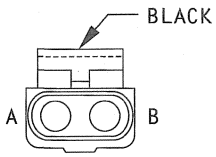
* WITH AUTO TRANSMISSION



LICENSE LAMP

C406

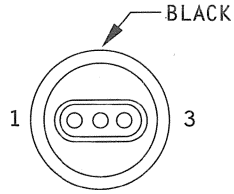
CAV	CIRCUIT	FUNCTION
1	L90 20DB/RD	PARK LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND



4WD SWITCH

C407

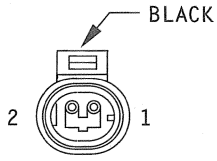
CAV	CIRCUIT	FUNCTION
A	G107 18BK/RD	4WD LOCK
B	Z1 18BK*	GROUND
B	Z1 18GY**	GROUND



PARK/NEUTRAL POSITION SWITCH

C408

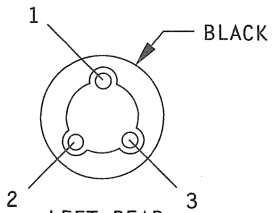
CAV	CIRCUIT	FUNCTION
1	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT
2	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSOR
3	L10 18BR/LG	BACK-UP LAMP SENSE



AMBIENT AIR TEMPERATURE SENSOR

C409

CAV	CIRCUIT	FUNCTION
1	G31 18VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL
2	G32 18BK/LB	SENSOR GROUND

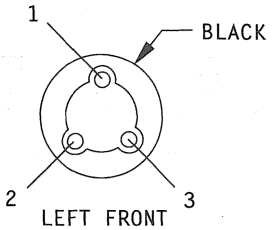


LEFT REAR DOOR JAMB SWITCH

C410

CAV	CIRCUIT	FUNCTION
1	–	–
2	Z1 18BK	GROUND
3	M2 18YL	COURTESY LAMPS DRIVER

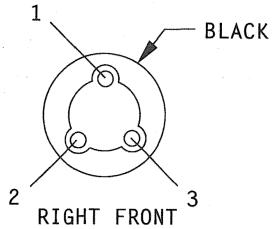
* WITH 4.0L ENG
** WITH 2.5L ENG



LEFT FRONT DOOR JAMB SWITCH

C411

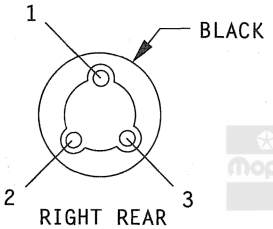
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	M2 18YL	COURTESY LAMPS DRIVER
3	M2 18YL	COURTESY LAMPS DRIVER



RIGHT FRONT DOOR JAMB SWITCH

C412

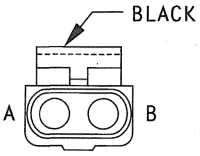
CAV	CIRCUIT	FUNCTION
1	99 18BK	GROUND
2	98 18YL	COURTESY LAMPS DRIVER
3	–	–



RIGHT REAR DOOR JAMB SWITCH

C413

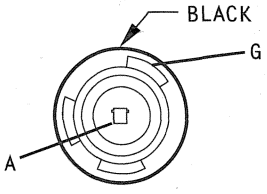
CAV	CIRCUIT	FUNCTION
1	–	–
2	Z1 18BK	GROUND
3	M2 18YL	COURTESY LAMPS DRIVER



4WD SWITCH

C414

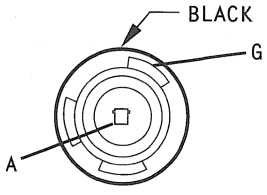
CAV	CIRCUIT	FUNCTION
A	G107 18BK/RD	4WD LOCK
B	G106 18GY/YL	4WD FULL TIME



LEFT BACK-UP LAMP

C416

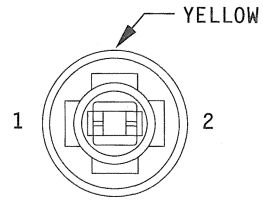
CAV	CIRCUIT	FUNCTION
A	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



RIGHT BACK-UP LAMP

C417

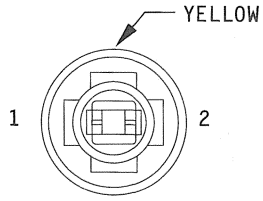
CAV	CIRCUIT	FUNCTION
A	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



LEFT REAR SIDE MARKER LAMP

C418

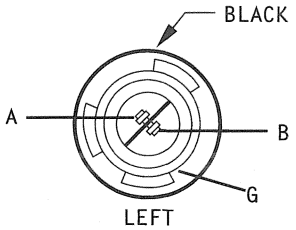
CAV	CIRCUIT	FUNCTION
1	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
2	Z1 18BK	GROUND



RIGHT REAR SIDE MARKER LAMP

C419

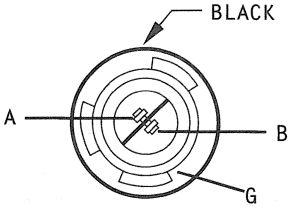
CAV	CIRCUIT	FUNCTION
1	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
2	Z1 18BK	GROUND



LEFT TAIL/STOP LAMP

C420

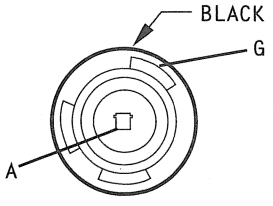
CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



RIGHT TAIL/STOP LAMP

C421

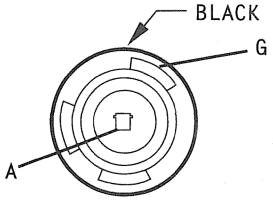
CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



LEFT REAR TURN SIGNAL LAMP

C422

CAV	CIRCUIT	FUNCTION
A	L60 18TN	LEFT TURN SIGNAL
G	Z1 18BK	GROUND

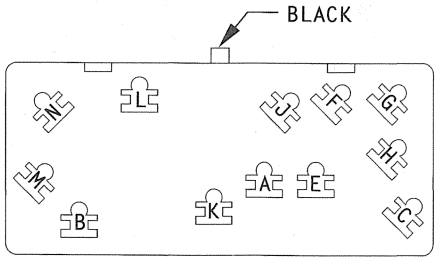


RIGHT REAR TURN SIGNAL LAMP

C423

CAV	CIRCUIT	FUNCTION
A	L60 18TN	RIGHT TURN SIGNAL
G	Z1 18BK	GROUND

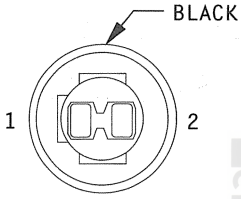
Mopar AUTHENTIC RESTORATION PRODUCT



LEFT POWER SEAT SWITCH

C424

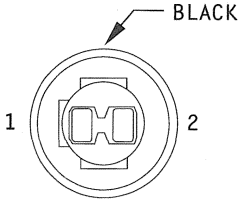
CAV	CIRCUIT	FUNCTION
A	Z1 14BK	GROUND
B	F35 14RD	FUSED B(+)
C	–	–
D	–	–
E	P11 14YL/WT	LEFT POWER SEAT REAR UP
F	–	–
G	–	–
H	–	–
I	–	–
J	P13 14RD/WT	LEFT POWER SEAT REAR DOWN
K	P15 14YL/LB	LEFT POWER SEAT HORIZONTAL FORWARD
L	P17 14RD/LB	LEFT POWER SEAT HORIZONTAL REARWARD
M	P19 14YL/LG	LEFT POWER SEAT FRONT UP
N	P21 14RD/LG	LEFT POWER SEAT FRONT DOWN



CENTER HIGH MOUNTED STOP LAMP NO. 1

C426

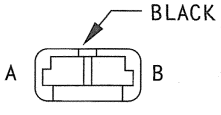
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND
	Z1 20BK	GROUND



CENTER HIGH MOUNTED STOP LAMP NO. 2

C427

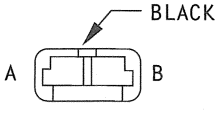
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND



LEFT SOUND BAR SPEAKER

C429

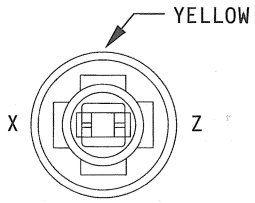
CAV	CIRCUIT	FUNCTION
A	X51 20BR/YL	LEFT SOUND BAR SPEAKER (+)
B	X57 20BR/LB	LEFT SOUND BAR SPEAKER (–)



RIGHT SOUND BAR SPEAKER

C430

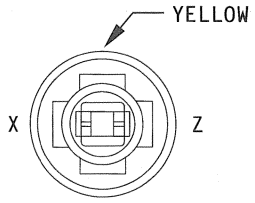
CAV	CIRCUIT	FUNCTION
A	X52 20DB/WT	RIGHT SOUND BAR SPEAKER (+)
B	X58 20DB/OR	RIGHT SOUND BAR SPEAKER (–)



LEFT COURTESY LAMP

C432

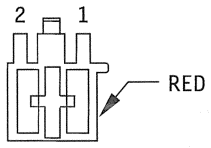
CAV	CIRCUIT	FUNCTION
X	M1 20PK	FUSED B(+)
Z	M2 20YL	COURTESY LAMPS DRIVER



RIGHT COURTESY LAMP

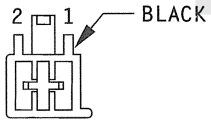
C433

CAV	CIRCUIT	FUNCTION
X	M1 20PK	FUSED B(+)
Z	M2 20YL	COURTESY LAMPS DRIVER



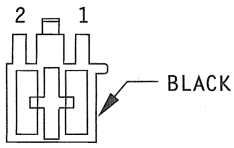
LEFT FRONT VERTICAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P19 14YL/LG	LEFT POWER SEAT FRONT UP
2	P21 14RD/LG	LEFT POWER SEAT FRONT DOWN



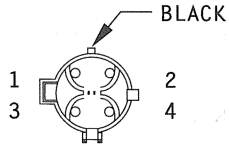
LEFT FORWARD/ REARWARD MOTOR

CAV	CIRCUIT	FUNCTION
1	P17 14RD/LB	LEFT POWER SEAT HORIZONTAL REARWARD
2	P15 14YL/LB	LEFT POWER SEAT HORIZONTAL FORWARD



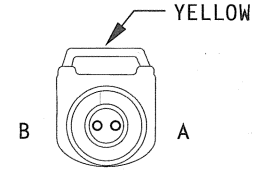
LEFT REAR VERTICAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P11 14YL/WT	LEFT POWER SEAT REAR UP
2	P13 14RD/WT	LEFT POWER SEAT REAR DOWN



DOWNSTREAM HEATED OXYGEN SENSOR

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	Z11 16BK/WT	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K341 18TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL



TORQUE CONVERTOR CLUTCH SOLENOID

C438

CAV	CIRCUIT	FUNCTION
A	T22 18DB/WT	TORQUE CONVERTOR CLUTCH RELAY OUTPUT
B	K54 18OR/BK	TORQUE CONVERTOR CLUTCH SOLENOID CONTROL

Mopar AUTHENTIC RESTORATION PRODUCT

8W-90 CONNECTOR LOCATIONS

DESCRIPTION AND OPERATION

INTRODUCTION

This section provides illustrations identifying component and connector locations in the vehicle. A connector index is provided. Use the wiring diagrams in each section for connector number identification. Refer to the index for the proper figure number.

SCHEMATICS AND DIAGRAMS

CONNECTOR/GROUND LOCATIONS

For items that are not shown in this section a N/S is placed in the Fig. column.

Conn #	Color	Location	Fig.
C100	BK	Left Fender Side Shield	2
C101	WT	Left Fender Side Shield	2
C102	BK	Bottom Right of Radiator Closure Panel	1
C103	BK	Near Left Side of Radiator	2
C104	BK	Left Fender Side Shield	N/S
C105	BK	Bottom of Left Fender Side Shield	2
C106	BK	Bottom of Knee Bolster, Left of Steering Column	9
C107	BK	On ABS Pump Motor	2
C108	BK	Right Rear Corner of Engine Compartment	2
C109	BK	Center of Dash Panel	3
C110	BK	Left Rear Corner of Engine Compartment	3
C112	BK	At Controller, Antilock Brakes	11
C113	BK	Taped to Harness, Near Controller, Antilock Brakes	4, 11
C114	BK	Center of I.P., Below Controller, Antilock Brakes	4
C117	BK	Rear of Intake Manifold	5, 6
C118	BK	On Throttle Body	5, 6
C119	GY	Bottom Left Front of Cylinder Block	5, 6
C120	BK	On Throttle Body	5, 6
C121	GY	Rear of Intake Manifold	5, 6
C122	BK	At Thermostat Housing	5, 6
C123	BK	Injector No. 1	5, 6
C124	BK	Injector No. 2	5, 6
C125	BK	Injector No. 3	5, 6
C126	BK	Injector No. 4	5, 6
C127	BK	Injector No. 5	5, 6
C128	BK	Injector No. 6	5, 6
C129	BK	Center of Dash Panel	5, 6
C130	BK	Below Brake Master Cylinder	5, 6
C131	BK	At Distributor	5, 6
C132	GN	Below and Behind Glove Box	10
C133	BK	Left of Blower Motor	3
C134	GY	Left of Blower Motor	3
C135	GY	Left of Blower Motor	3
C136	BK	On Washer Fluid Reservoir	3
C137	BK	Under Side of Hood	3
C138	BK	Left of Blower Motor	3
C139	BK	Bottom of Washer Fluid Reservoir	3
C140	BK	Bottom of Washer Fluid Reservoir	3
C141	BK	In Front of Washer Fluid Reservoir	3
C142	BK	Between PDC and Blower Motor	3
C143	BK	Bottom Front of Right Fender Side Shield	3
C144	BK	Front of Right Fender Side Shield	3
C145	BK	Front of Right Fender Side Shield	3
C146	BK	Right Side of Grille Opening	3
C147	BK	Below Distributor	6
C148	BK	Right Side of Engine	5, 7
C149	BK	Rear of Generator	5, 7
C150	BK	Right Rear of Engine	6
C151	BK	Right Fender Side Shield	3
C152	BK	Behind Power Steering Pump	5
C153	BK	Right Side of Transmission	20
C154	BK	Left Side of Radiator Closure Panel	1
C155	BK	Left Rear of Radiator Closure Panel	1
C156	BK	Behind Lens	1
C157	BK	Behind Left Headlamp	1
C158	YL	Behind Lens	1
C159	BK	Center of Grille Opening	1
C160	BK	Behind Lens	1
C161	BK	Behind Right Headlamp	1
C162	YL	Behind Lens	1

AUTHENTIC RESTORATION PRODUCTS

SCHEMATICS AND DIAGRAMS (Continued)

Conn #	Color	Location	Fig.
C163	BK	Center of Grille Opening	1
C165	GY	Left Fender Side Shield	2
C167	BK	Near Rear of Engine	N/S
C168	GY	Side of Transmission	N/S
C169	BK	Bottom of Battery Tray	7
C170	BK	Bottom Center of I.P.	4
C171	BK	Right of Steering Column	4
C172	GY	Right Fender Side Shield	N/S
C201	BK	Below Left Side of I.P.	4, 12
C202	GN	Behind Left Kick Panel	4
C203	BK	Behind Left Kick Panel	4
C204	GY	Behind Left Kick Panel	4
C205	BK	Bottom Right of I.P.	9
C206	BK	Bottom Right of I.P.	9
C207	BK	Behind Headlamp Switch	8
C209	BK	On I.P., Right of Steering Column	8
C210	NAT	On I.P., Right of Steering Column	8
C211	BK	Rear of Radio	10
C212	BR	Center of I.P.	8
C213	BK	Center of I.P.	8
C214	GY	Right Side of I.P.	11
C215	BK	Right Side of I.P.	11
C216	GY	Glove Box	8
C217	BK	Bottom of I.P.	N/S
C218	RD	Right Side of I.P.	11
C219	BK	Bottom Right of I.P.	10
C220	BK	Right Side of I.P.	11
C221	BK	Right Corner of I.P.	11
C222	GN	Right Corner of I.P.	11
C223	BK	Right Front of Steering Column	4
C224	BK	Right Front of Steering Column	4
C225	NAT	Below Steering Column	4
C226	NAT	On Side of Fuse Block	N/S
C227	BK	On I.P., Right of Steering Column	8
C228	GY	Left Side of Steering Column	4
C229	BK	Top of Brake Pedal Arm	11
C230	BK	Left Side of I.P.	9
C231	BK	Center of I.P.	8
C232	GY	Left Side of I.P.	9
C233	BK	Left Side of I.P.	9
C234	BK	Rear of I.P. Cluster	8
C235	NAT	Rear of I.P. Cluster	8
C236	BK	On I.P. Right of Steering Column	8
C237	BK	On I.P. Right of Steering Column	8
C238	BK	On I.P. Left of Steering Column	8
C239	RD	On I.P. Left of Steering Column	8
C240	BK	Lower Left of I.P.	N/S
C241	BK	Near Relay Bank	N/S
C242	BK	Center Bottom of I.P.	10, 12
C243	NAT	Top of Fuse Block	4
C244	BK	At Shift Interlock Solenoid	N/S
C301	GN	Behind Left Kick Panel	17
C302	BK	Near Floor Console	17
C303	BK	Bottom of Driver's Seat	17, 21
C304	BK	Bottom of Driver's Seat	17
C305	BK	Behind Right Kick Panel	16
C306	BK	Left B-Pillar	N/S
C307	BK	Near Fuel Tank	17
C308	BK	In Liftgate	19
C309	BK	Under Rear of Roof Liner	18
C310	BK	Left Rear Quarter Panel	18
C311	BK	Left Rear Quarter Panel	18
C312	BK	Left Rear Quarter Panel	18
C313	BK	In Liftgate	N/S
C314	NAT	In Left Rear Door	16
C315	BK	In Left Rear Door	16
C316	RD	In Left Rear Door	16
C317	BK	Behind Left Kick Panel	15, 17
C318	RD	Behind Left Kick Panel	15, 17
C319	BK	Under Floor Console	17
C320	GY	Behind Right Kick Panel	15
C321	BK	Behind Right Kick Panel	15
C322	GN	At Dome Lamp	15
C323	BK	In Liftgate	19
C324	BK	Right Rear Quarter Panel	18
C325	NAT	In Right Rear Door	16
C326	BK	In Right Rear Door	16
C327	RD	In Right Rear Door	16
C328	BK	In Right B-Pillar	N/S
C329	BK	In Right Front Door	15
C331	BK	In Right Front Door	15
C332	BK	In Right Front Door	15
C333	BK	In Right Front Door	15
C334	BK	In Right Front Door	15
C335	BK	In Left Front Door	15

SCHEMATICS AND DIAGRAMS (Continued)

Conn #	Color	Location	Fig.
C336	RD	In Left Front Door	15
C338	BK	In Left Front Door	15
C339	BK	In Left Front Door	15
C340	NAT	In Left Front Door	15
C341	NAT	In Left Front Door	15
C342	BK	Front Center of Roof Liner	14
C343	NAT	Behind Overhead Console	14
C344	BK	Behind Dome Lamp	14
C345	BK	In Left Rear Corner of Vehicle	18
C346	BK	Left Rear Quarter Panel	19
C347	BK	Left Rear Quarter Panel	19
C348	BK	Left Rear Quarter Panel	19
C349	BK	Left Rear Quarter Panel	18
C350	BK	In Liftgate	19
C351	BK	Rear Bumper	19
C352	BK	Floor Pan, Near Drivers Seat	N/S
C353	BK	In Liftgate	23
C354	BK	Below Left Rear Seat	13
C355	RD	Below Left Rear Seat	13
C356	BK	Below Left Rear Seat	13
C357	BK	On Transmission	20
C358	GN	In Liftgate	19
C401	BK	Behind PRNDL	N/S
C402	BK	In Floor Console	N/S
C403	BK	Rear of Radio	10
C404	BK	Rear of Transmission (2WD)	20
C404	BK	Rear of Transfer Case (4WD)	20
C405	BK	Behind Cargo Lamp	18
C406	YL	In Liftgate	N/S
C407	BK	On Transfer Case	20
C408	BK	Side of Transmission	N/S
C409	BK	Right of Radiator	3
C410	BK	In Left Door	16
C411	BK	In Left Front Door	N/S
C412	BK	In Right Door	15
C413	BK	In Right Rear Door	16

Conn #	Color	Location	Fig.
C414	BK	On Transfer Case	20
C416	BK	Behind Lens	N/S
C417	BK	Behind Lens	N/S
C418	YL	Behind Lens	N/S
C419	YL	Behind Lens	N/S
C420	BK	Behind Lens	N/S
C421	BK	Behind Lens	N/S
C422	BK	Behind Lens	N/S
C423	BK	Behind Lens	N/S
C424	BK	Side of Driver's Seat	21
C426	BK	Behind Lens	23
C427	BK	Behind Lens	23
C429	BK	In Sound Bar	18
C430	BK	In Sound Bar	18
C432	YL	Behind Lamp	N/S
C433	YL	Behind Lamp	N/S
C434	RD	Under Seat	N/S
C435	BK	Under Seat	N/S
C436	BK	Under Seat	N/S
C437	BK	Under Seat	22
C438	YL	Side of Transmission	N/S
G101	N/A	Near Ignition Coil	7
G102	N/A	Near Battery	7
G103	N/A	Right Front Side of Engine, Behind Generator	7
G104	N/A	Left Fender Side Shield, Behind PCM	2
G105	N/A	Left Fender Side Shield, Behind PCM	2
G106	N/A	Right Rear of Engine	5, 6
G107	N/A	Right Rear of Engine	5, 6
G108	N/A	Right Rear of Engine	5, 6
G109	N/A	Right Front Side of Engine, Behind Generator	7
G201	N/A	Below Headlamp Switch	12
G301	N/A	Left Rear Quarter Panel	18

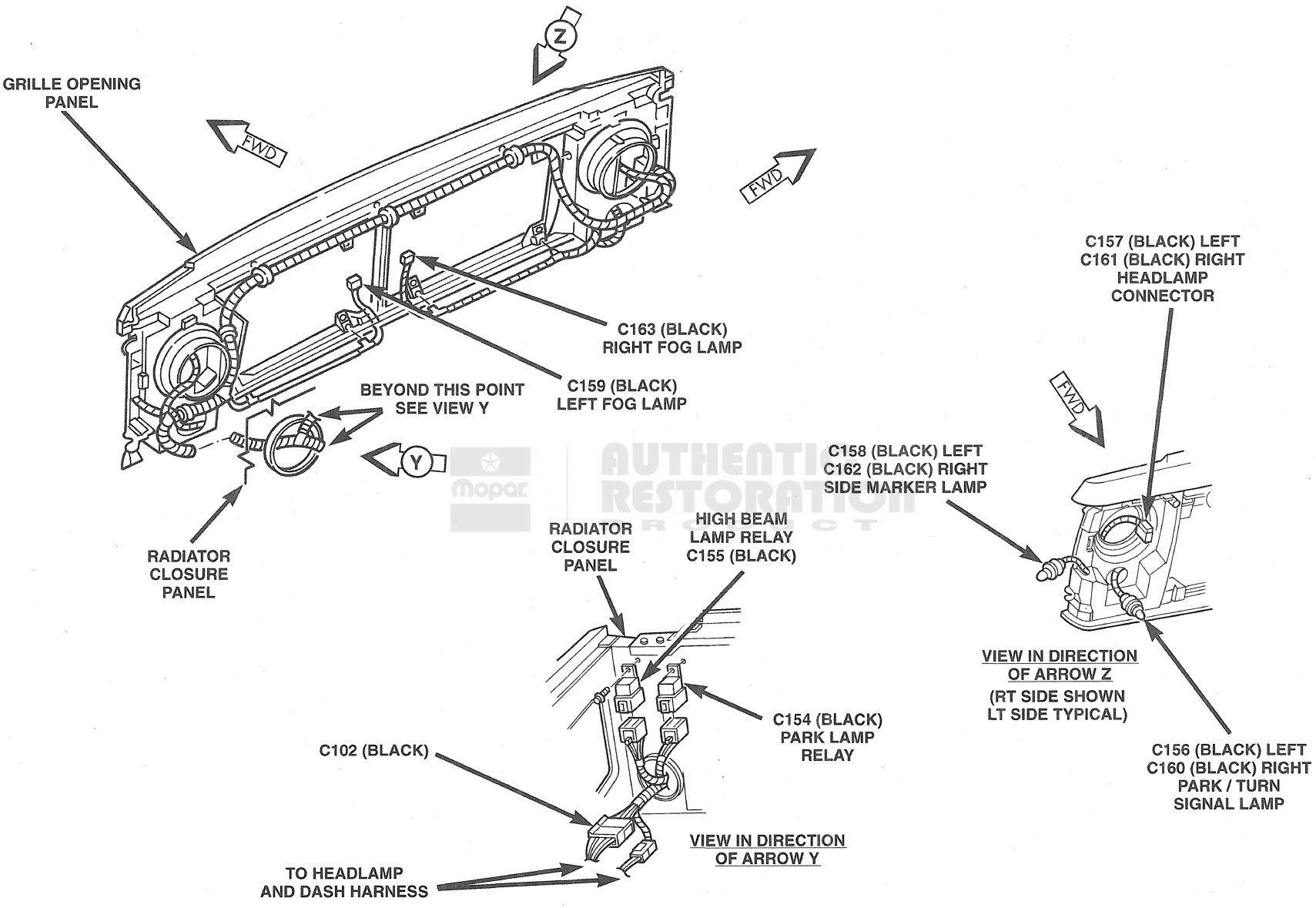


Fig. 1 Front End Lighting Wiring Connectors

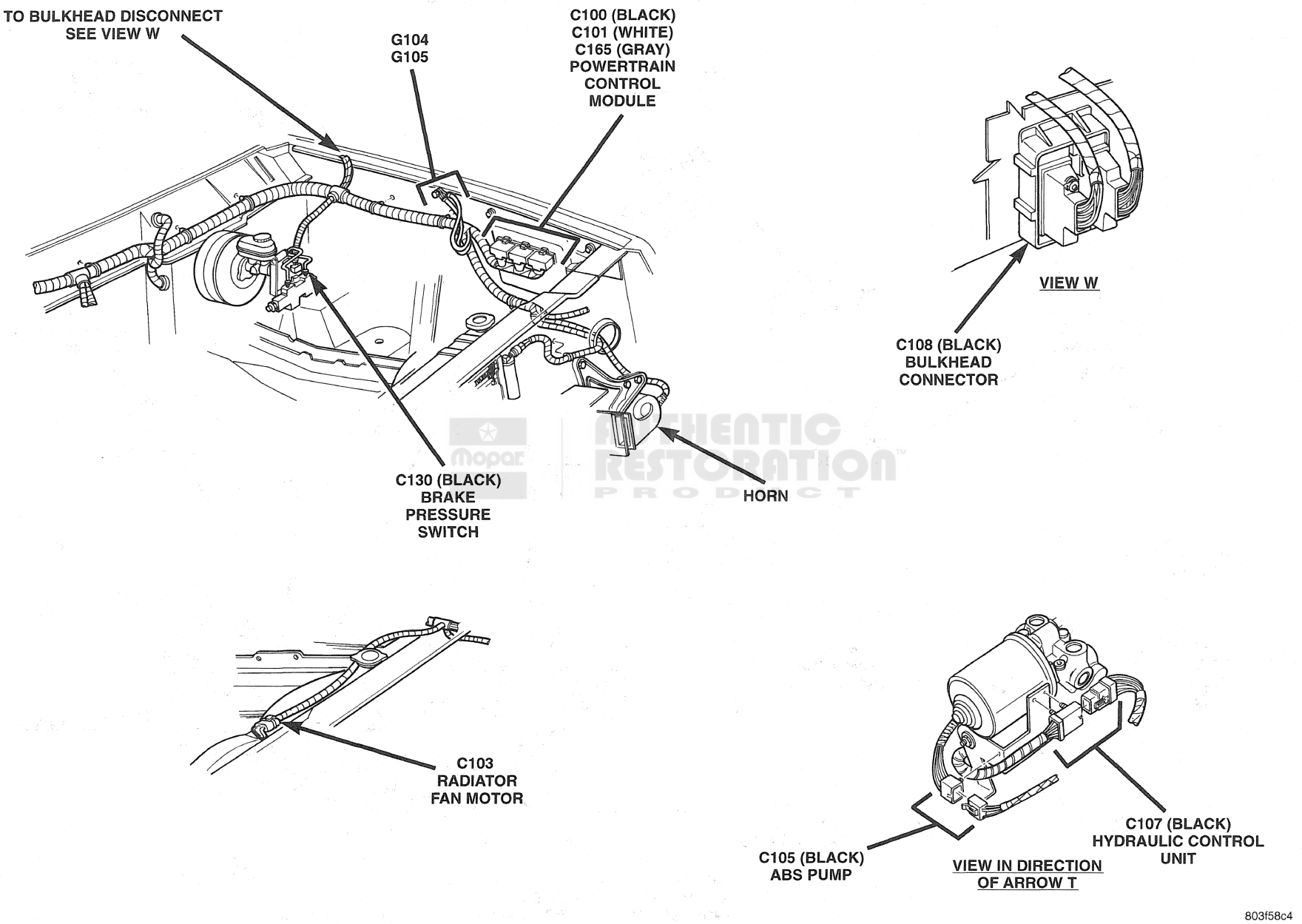


Fig. 2 Engine Compartment Wiring Connectors—Left Side

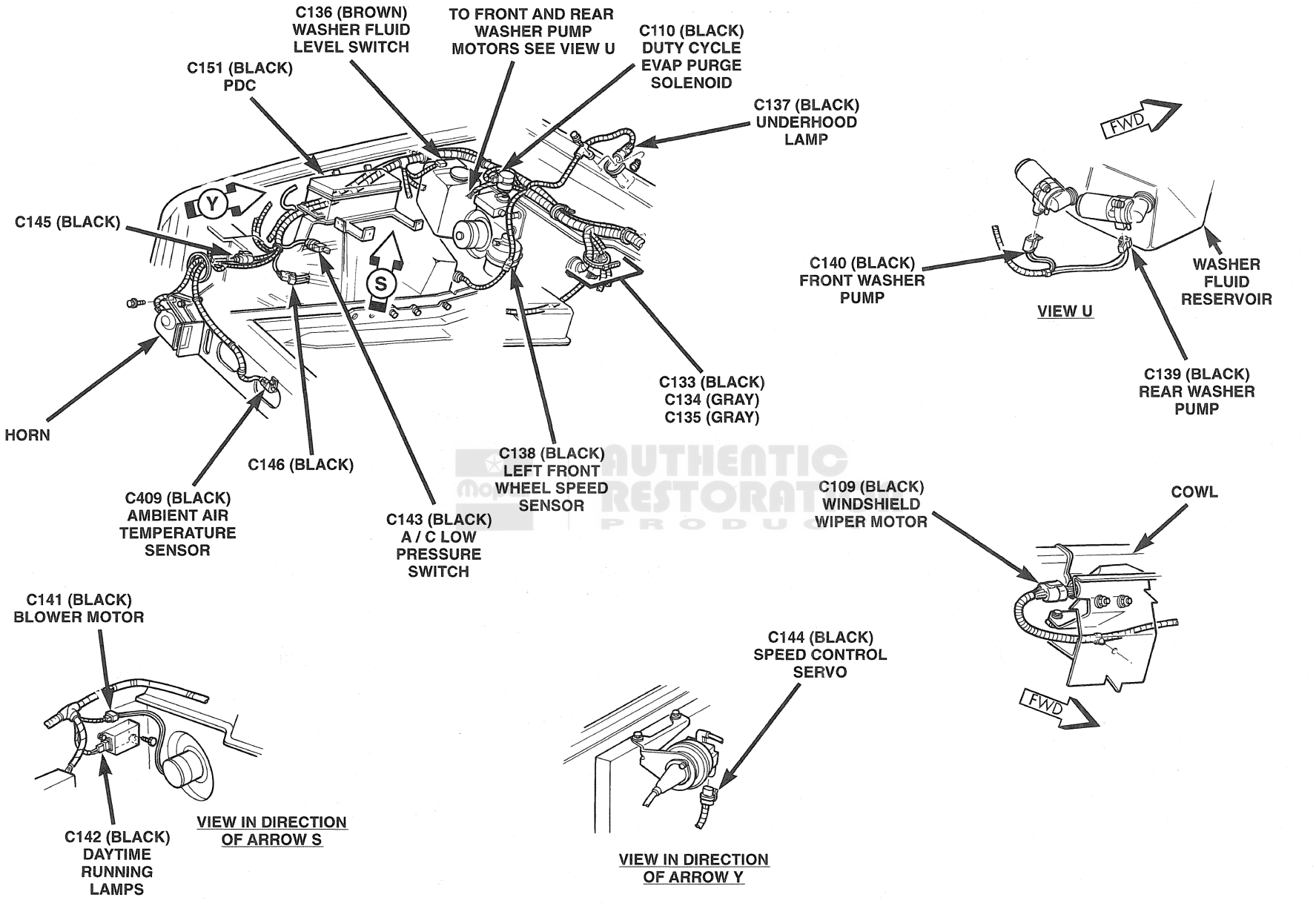
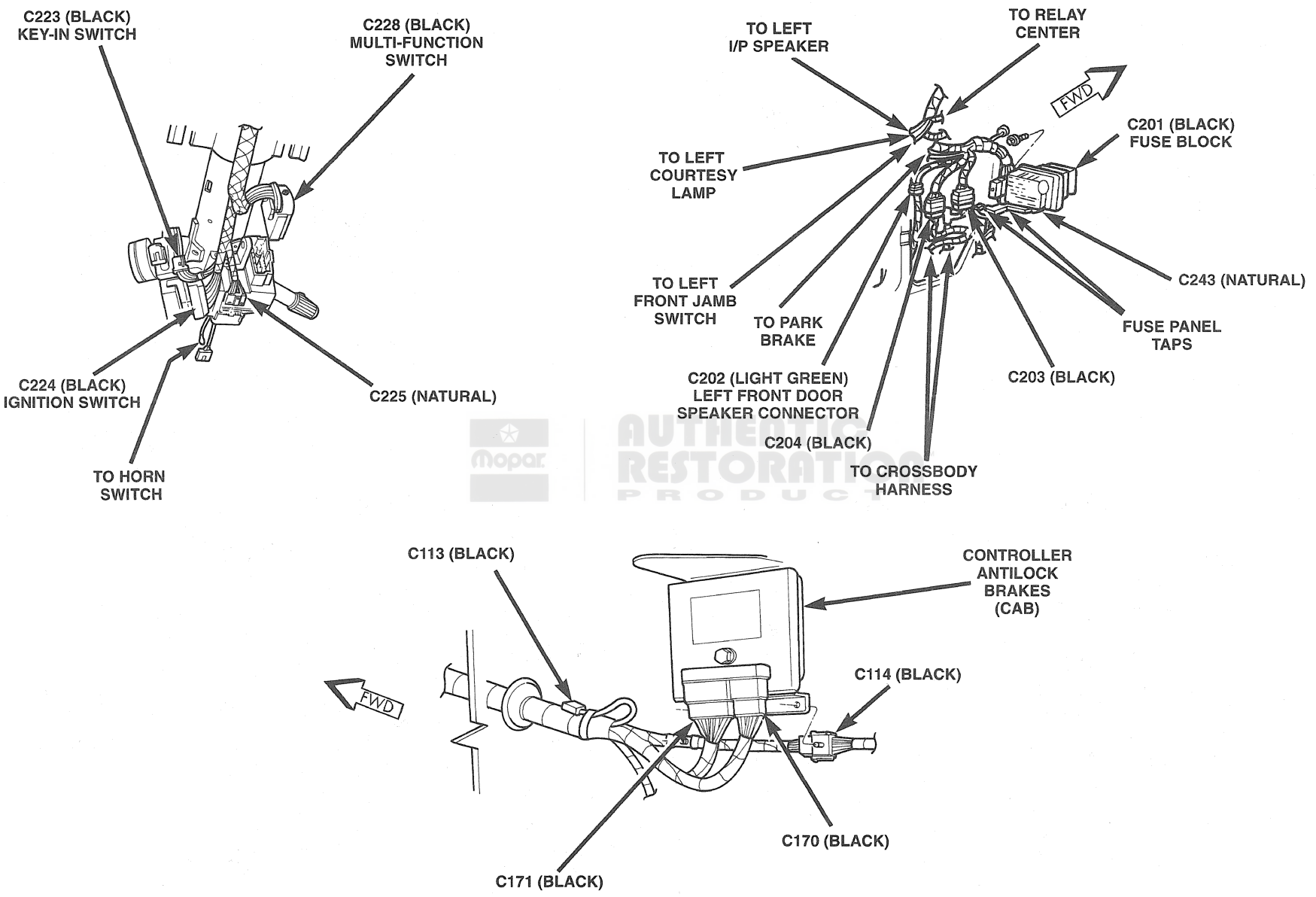


Fig. 3 Engine Compartment Wiring Connectors—Right Side



804facd5

Fig. 4 Controller, Antilock Brakes (CAB) Wiring Connectors

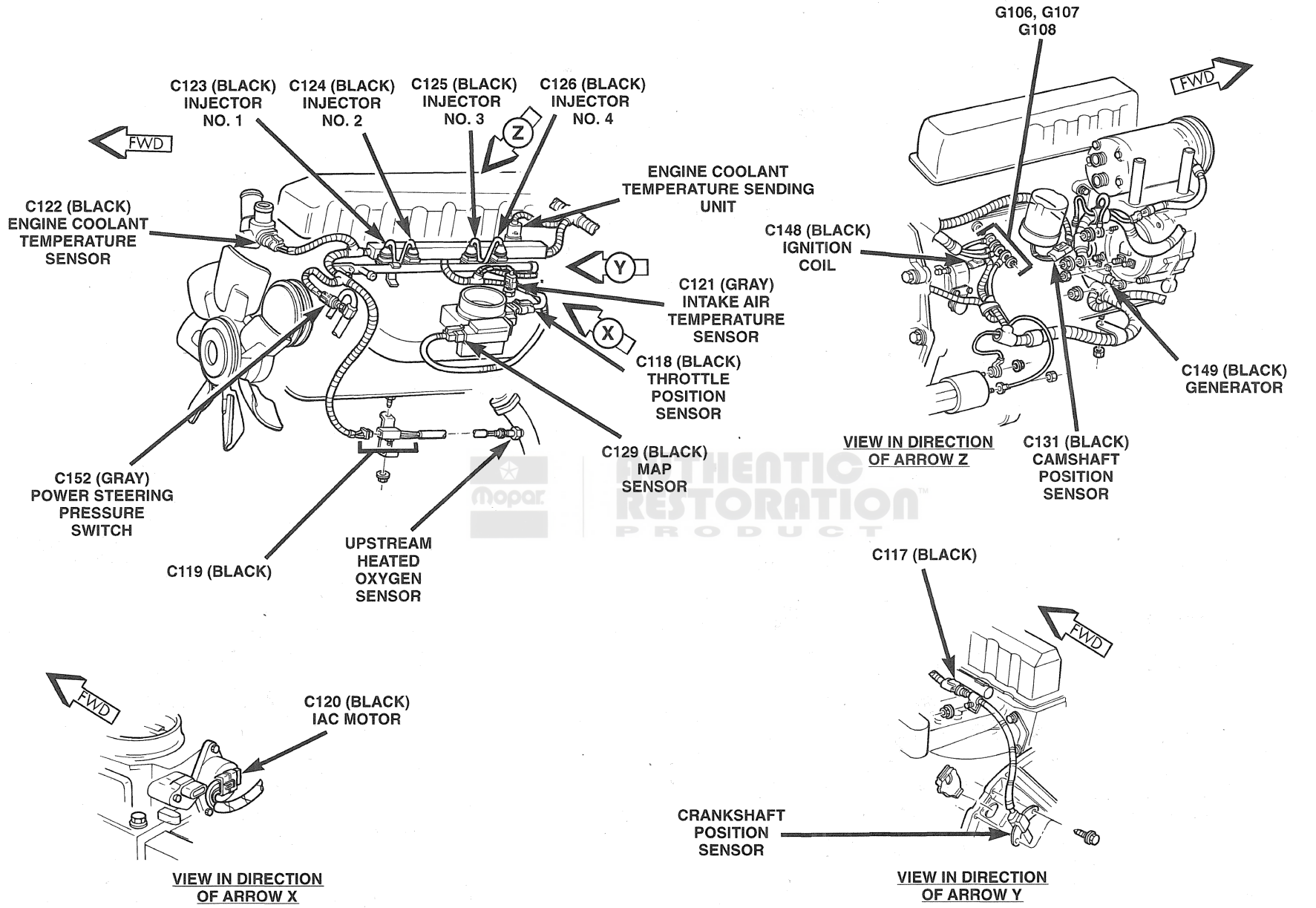
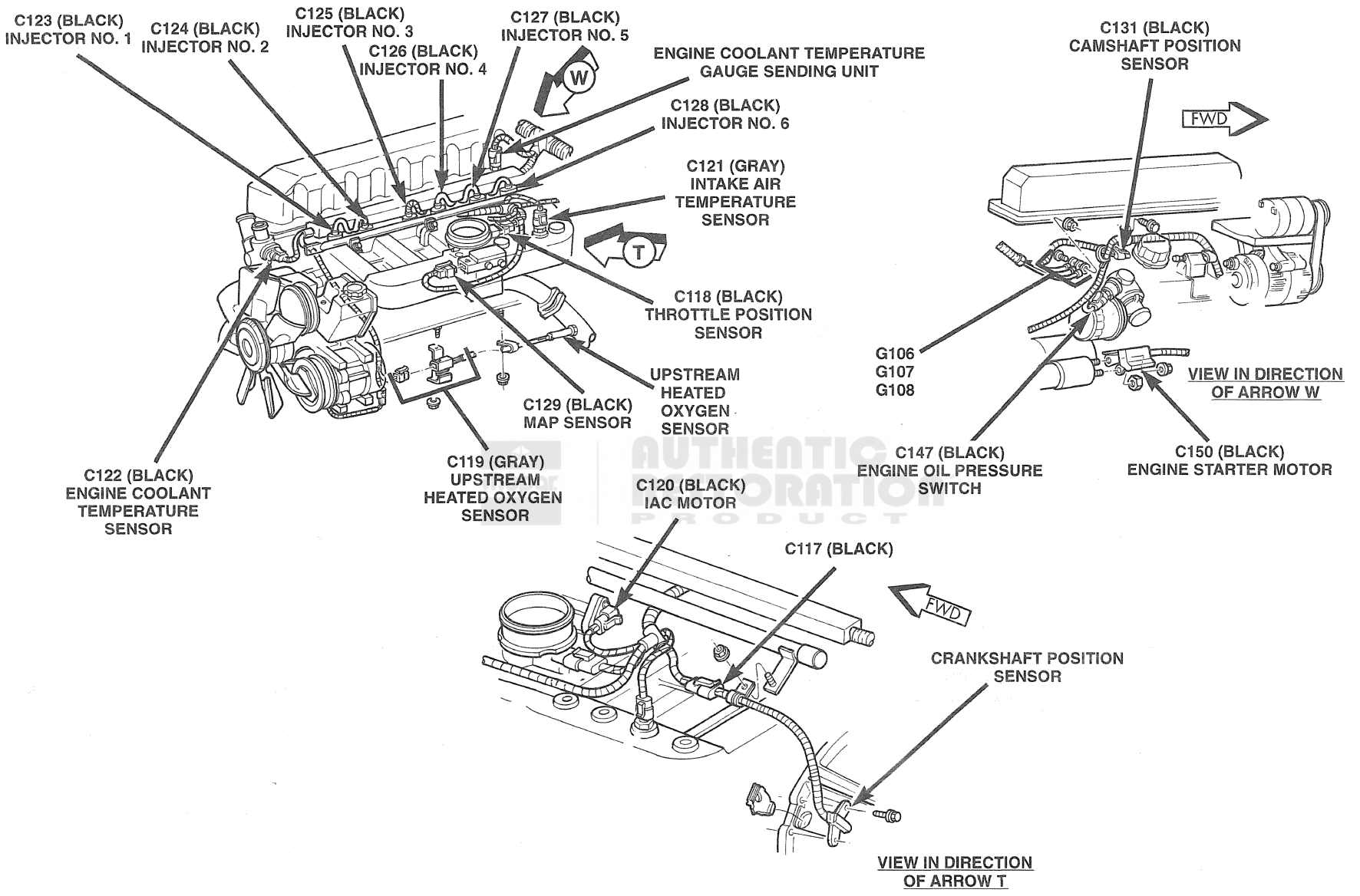


Fig. 5 Engine Wiring Connectors—2.5L Engine



803f58c5

Fig. 6 Engine Wiring Connectors—4.0L

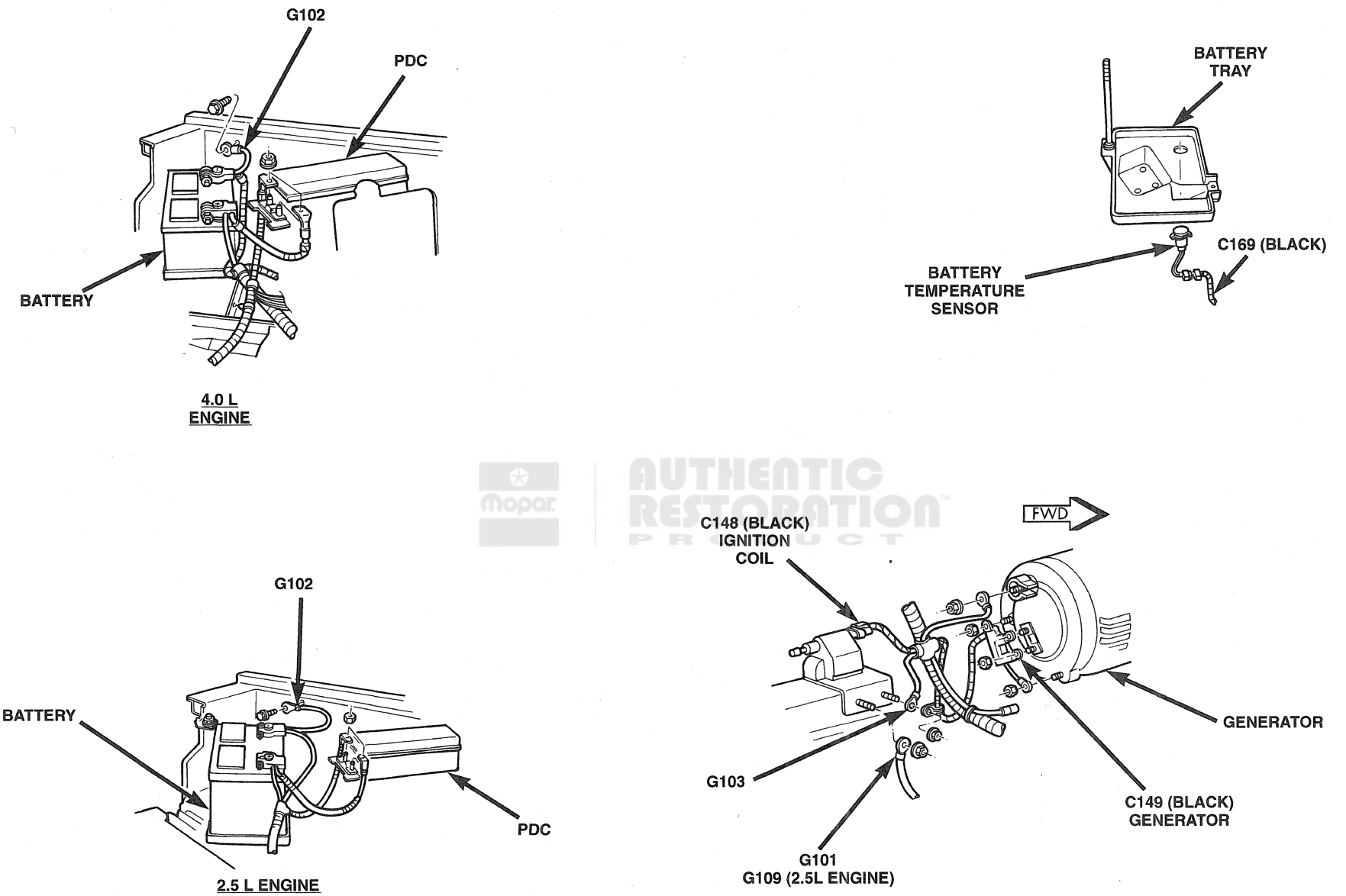


Fig. 7 Battery and Generator Wiring Connectors

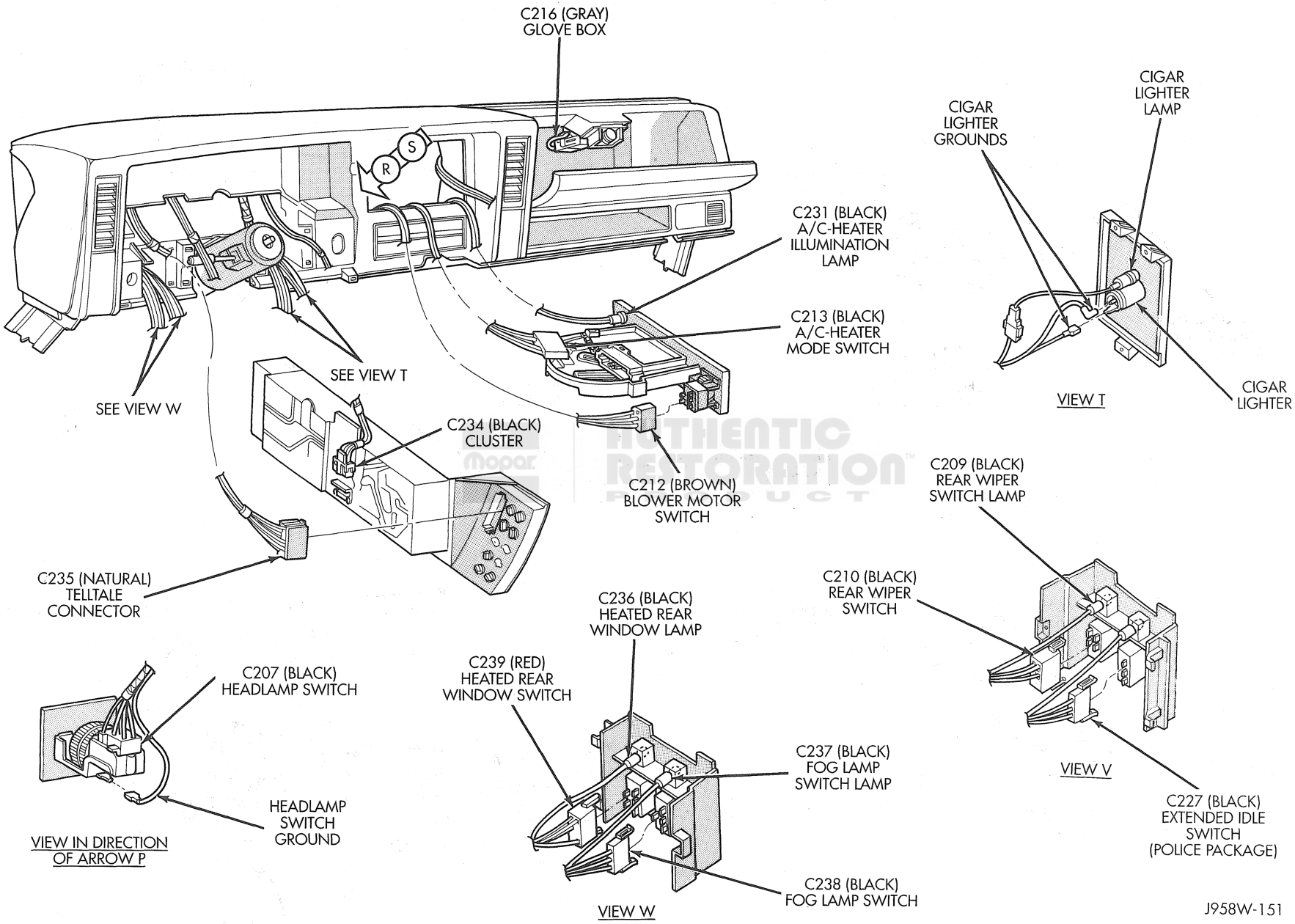


Fig. 8 Instrument Panel Wiring Connectors—Left Side

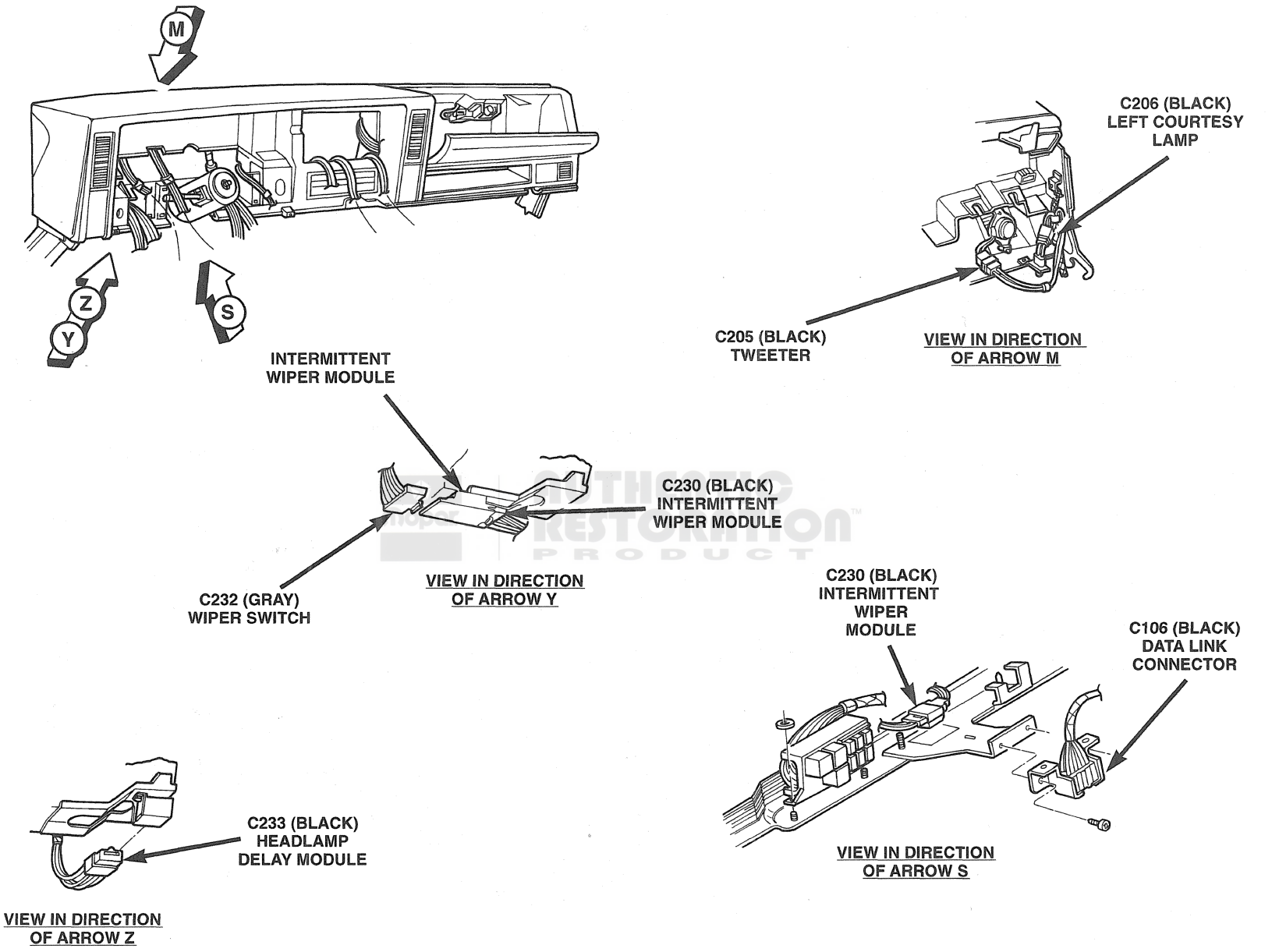


Fig. 9 Instrument Panel Wiring Connectors

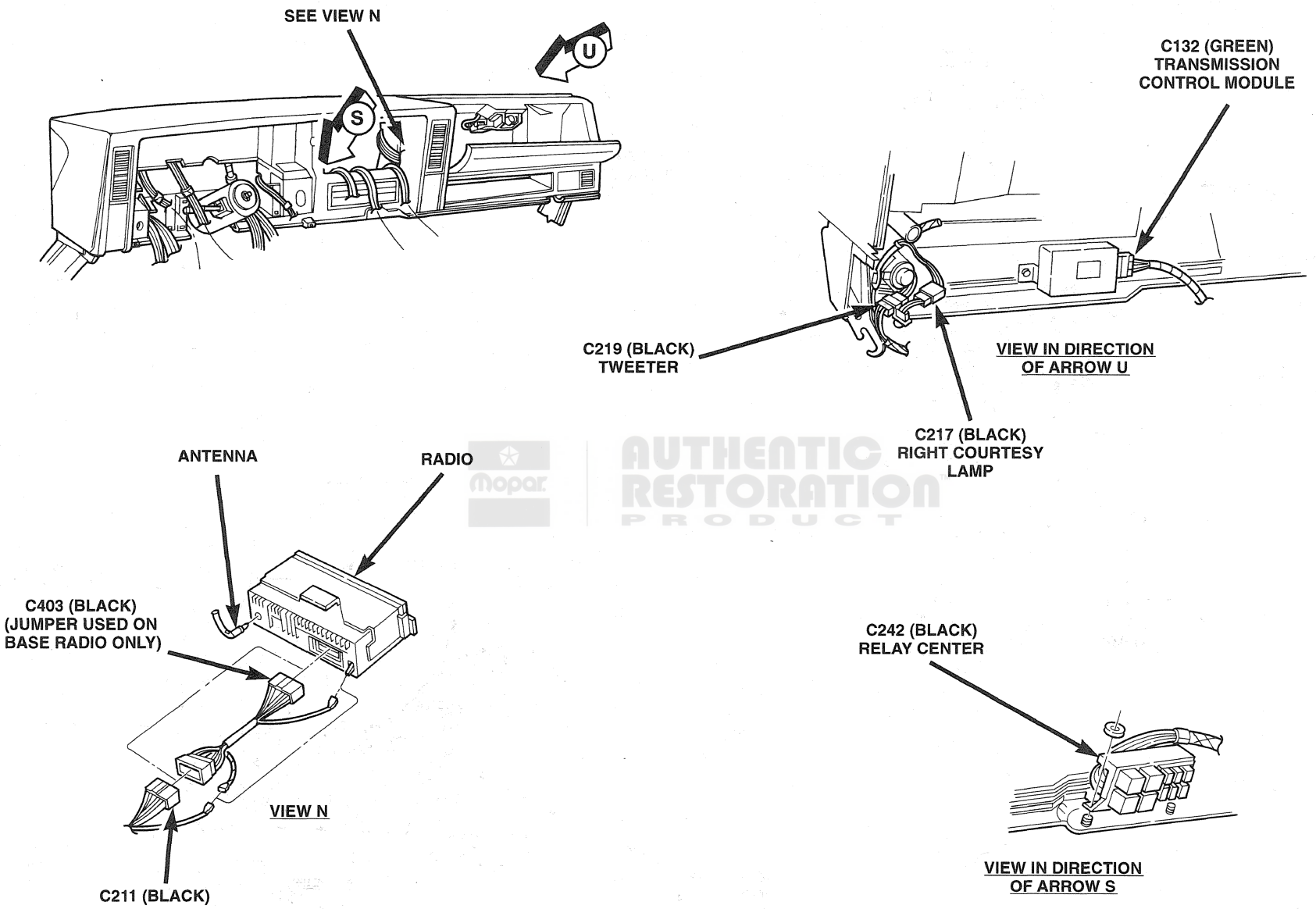


Fig. 10 Instrument Panel Wiring Connectors—Center

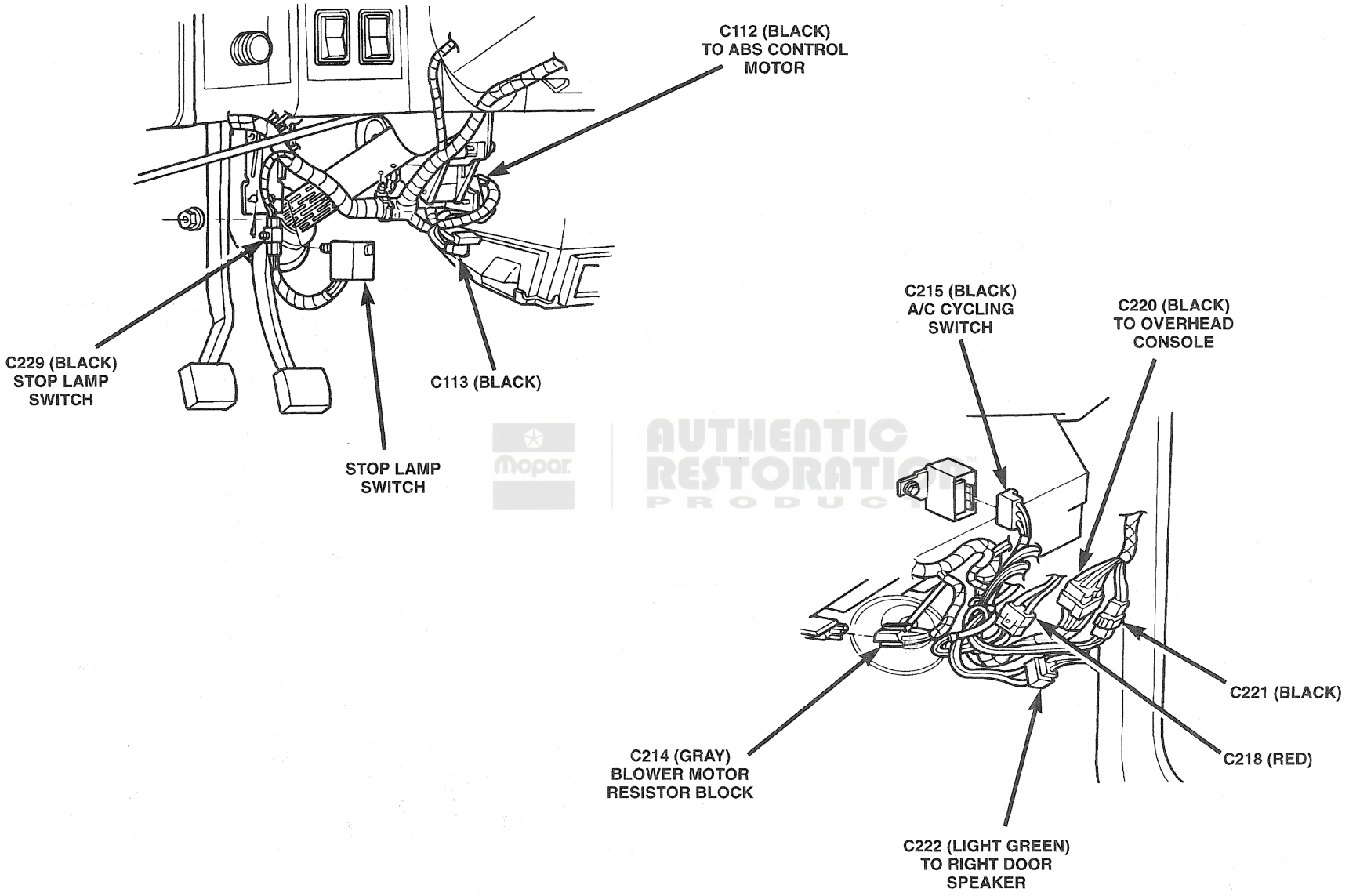


Fig. 11 Instrument Panel Wiring Connectors—Lower

SCHEMATICS AND DIAGRAMS (Continued)

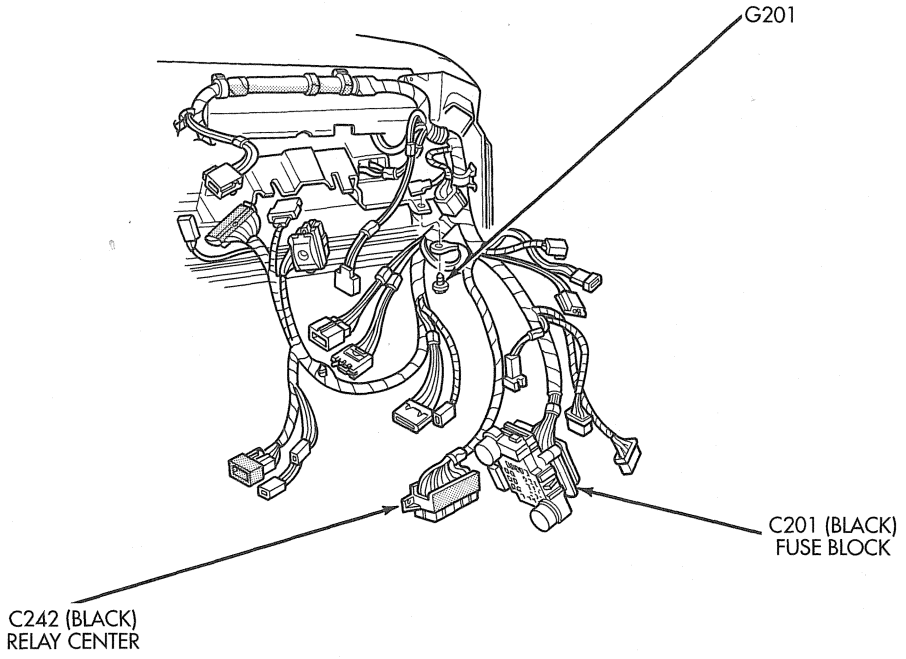


Fig. 12 Instrument Panel Ground

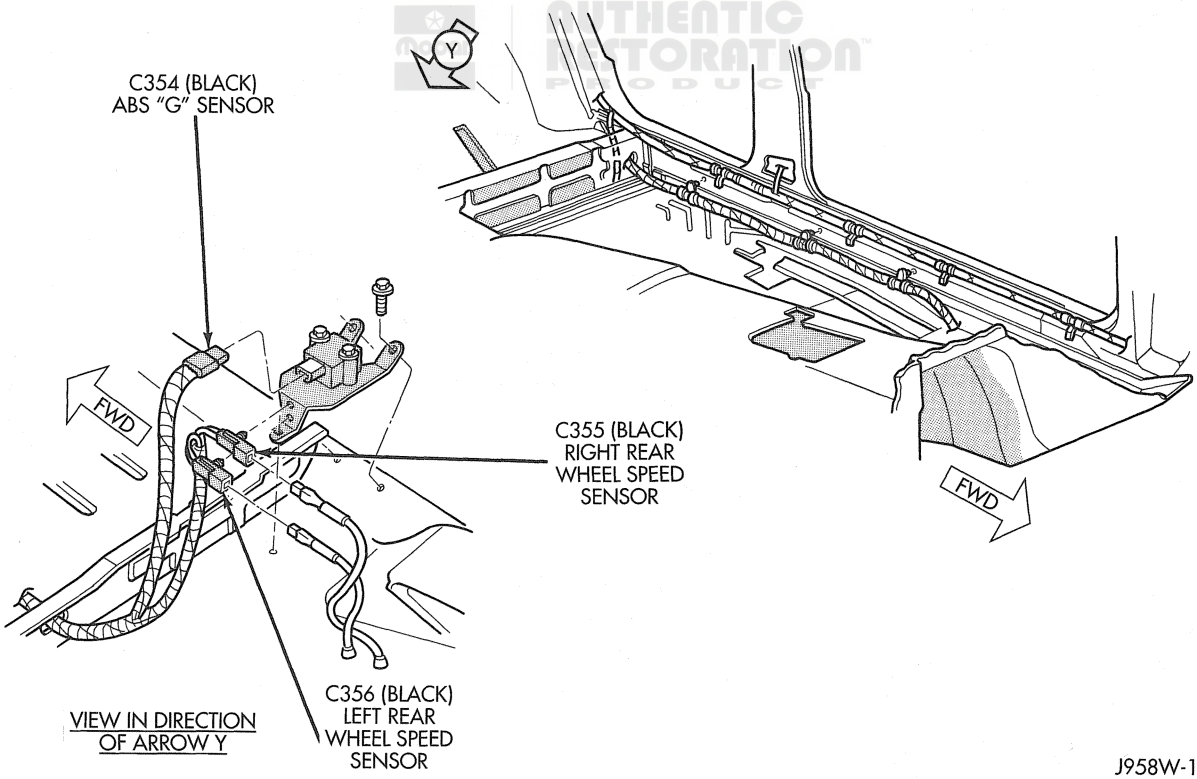


Fig. 13 ABS G-Sensor

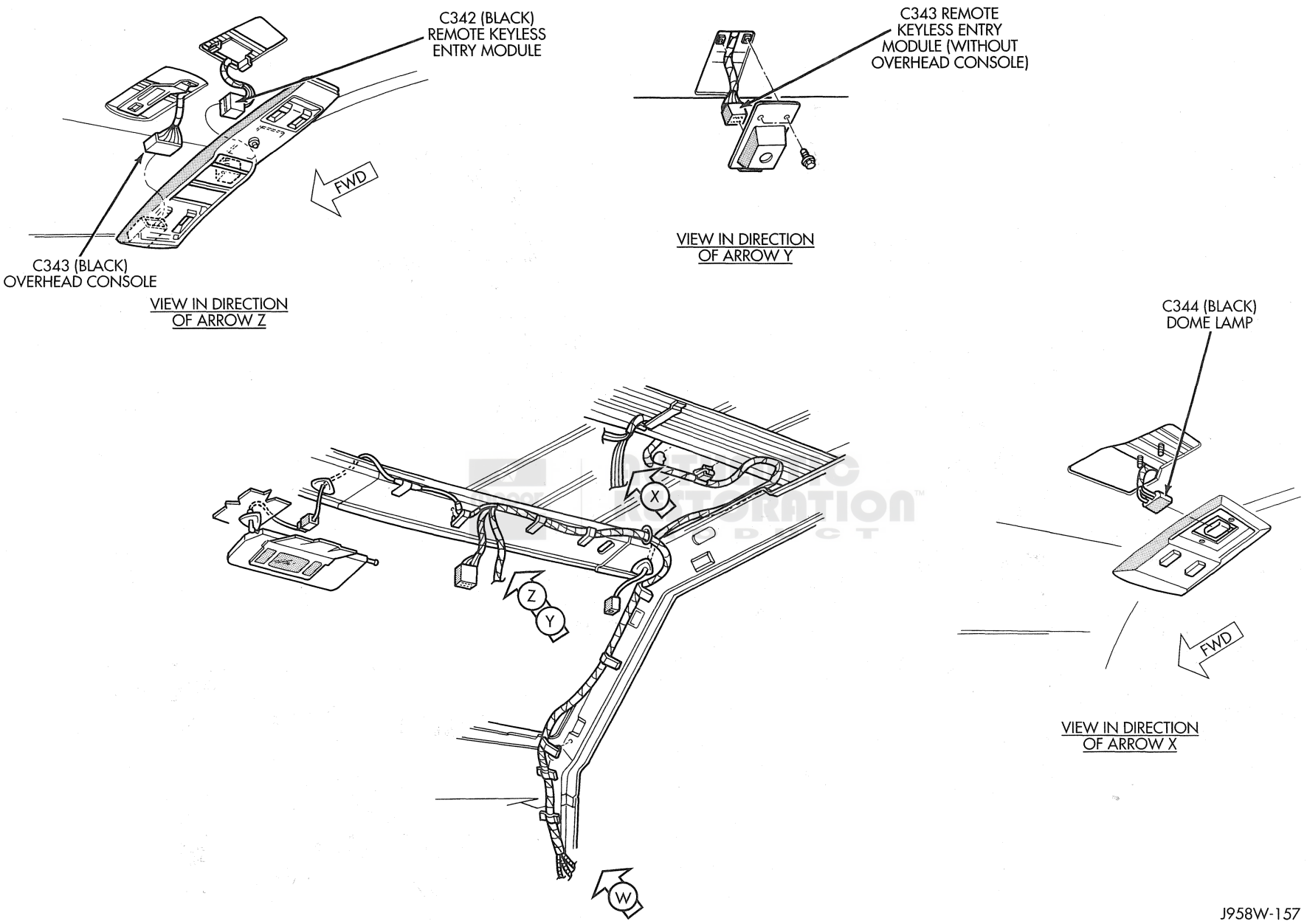


Fig. 14 Dome Lamp and Overhead Console Wiring Connectors

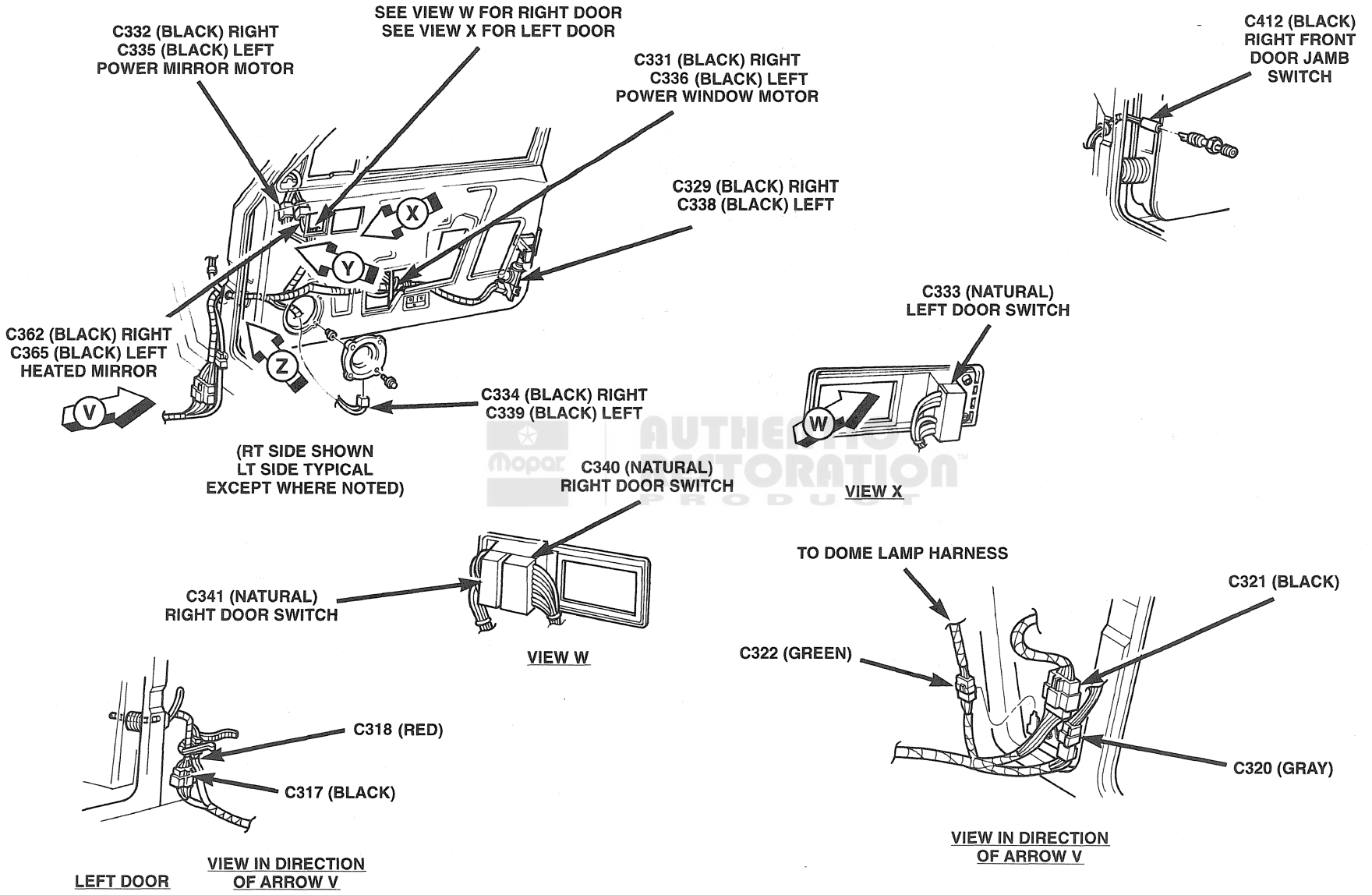


Fig. 15 Front Door Wiring Connectors

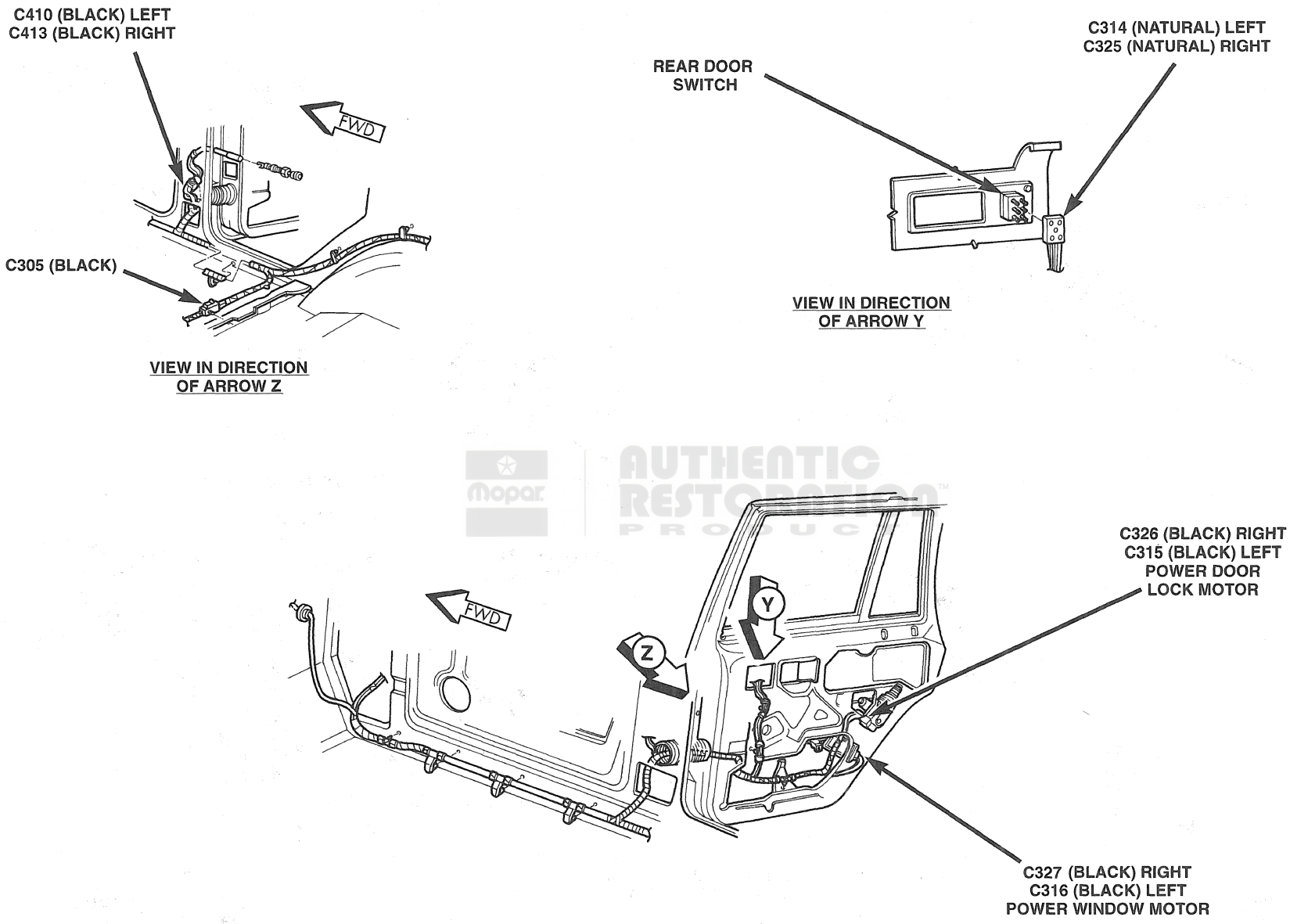
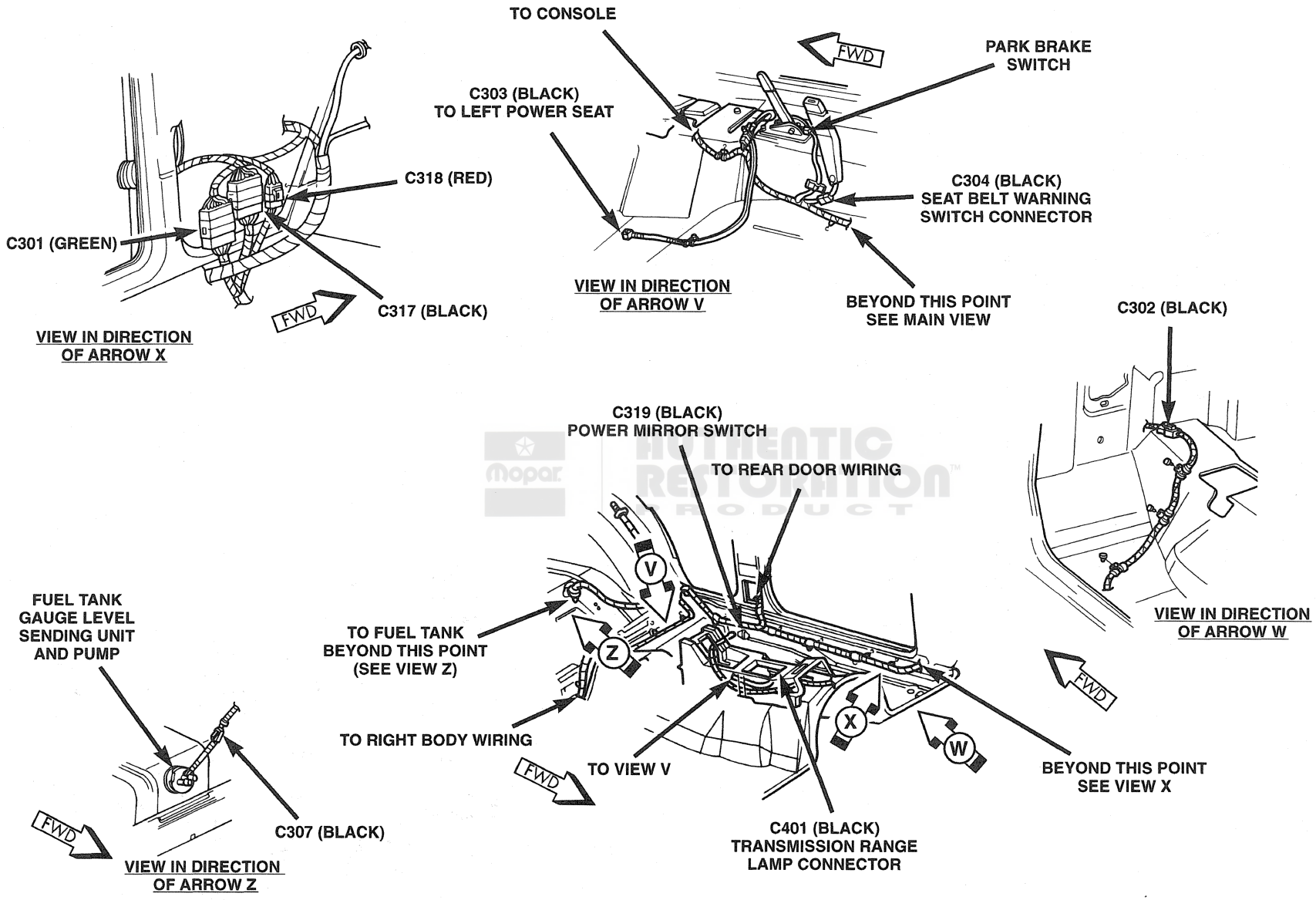


Fig. 16 Rear Door Wiring Connectors



804facd9

Fig. 17 Body Wiring Connectors

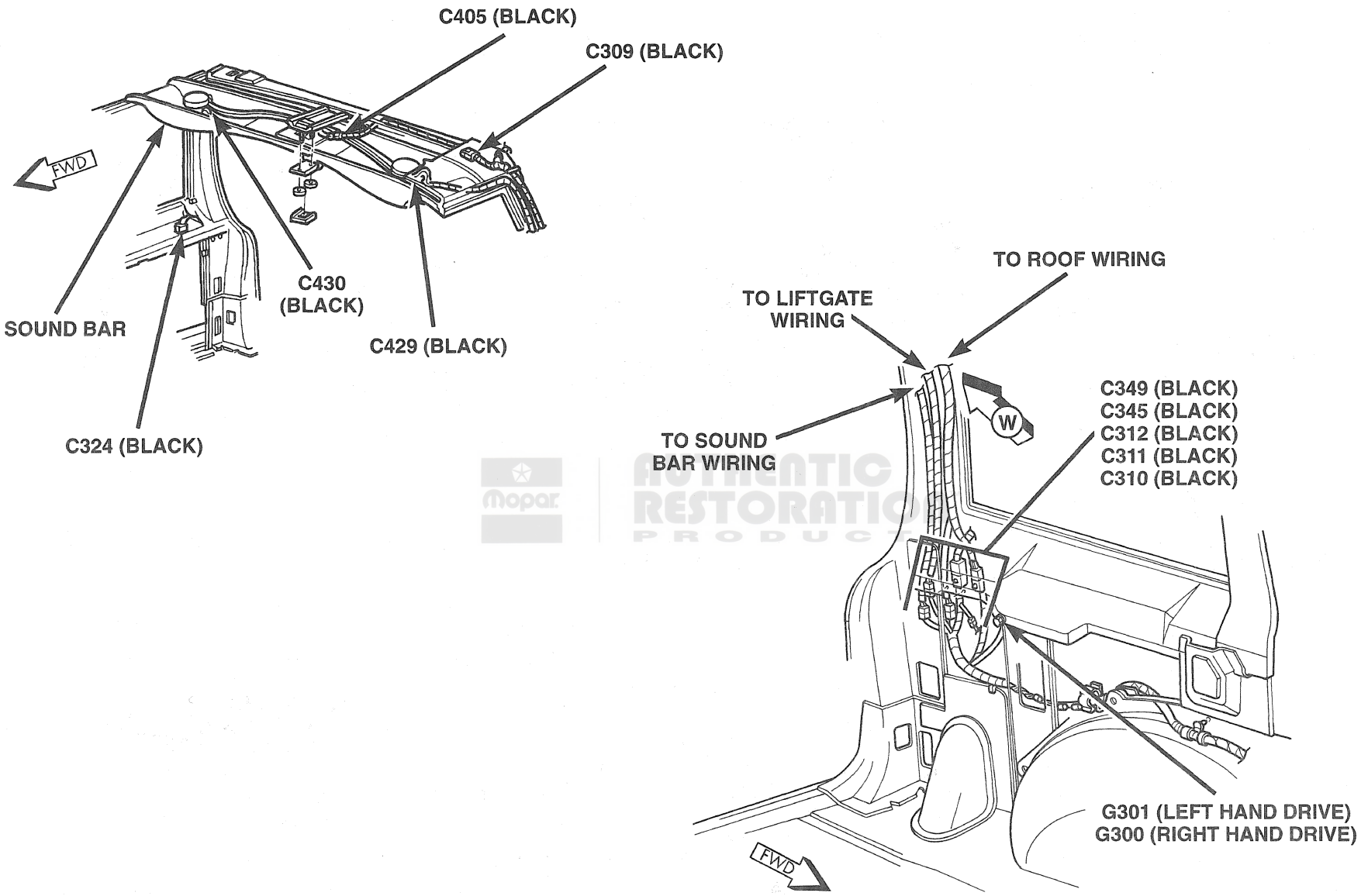


Fig. 18 Rear Compartment Wiring Connectors

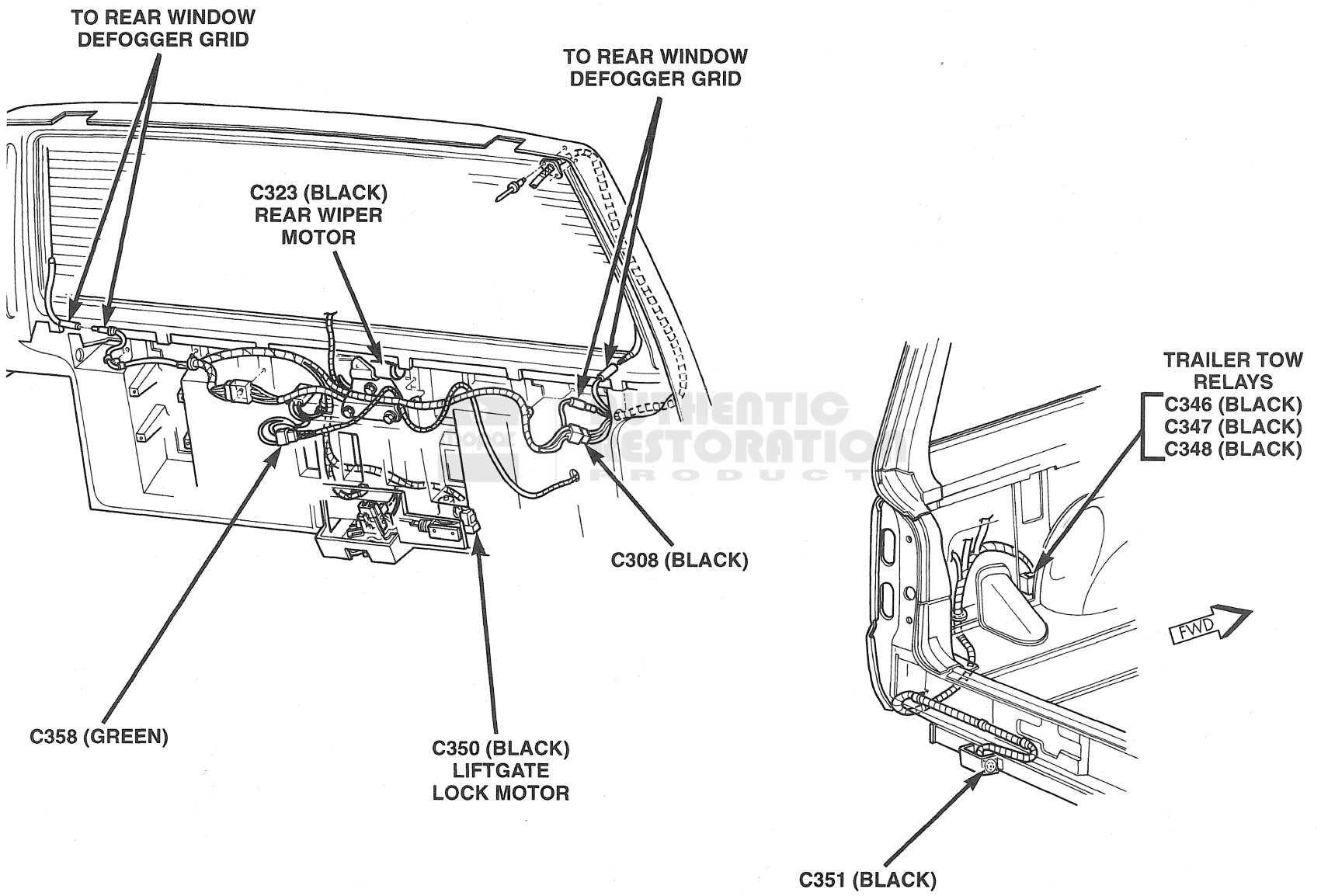


Fig. 19 Liftgate Wiring Connectors

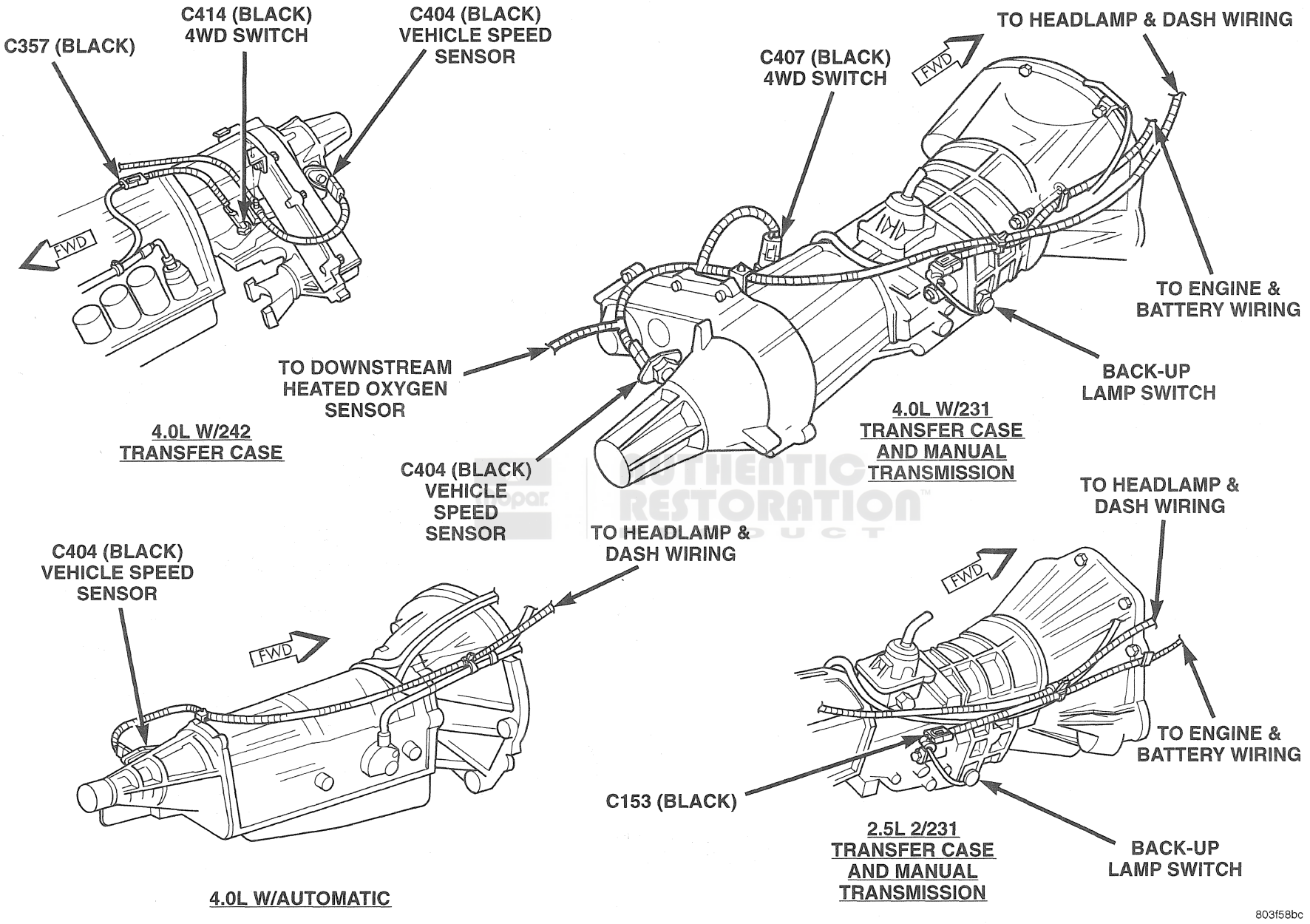


Fig. 20 Transmission Wiring Connectors

SCHEMATICS AND DIAGRAMS (Continued)

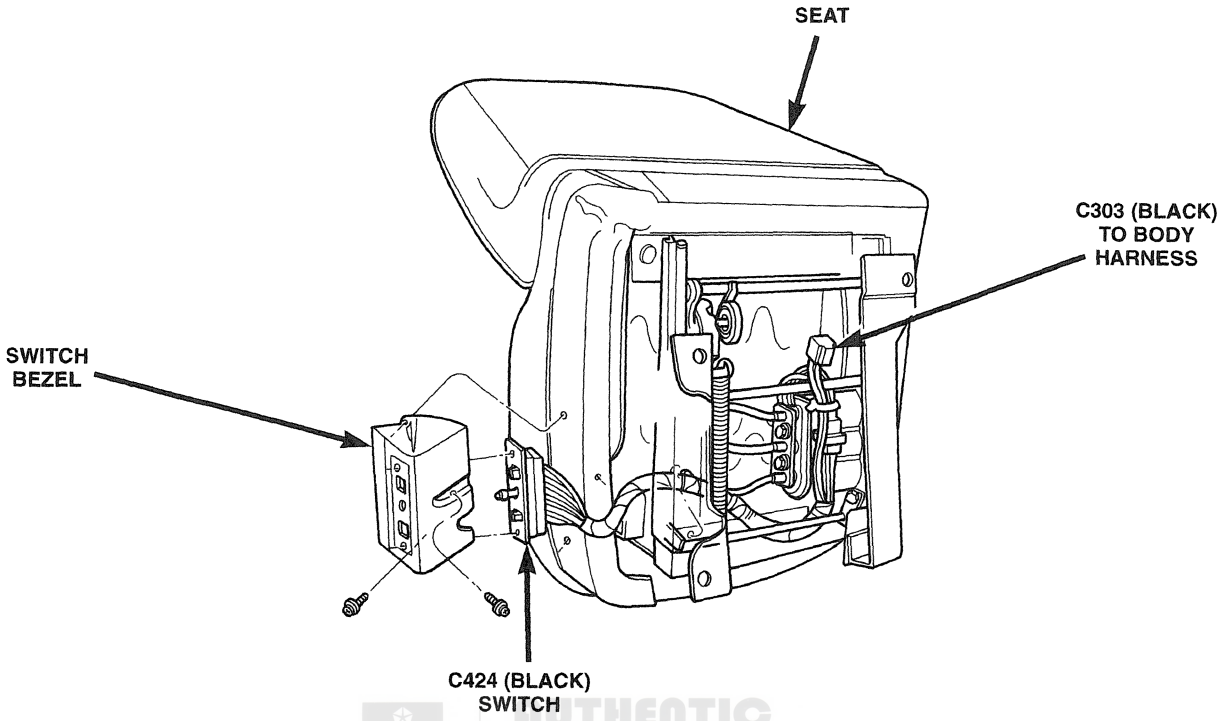


Fig. 21 Power Seat Wiring Connectors

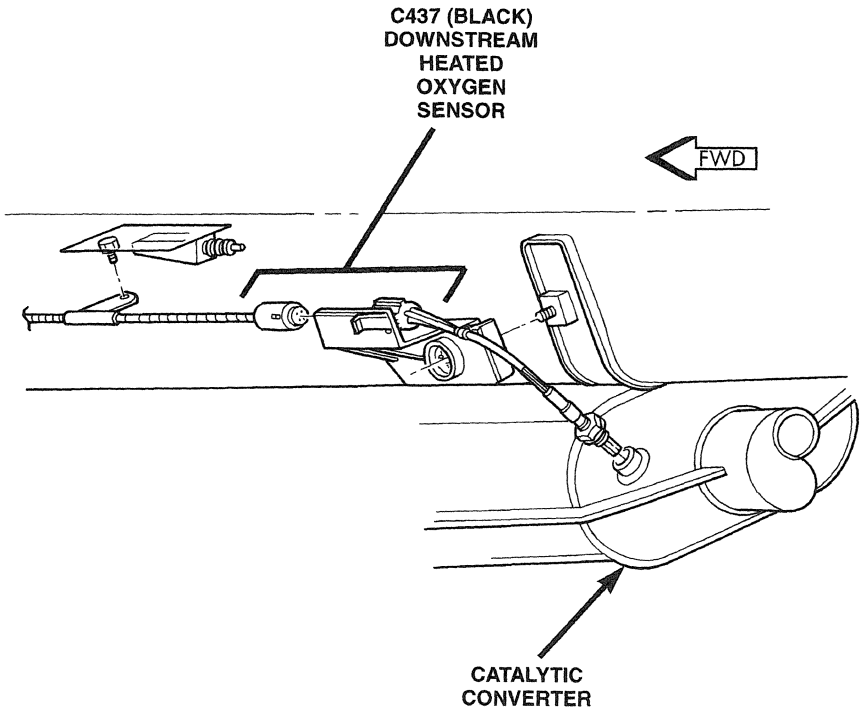


Fig. 22 Downstream Heated Oxygen Sensor

SCHEMATICS AND DIAGRAMS (Continued)

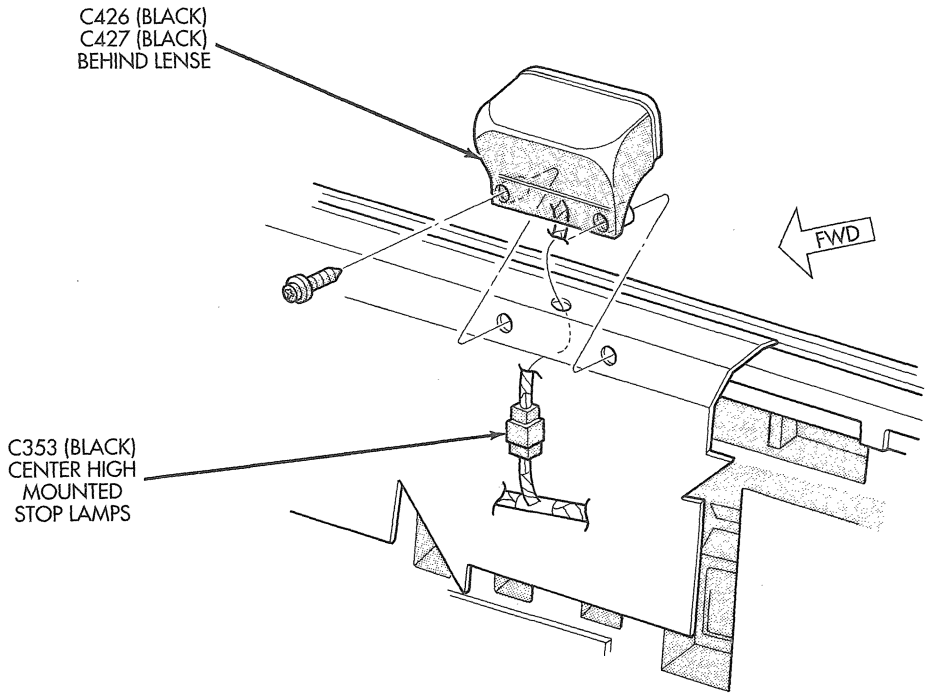


Fig. 23 Center High Mounted Stop Lamps (CHMSL)

8W-95 SPLICE LOCATIONS

DIAGNOSIS AND TESTING

INTRODUCTION

This section provides illustrations identifying the general location of the splices in this vehicle. A splice index is provided. Use the wiring diagrams in each section for splice number identification. Refer to the index for proper splice number.

SCHEMATICS AND DIAGRAMS

SPLICE LOCATIONS

For splices that are not shown in the figures in this section a N/S is placed in the Fig. column.

Splice Number	Location	Fig.
S101	In Branch to Connector C146 (2.5L Engine)	2
S101	Near Generator T/O (4.0L Engine	3
S102	Near Bulkhead T/O	1
S103	Near Branch to Engine Harness	1
S104	Near Bulkhead T/O	1
S105	Near Bulkhead T/O	1
S107	Near Wiper Motor T/O	1
S108	Near Wiper Motor T/O	1
S109	Near Wiper Motor T/O	1
S110	Center of Dash Panel, Near Grommet	1
S111	In T/O to Connector C114 (to I.P. Harness)	1
S112	Center of Dash Panel, Near Grommet	1
S114	Near T/O for Injector No. 4 (2.5L Engine)	2
S114	Near T/O for Injector No. 6 (4.0L Engine)	3
S115	Between T/Os for Injectors No. 2 and 3 (2.5L Engine)	2
S115	Near T/O for Injector No. 2	3
S116	Near Branch to Engine Harness (2.5L Engine)	1
S116	In Branch to Camshaft Position Sensor (4.0L Engine)	3
S118	Near Branch to Engine Harness	1
S119	Near T/O to Transmission Control Module	1
S120	Near T/O to Transmission Control Module	1
S121	Between Transmission Control Module T/O and Underhood Lamp T/O	1
S122	Between Transmission Control Module T/O and Underhood Lamp T/O	1
S123	Between Blower Motor T/O and Underhood Lamp T/O	1
S124	Between Blower Motor T/O and Underhood Lamp T/O	1
S126	Near Oil Pressure Switch T/O	2
S128	Between Left and Right Fog Lamp T/Os	5
S129	Between Left and Right Fog Lamp T/Os	5
S130	Between Left and Right Fog Lamp T/Os	5
S131	Near Bulkhead T/O	1
S201	Near Left Door Speaker T/O	4
S202	Near Left Door Speaker T/O	4
S203	Near I.P. Speaker	4
S204	Near Relay Center	4
S205	Near T/O for Headlamp Switch	4
S206	Near Headlamp Switch T/O	4
S207	Near Cluster T/O	4
S208	Near Cluster T/O	4
S209	Right Side of Cluster, Near Rear Wiper Switch	4
S210	Right Side of Cluster, Near Radio T/O	4

AUTHENTIC RESTORATION PARTS

SCHEMATICS AND DIAGRAMS (Continued)

Splice Number	Location	Fig.
S212	Near Wiper Switch T/O	4
S213	Near Antenna T/O	4
S214	Near Blower Motor Resistor T/O	4
S215	Right Side of Instrument Panel	4
S216	Near Headlamp Switch T/O	4
S217	Near Headlamp Switch T/O	4
S301	In Left Rear Door T/O	6
S302	Near Left C-Pillar	6
S303	Near Left C-Pillar	6
S304	Near Left C-Pillar	6
S306	Near Left C-Pillar	6
S307	Left Rear Quarter Panel	7
S308	Left Rear Quarter Panel	7
S309	Near Left Rear Door T/O	6
S310	Near Left Rear Door T/O	6
S311	Left Side of Floor Tunnel	8
S312	Top of Floor Tunnel	8
S313	In Power Mirror Switch T/O	8
S314	Right A-Pillar	9
S315	Near Right Vanity Mirror T/O	9
S316	Near Right Vanity Mirror T/O	9
S317	In Trailer Tow Harness, Near Grommet	10
S318	In Trailer Tow Harness, Near Grommet	10
S319	In Liftgate, Near T/O for Liftgate Lock Motor	10
S320	Right A-Pillar	9
S401	In Left Rear Tail Lamp Harness	N/S
S402	In Right Rear Tail Lamp Harness	N/S
S403	In Left Rear Tail Lamp Harness	N/S
S404	In Right Rear Tail Lamp Harness	N/S

AUTHENTIC RESTORATION PRODUCT

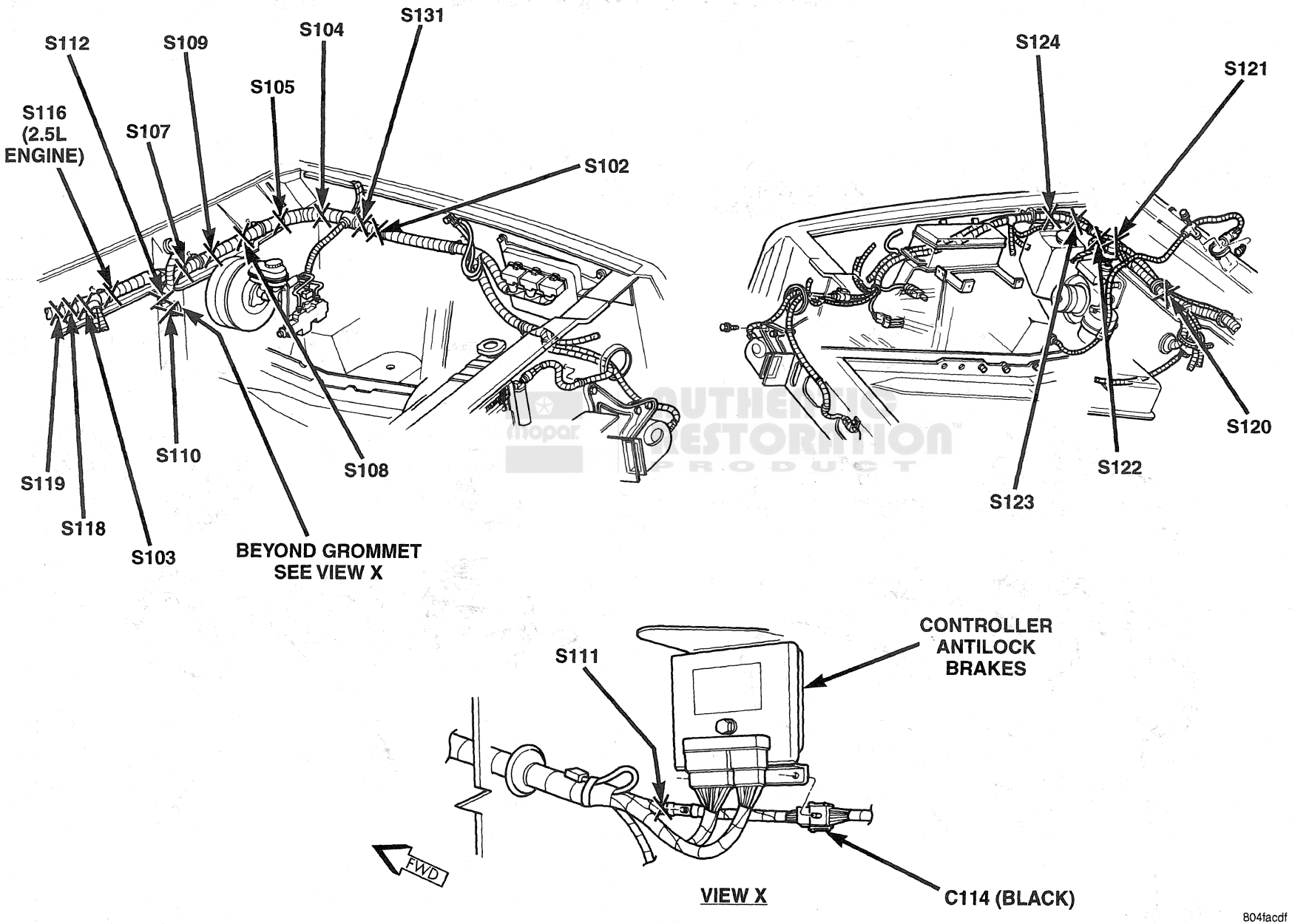


Fig. 1 Engine Compartment Wiring Splices

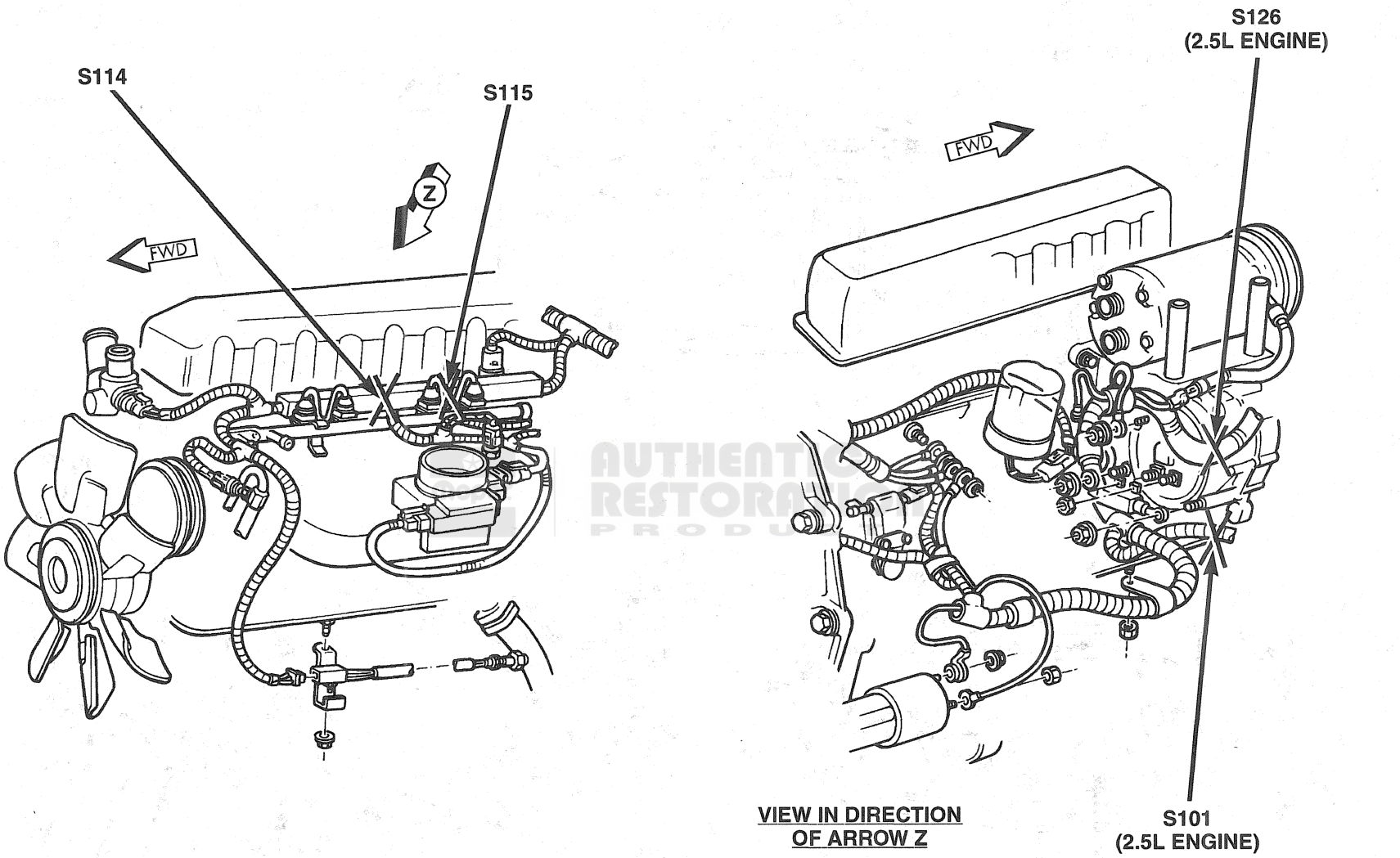


Fig. 2 Engine Wiring Splices—2.5L Engine

SCHEMATICS AND DIAGRAMS (Continued)

804facde

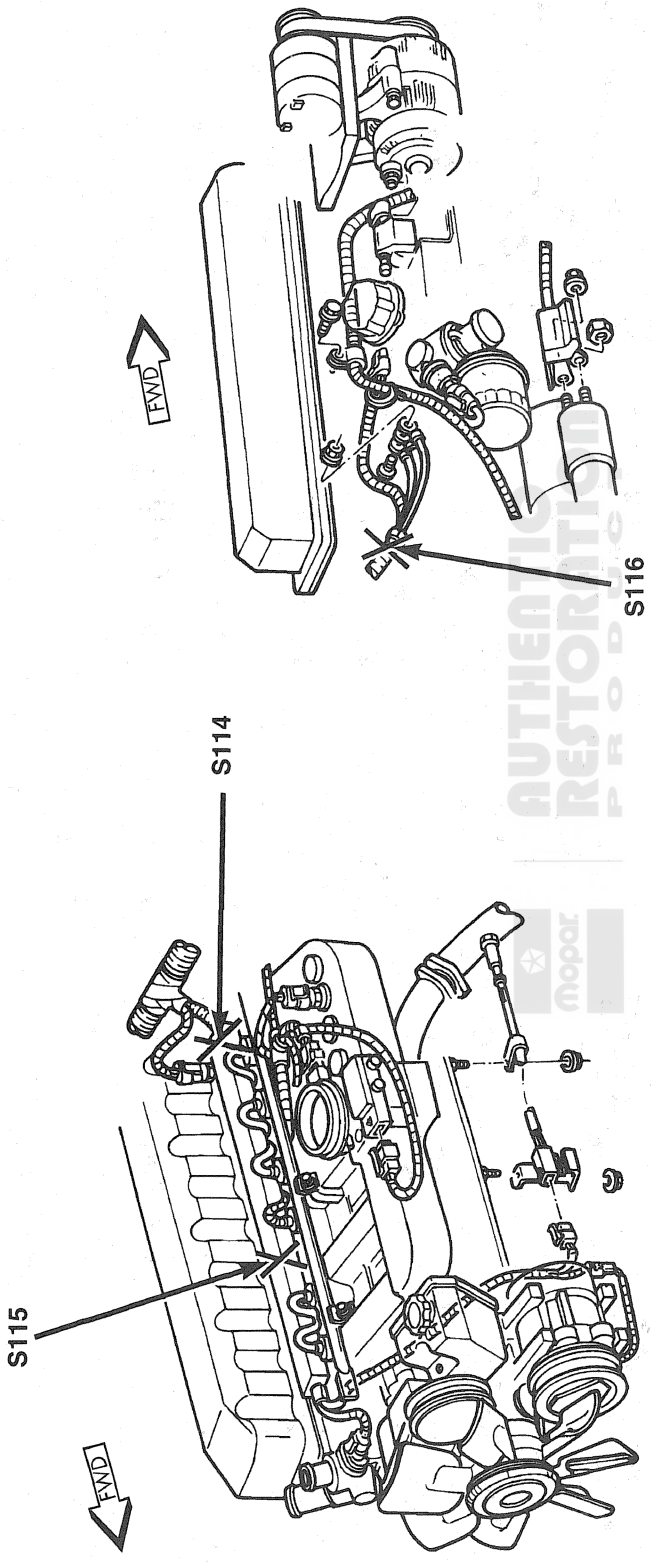


Fig. 3 Engine Wiring Splices—4.0L Engine

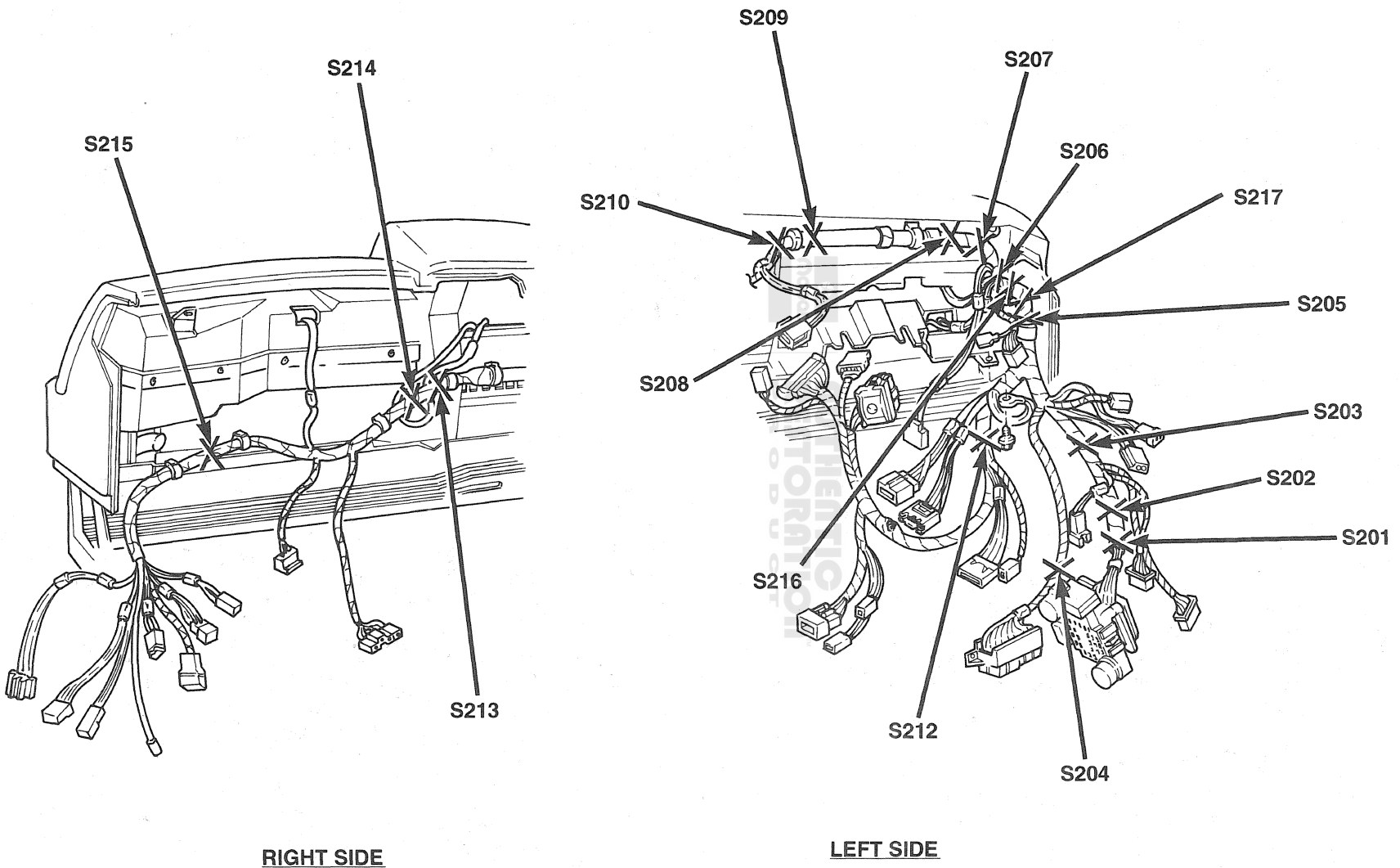
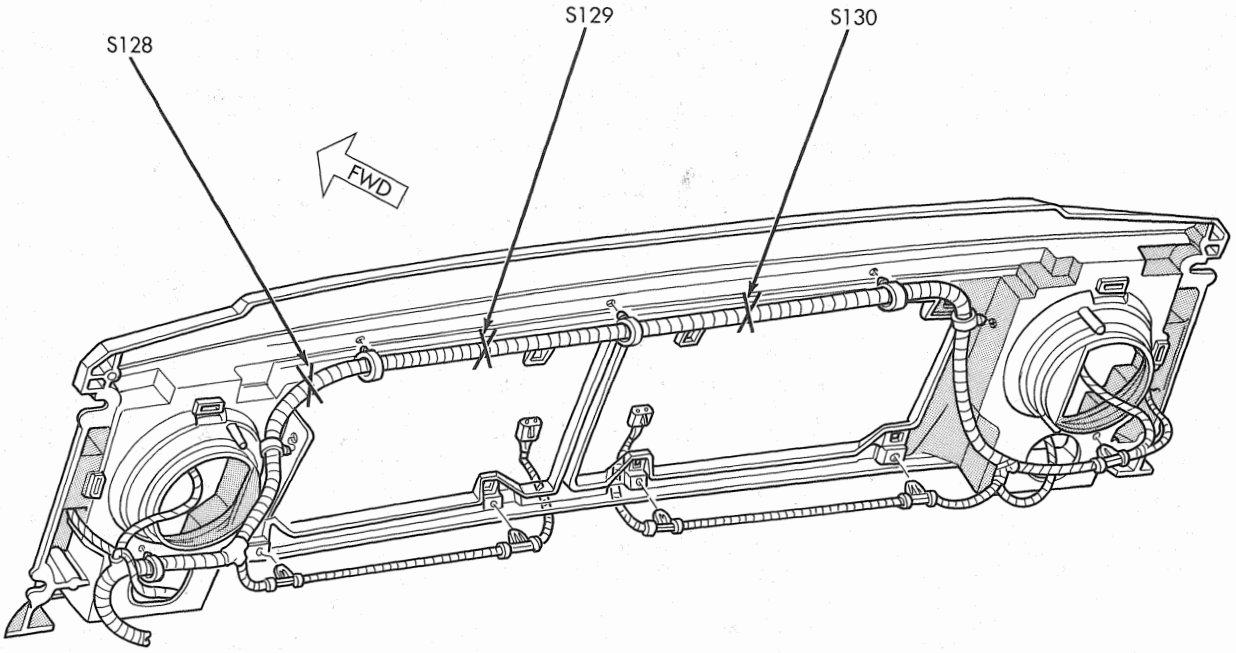


Fig. 4 Instrument Panel Wiring Splices

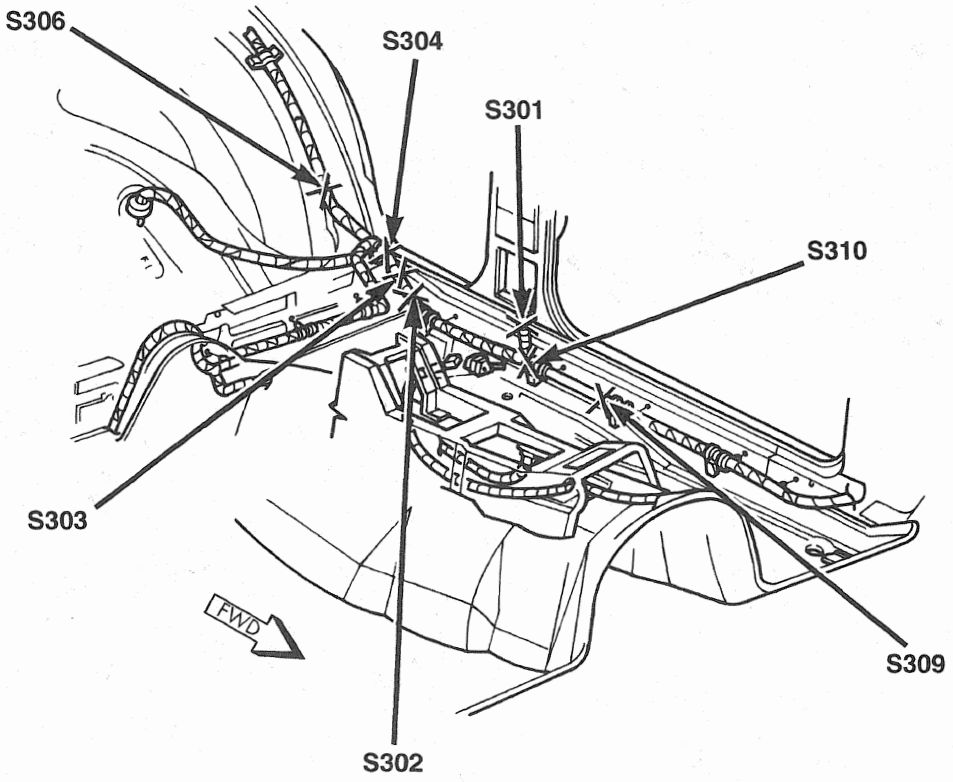
SCHEMATICS AND DIAGRAMS (Continued)



Mopar AUTHENTIC RESTORATION

J958W-130

Fig. 5 Front End Lighting Splices



80468d99

Fig. 6 Body Wiring Splices

SCHEMATICS AND DIAGRAMS (Continued)

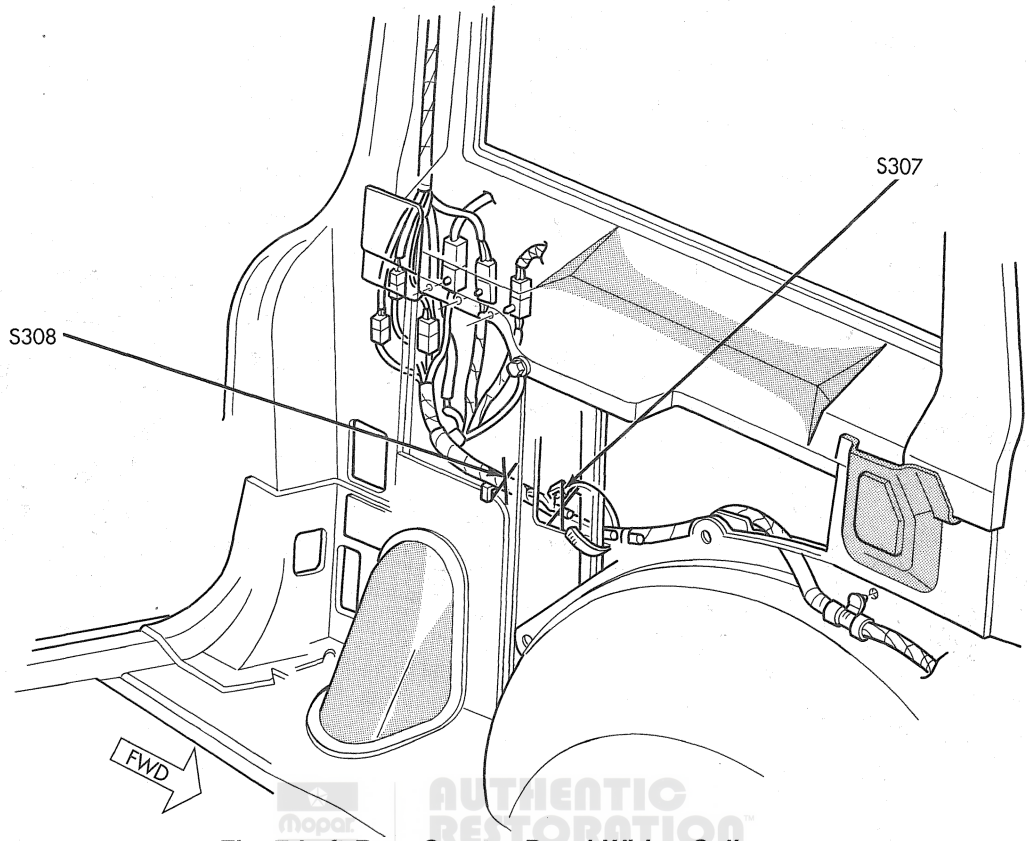


Fig. 7 Left Rear Quarter Panel Wiring Splices

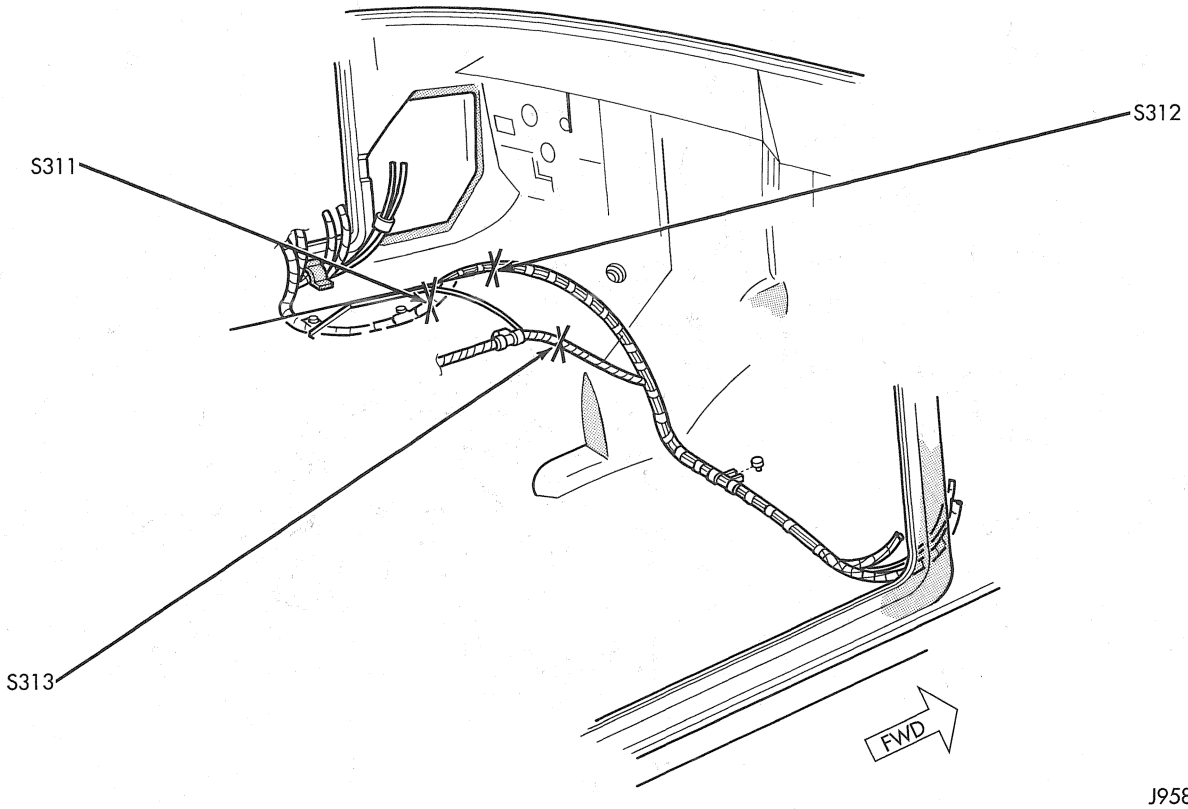


Fig. 8 Cross-Body Wiring Splices

SCHEMATICS AND DIAGRAMS (Continued)

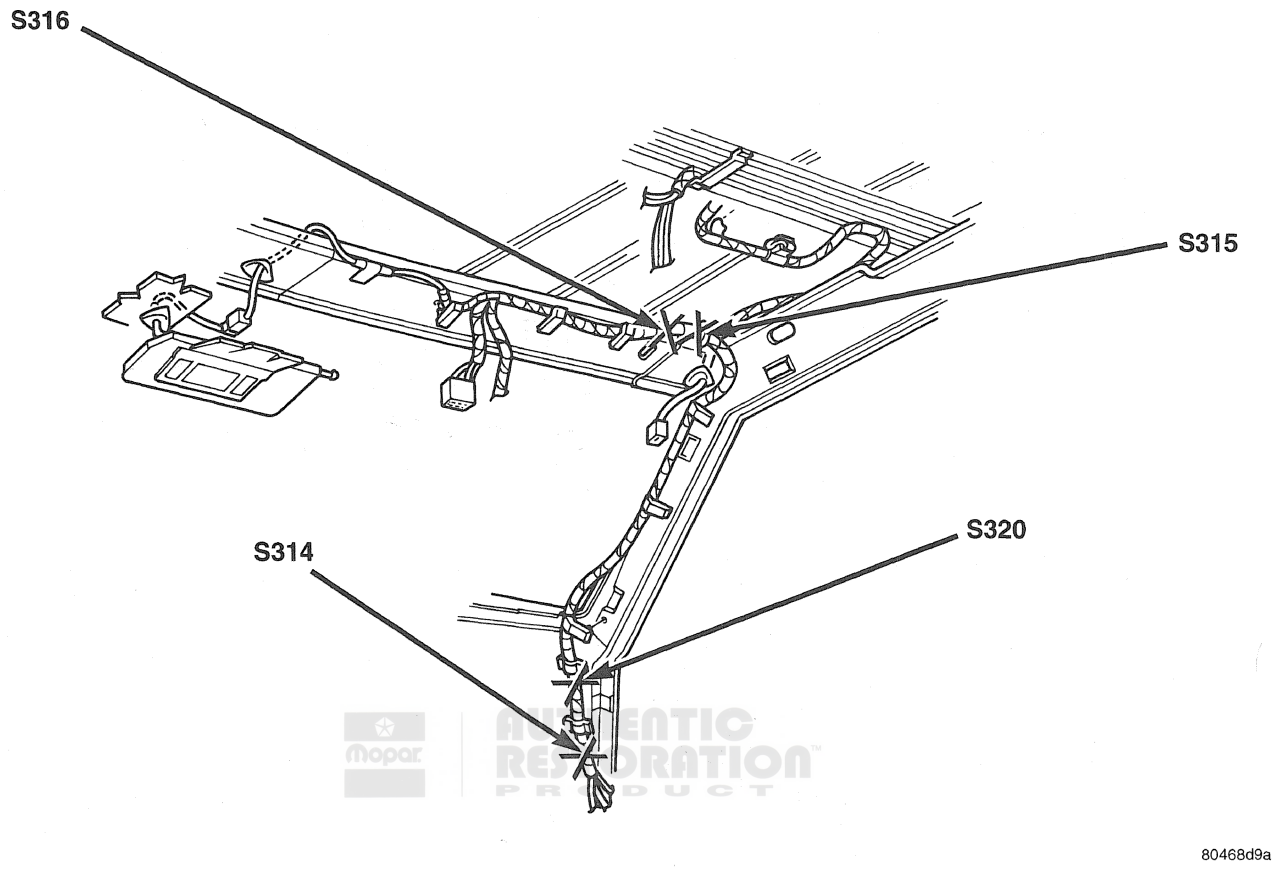


Fig. 9 Roof Wiring Splices

SCHEMATICS AND DIAGRAMS (Continued)

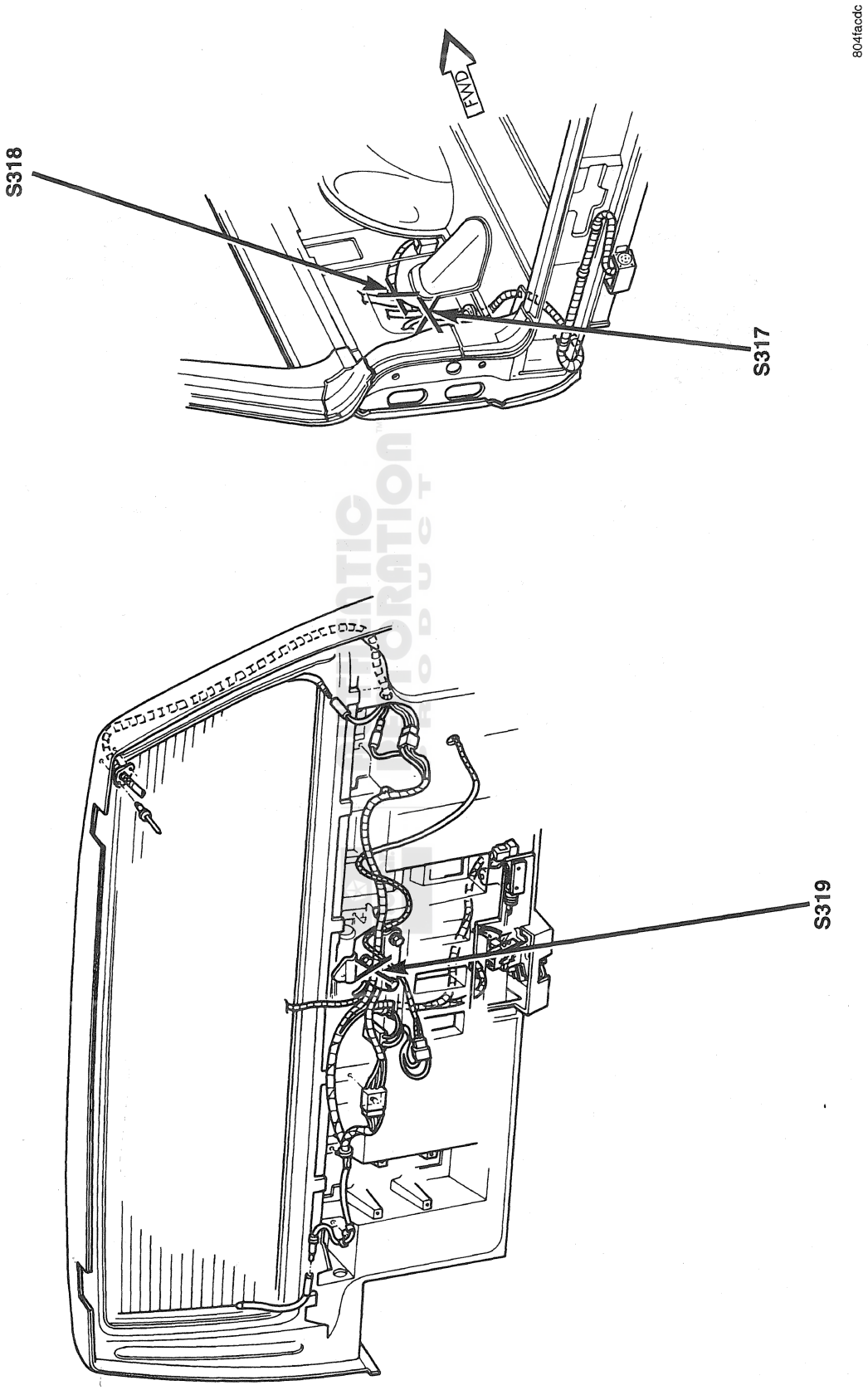


Fig. 10 Liftgate and Trailer Tow Wiring Splices

WIRING DIAGRAMS

CONTENTS

	page		page
8W-01 GENERAL INFORMATION	8W-01-1	8W-47 AUDIO SYSTEM	8W-47-1
8W-02 COMPONENT INDEX	8W-02-1	8W-48 REAR WINDOW DEFOGGER	8W-48-1
8W-10 FUSE/FUSE BLOCK	8W-10-1	8W-50 FRONT LIGHTING	8W-50-1
8W-11 POWER DISTRIBUTION	8W-11-1	8W-51 REAR LIGHTING	8W-51-1
8W-15 GROUND DISTRIBUTION	8W-15-1	8W-52 TURN SIGNALS	8W-52-1
8W-20 CHARGING SYSTEM	8W-20-1	8W-53 WIPERS	8W-53-1
8W-21 STARTING SYSTEM	8W-2-11	8W-54 TRAILER TOW	8W-54-1
8W-30 FUEL/IGNITION SYSTEMS	8W-30-1	8W-60 POWER WINDOWS	8W-60-1
8W-31 TRANSMISSION CONTROL SYSTEM	8W-31-1	8W-61 POWER DOOR LOCKS	8W-61-1
8W-33 VEHICLE SPEED CONTROL	8W-33-1	8W-62 POWER MIRRORS	8W-62-1
8W-35 ALL-WHEEL ANTI-LOCK BRAKES	8W-35-1	8W-63 POWER SEAT	8W-63-1
8W-40 INSTRUMENT CLUSTER	8W-40-1	8W-70 SPLICE INFORMATION	8W-70-1
8W-41 HORN/CIGAR LIGHTER	8W-41-1	8W-80 CONNECTOR PIN-OUTS	8W-80-1
8W-42 AIR CONDITIONING/HEATER	8W-42-1	8W-90 CONNECTOR LOCATIONS	8W-90-1
8W-44 INTERIOR LIGHTING	8W-44-1	8W-95 SPLICE LOCATIONS	8W-95-1

8W-01 GENERAL INFORMATION

INDEX

page

DESCRIPTION AND OPERATION
CONNECTOR/GROUND LOCATIONS 1
HOW TO USE THIS GROUP 1
SECTION IDENTIFICATION 1
SPLICE LOCATIONS 1

DESCRIPTION AND OPERATION

HOW TO USE THIS GROUP

The purpose of this group is to show the electrical circuits in a clear, simple fashion and to make troubleshooting easier. Components that work together are shown together. All electrical components used in a specific system are shown on one diagram. The feed for a system is shown at the top of the page. All wires, connectors, splices, and components are shown in the flow of current to the bottom of the page. Wiring which is not part of the circuit represented is referenced to another page/section, where the complete circuit is shown. In addition, all switches, components, and modules are shown in the **at rest position with the doors closed and the key removed from the ignition.**

If a component is part of several different circuits, it is shown in the diagram for each. For example, the headlamp switch is the main part of the exterior lighting, but it also affects the interior lighting and the chime warning system. **It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.**

SECTION IDENTIFICATION

Sections in Group 8W are organized by sub-systems. The sections contain circuit operation descriptions, helpful information, and system diagrams. The intention is to organize information by system, consistently from year to year.

CONNECTOR/GROUND LOCATIONS

Section 8W-90 contains connector/ground location illustrations. The illustrations contain the connector/ground number and component identification. Connector/ground location charts in Section 8W-90 reference the illustration number for components and connectors.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the number on the Diagram pages.

SPLICE LOCATIONS

Splice Location charts in Section 8W-70 show the entire splice, and provide references to other sections the splice serves.

Section 8W-95 contains illustrations that show the general location of the splices in each harness. The illustrations show the splice by number, and provide a written location.

8W-02 COMPONENT INDEX

GENERAL INFORMATION

INTRODUCTION

This section provides an alphabetical listing of all the components covered in group 8W. For information on system operation, refer to the appropriate section of the wiring diagrams.

Mopar AUTHENTIC RESTORATION PRODUCT

COMPONENT/SECTION INDEX

Component	Section
A/C Compressor	8W-42
ABS Main Relay	8W-35
ABS Pump Motor Relay	8W-35
ABS Warning Lamp	8W-35
Automatic Shut Down (ASD) Relay	8W-30
Back-Up Lamps	8W-51
Battery Temperature Sensor	8W-30
Blower Motor	8W-42
Brake Warning Lamp	8W-40
Buzzer Module	8W-44
Camshaft Position Sensor	8W-30
Cargo Lamp	8W-44
CCD Bus	8W-30, 35
Center High Mounted Stop Lamps (CHMSL)	8W-51
Charging System	8W-20
Cigar Lighter	8W-41
Combination Flasher	8W-52
Controller Anti-Lock Brake	8W-35
Courtesy Lamp	8W-44
Crankshaft Position Sensor	8W-30
Data Link Connector	8W-30
Dome/Reading Lamps	8W-44
Engine Coolant Temperature Warning Lamp	8W-40
Engine Coolant Temperature Gauge	8W-40
Engine Coolant Temperature Sensor	8W-30
Engine Starter Motor	8W-21
Evap/Purge Solenoid	8W-30
Fog Lamps	8W-50
Four-Wheel Drive (4WD) Switch	8W-31
Fuel Gauge	8W-40
Fuel Injectors	8W-30
Fuel Pump Module	8W-30
Fuel Pump Relay	8W-30
Fuse/Fuse Block	8W-10
G-Switch	8W-35
Generator	8W-20
Generator Lamp	8W-40
Glove Box Lamp and Switch	8W-44
Hazard Flashers	8W-52
Headlamp Delay Module	8W-50
Headlamps	8W-50
Heated Oxygen Sensors	8W-30
High Beam Indicator Lamp	8W-40
High Beam Relay	8W-50
Horn	8W-41
Hydraulic Control Unit	8W-35
Idle Air Control (IAC) Motor	8W-30
Ignition Coil	8W-30
Ignition Switch	8W-30
Instrument Cluster	8W-40
Instrument Panel Illumination Lamps	8W-44
Intake Air Temperature (IAT) Sensor	8W-30
Intermittent Wipers	8W-53
Key-In Switch/Halo Lamp	8W-44
Left Turn Relay	8W-54
License Lamp	8W-51
Low Washer Fluid Warning Lamp	8W-53
Malfunction Indicator Lamp (MIL)	8W-30, 40
Manifold Absolute Pressure (MAP) Sensor	8W-30
Oil Pressure Gauge	8W-40
Oil Pressure Warning Lamp	8W-40
Park Lamps	8W-50
Park Lamp Relay	8W-50
Park/Neutral Position Switch	8W-21, 31, 51
Power Distribution	8W-11
Power Door Lock Relay	8W-61
Power Door Unlock Relay	8W-61
Power Mirrors	8W-62
Power Seat	8W-63
Powertrain Control Module	8W-30
Radiator Fan Relay	8W-42
Radio	8W-47
Rear Window Defogger	8W-48
Rear Wipers	8W-53
Relay Bank	8W-11
Right Turn Relay	8W-54
Seat Belt Indicator Warning Lamp	8W-40
Speedometer	8W-40
Starting System	8W-21
Stop Lamp Relay	8W-54
Stop Lamps	8W-51
Tachometer	8W-40
Tail Lamps	8W-51
Throttle Position Sensor	8W-30
Trailer Tow Connector	8W-54
Transmission Control Module	8W-31
Turn Signal Indicator Lamps	8W-40
Underhood Lamp	8W-44
Vehicle Speed Control	8W-33
Vehicle Speed Sensor	8W-30, 33, 40

AUTENTICO REMOREMAR

8W-10 FUSE/FUSE BLOCK

DESCRIPTION AND OPERATION

INTRODUCTION

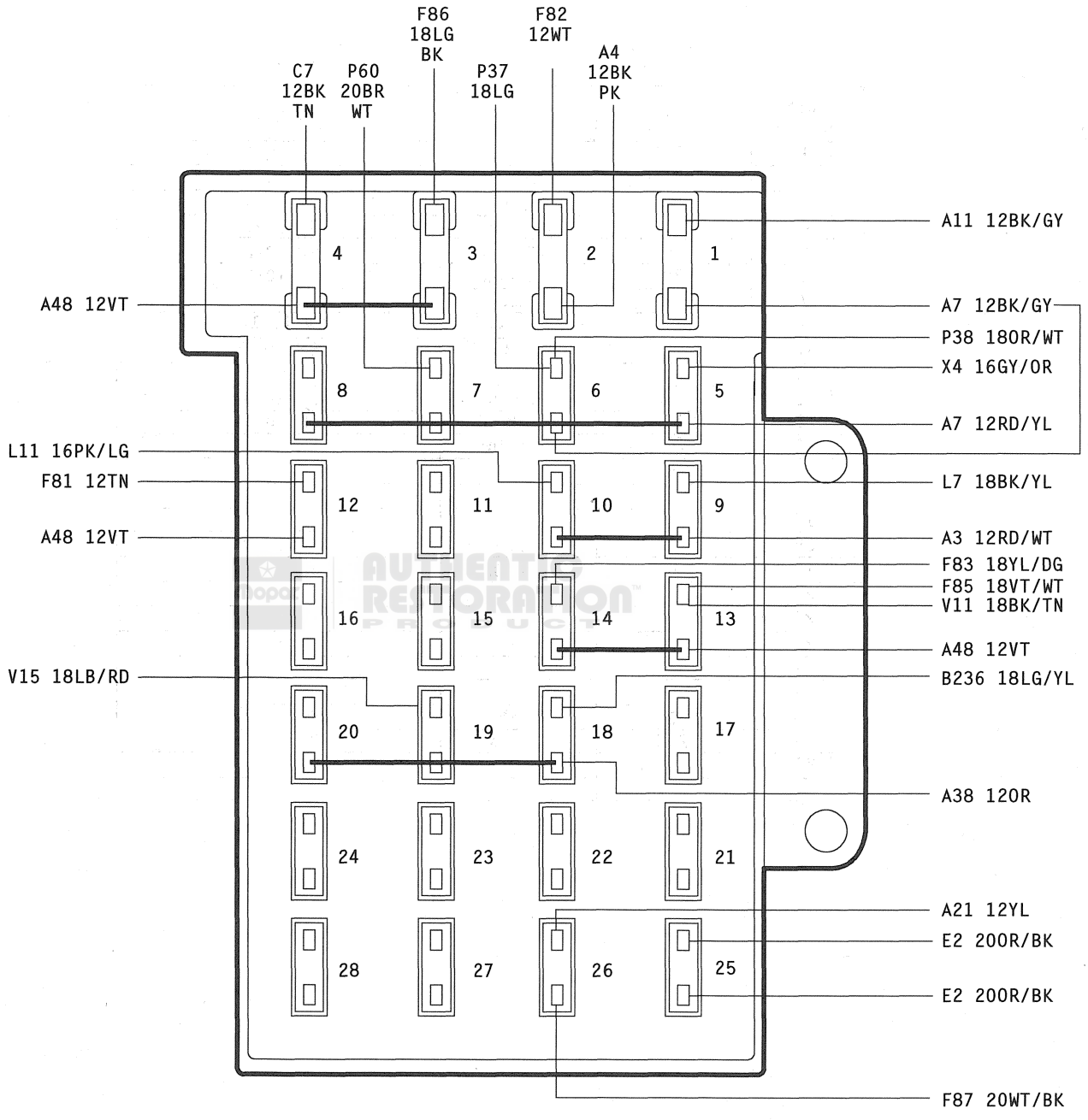
This section covers the Fuse Block and all circuits involved with it. For additional information on system operation, refer to the appropriate section of the wiring diagrams.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

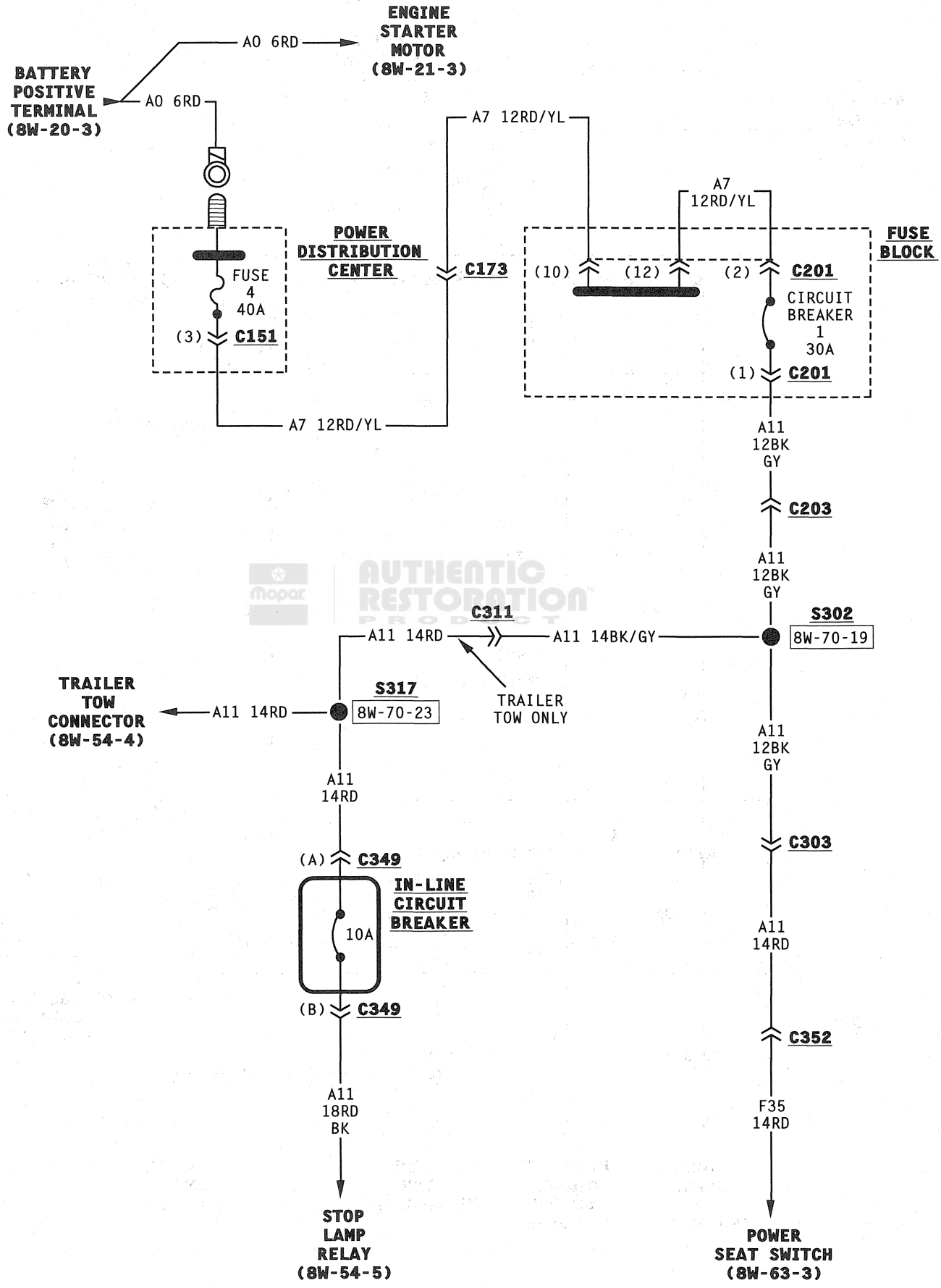
Component	Page
Circuit Breaker 1	8W-10-5
Circuit Breaker 3	8W-10-7
Fuse Block	8W-10-3
Fuse 2	8W-10-6
Fuse 4	8W-10-7
Fuse 5	8W-10-8
Fuse 6	8W-10-8
Fuse 7	8W-10-6
Fuse 9	8W-10-6, 10
Fuse 10	8W-10-6
Fuse 12	8W-10-9
Fuse 13	8W-10-9
Fuse 14	8W-10-9
Fuse 18	8W-10-9
Fuse 19	8W-10-9
Fuse 25	8W-10-10
Fuse 26	8W-10-11
Fuse 3 (PDC)	8W-10-6
Fuse 4 (PDC)	8W-10-5, 6, 8
Fuse 8 (PDC)	8W-10-7, 9, 11
Fuse 13 (PDC)	8W-10-6, 10
Headlamp Switch	8W-10-10
Ignition Switch	8W-10-7, 9, 11
In-Line Circuit Breaker	8W-10-5

Mopar AUTHENTIC RESTORATION PRODUCT

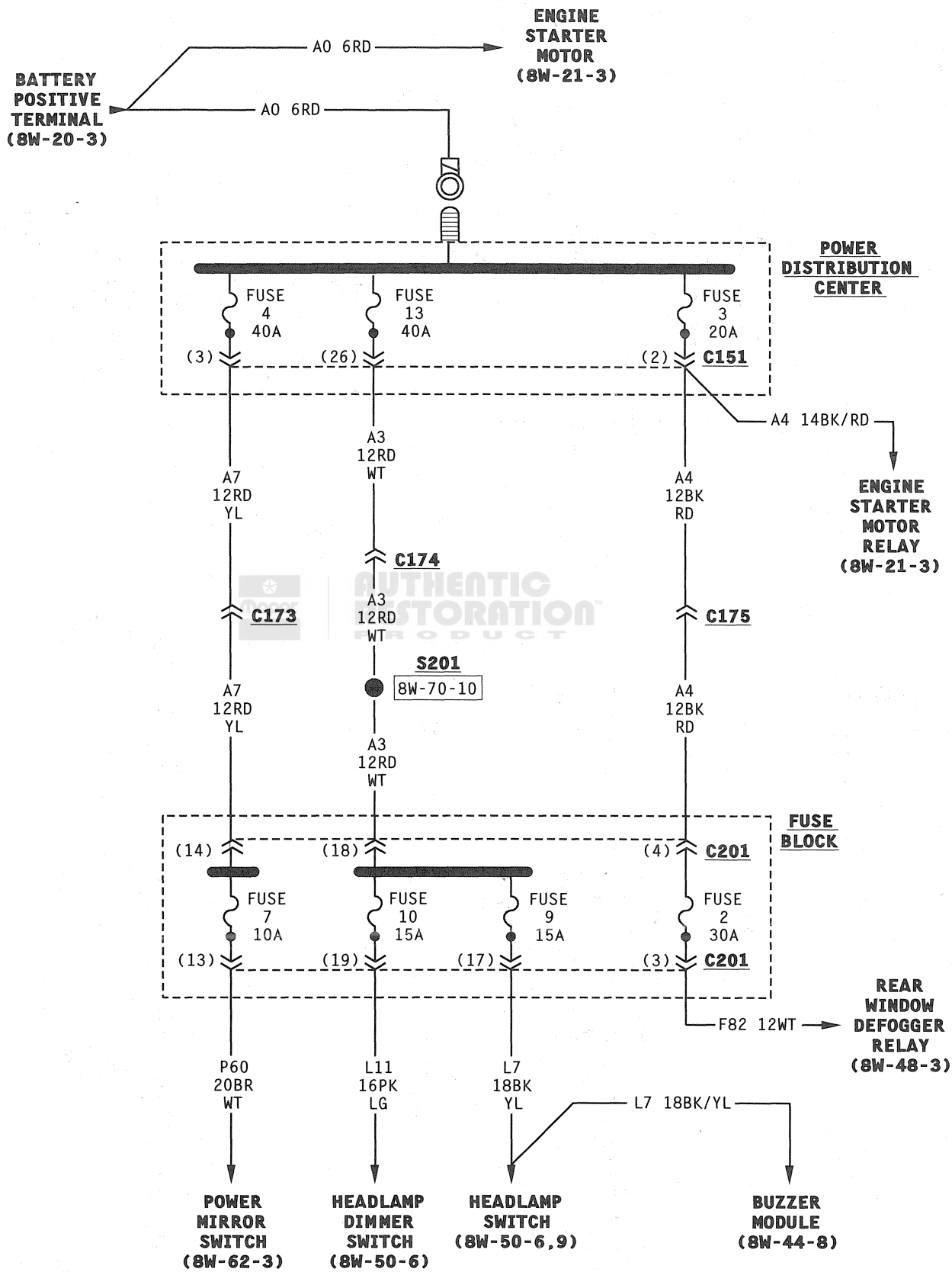

F86
18LG
BK
F82
12WT
C7
12BK
TN
P60
20BR
WT
P37
18LG
A4
12BK
PK
A11 12BK/GY
A48 12VT
A7 12BK/GY
P38 18OR/WT
X4 16GY/OR
A7 12RD/YL
L11 16PK/LG
F81 12TN
L7 18BK/YL
A48 12VT
A3 12RD/WT
F83 18YL/DG
F85 18VT/WT
V11 18BK/TN
A48 12VT
V15 18LB/RD
B236 18LG/YL
A38 12OR
A21 12YL
E2 20OR/BK
E2 20OR/BK
F87 20WT/BK
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

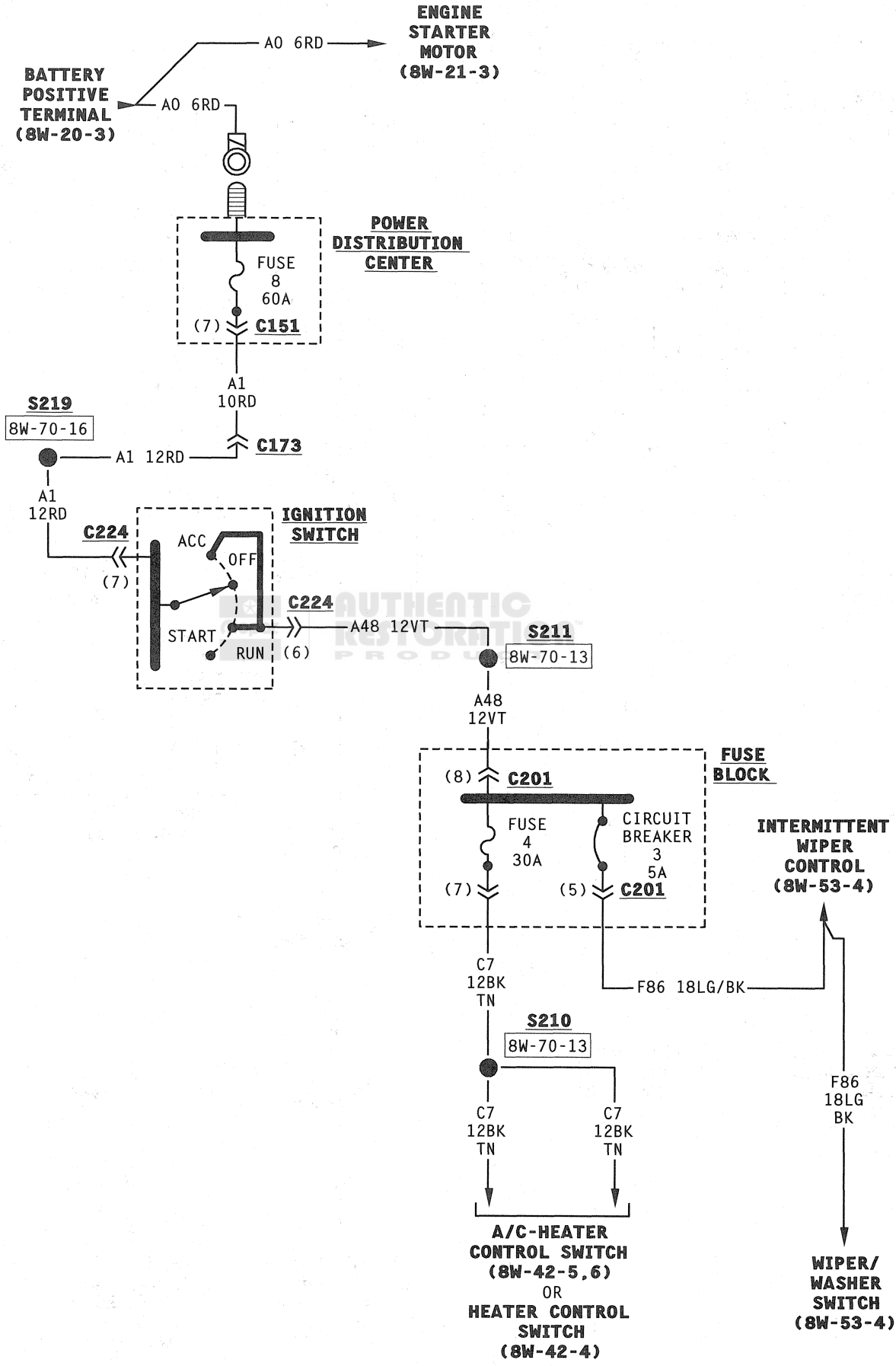
FUSE NUMBER	AMPS	COLOR	SHEET
1	30	C. B.	8W-10-5
2	30	GREEN	8W-10-6
3	5	C. B.	8W-10-7
4	30	GREEN	8W-10-7
5	20	YELLOW	8W-10-8
6	20	YELLOW	8W-10-8
7	10	RED	8W-10-6
9	15	LT. BLUE	8W-10-10
10	15	LT. BLUE	8W-10-6
11	–	–	–
12	30	GREEN	8W-10-9
13	15	LT. BLUE	8W-10-9
14	20	YELLOW	8W-10-9
15	–	–	–
16	–	–	–
17	–	–	–
18	2	GRAY	8W-10-9
19	20	YELLOW	8W-10-9
20	–	–	–
21	–	–	–
22	–	–	–
23	–	–	–
24	–	–	–
25	5	TAN	8W-10-10
26	7.5	BROWN	8W-10-11
27	–	–	–
28	–	–	–

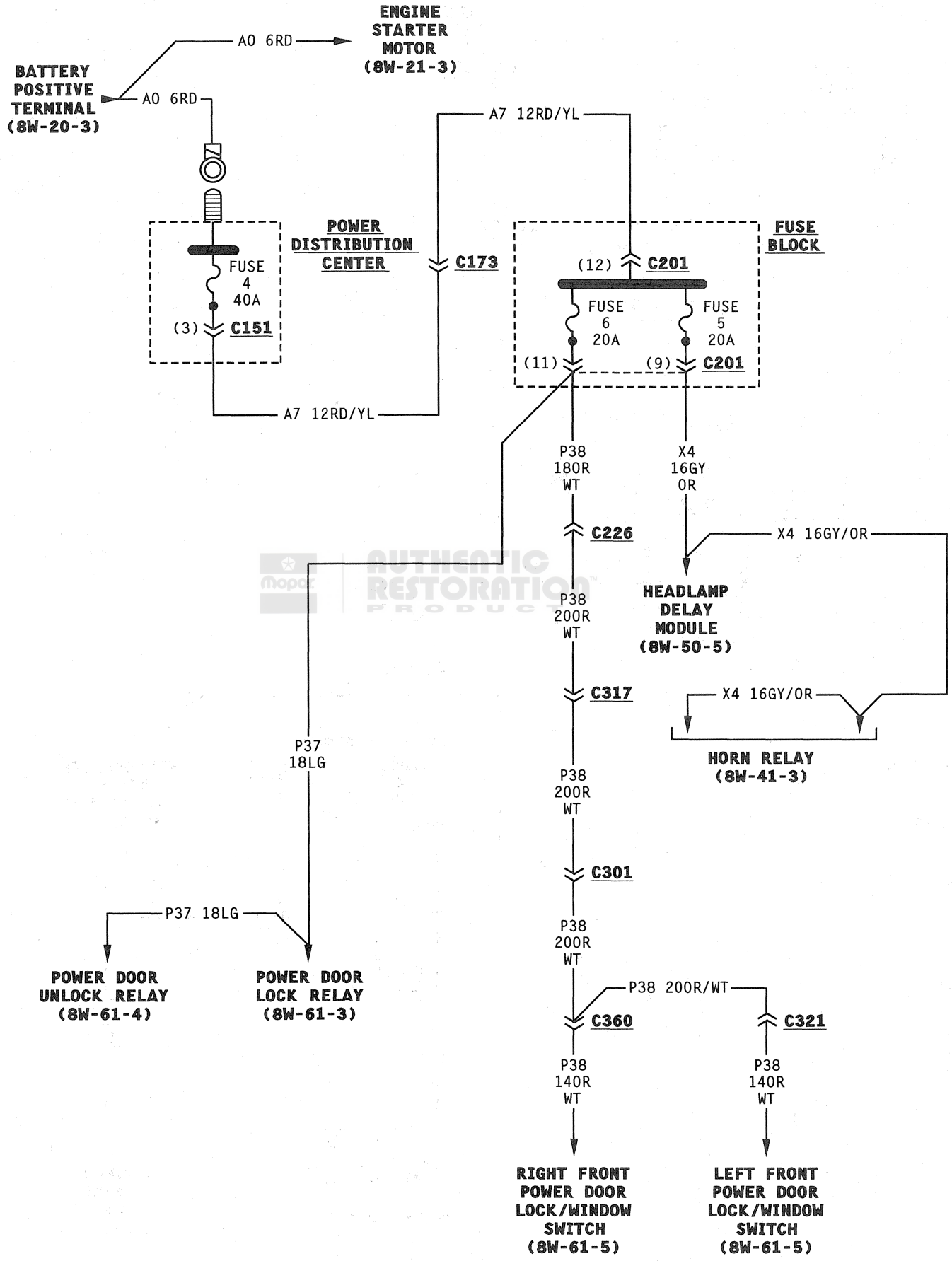
Mopar AUTHENTIC RESTORATION PRODUCT

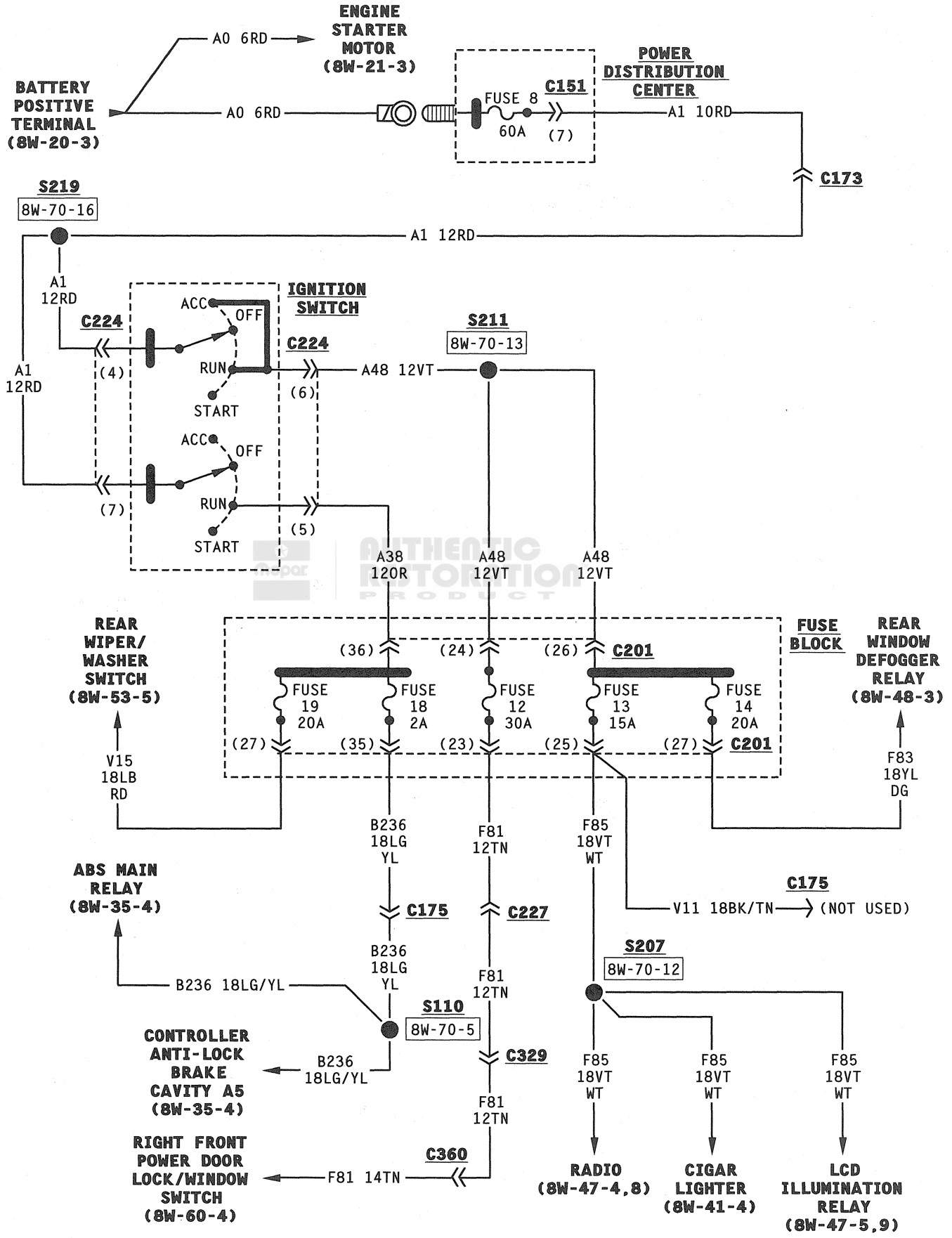


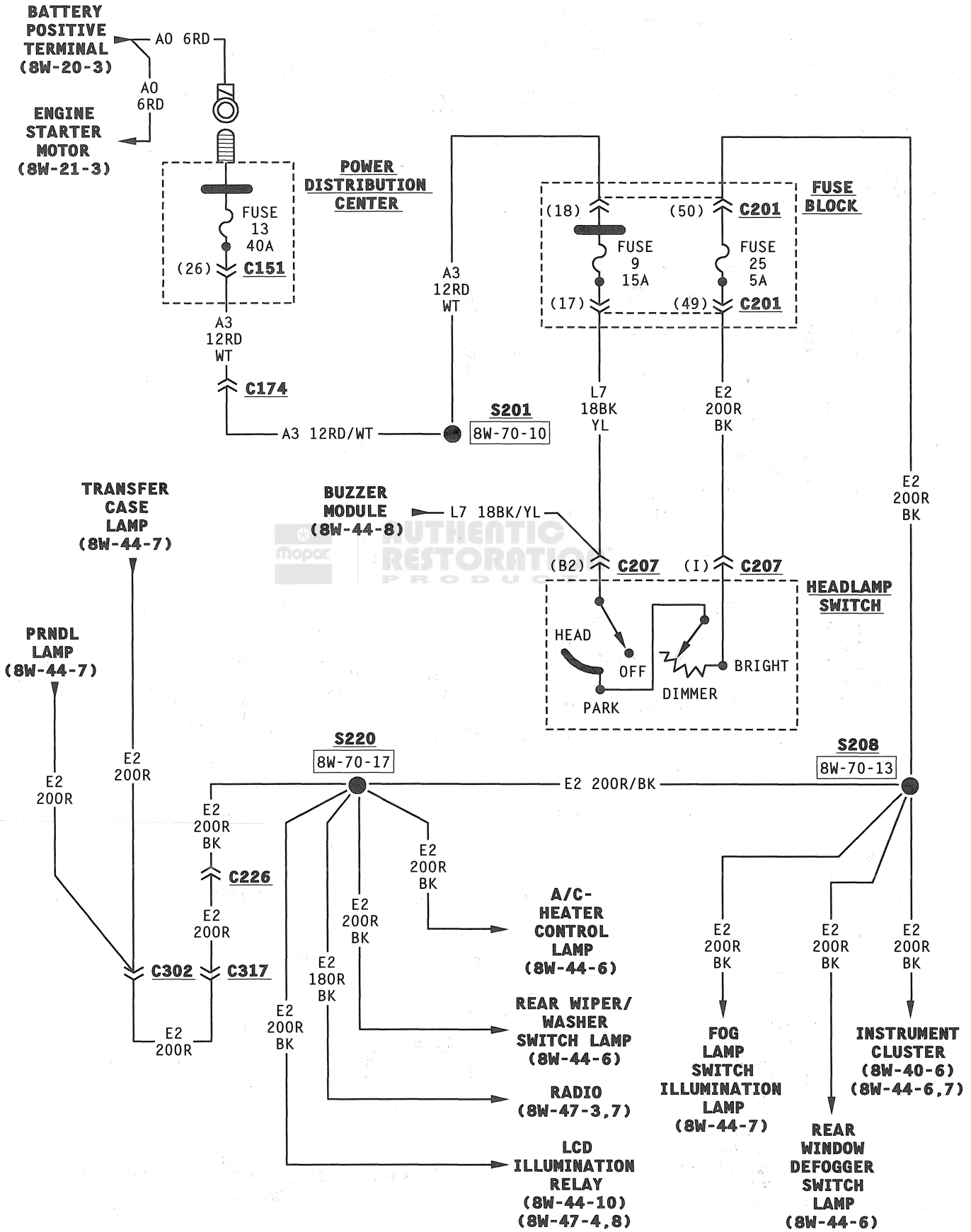
Mopar AUTHENTIC RESTORATION PRODUCT

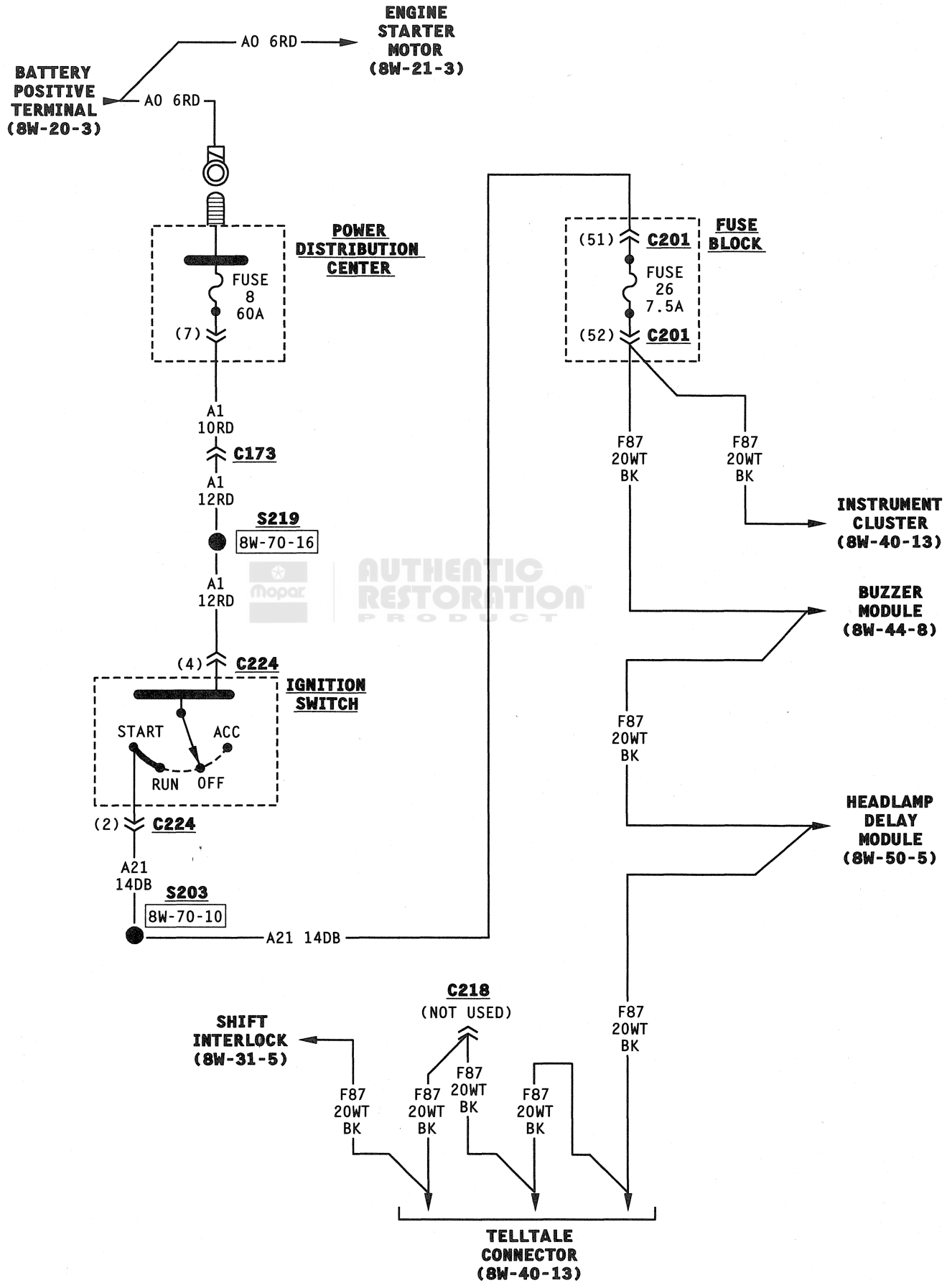

ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 4 40A
FUSE 13 40A
FUSE 3 20A
(3)
(26)
(2)
C151
A4 14BK/RD
ENGINE STARTER MOTOR RELAY (8W-21-3)
A7 12RD YL
A3 12RD WT
A4 12BK RD
C174
C173
A3 12RD WT
C175
S201
8W-70-10
A7 12RD YL
A4 12BK RD
A3 12RD WT
FUSE BLOCK
(14)
(18)
(4)
C201
FUSE 7 10A
FUSE 10 15A
FUSE 9 15A
FUSE 2 30A
(13)
(19)
(17)
(3)
C201
REAR WINDOW DEFOGGER RELAY (8W-48-3)
F82 12WT
P60 20BR WT
L11 16PK LG
L7 18BK YL
L7 18BK/YL
POWER MIRROR SWITCH (8W-62-3)
HEADLAMP DIMMER SWITCH (8W-50-6)
HEADLAMP SWITCH (8W-50-6,9)
BUZZER MODULE (8W-44-8)


ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
A1 10RD
S219
8W-70-16
A1 12RD
C173
A1 12RD
C224
IGNITION SWITCH
ACC
OFF
(7)
C224
START
RUN
(6)
A48 12VT
S211
8W-70-13
A48 12VT
FUSE BLOCK
(8) C201
FUSE 4 30A
CIRCUIT BREAKER 3 5A
(7)
(5) C201
INTERMITTENT WIPER CONTROL (8W-53-4)
C7 12BK TN
F86 18LG/BK
S210
8W-70-13
C7 12BK TN
C7 12BK TN
F86 18LG BK
A/C-HEATER CONTROL SWITCH (8W-42-5,6)
OR
HEATER CONTROL SWITCH (8W-42-4)
WIPER/ WASHER SWITCH (8W-53-4)


ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A7 12RD/YL
POWER DISTRIBUTION CENTER
C173
FUSE 4 40A
(3) C151
A7 12RD/YL
FUSE BLOCK
(12) C201
FUSE 6 20A
FUSE 5 20A
(11)
(9) C201
P38 18OR WT
X4 16GY OR
C226
X4 16GY/OR
HEADLAMP DELAY MODULE (8W-50-5)
P38 20OR WT
C317
X4 16GY/OR
HORN RELAY (8W-41-3)
P37 18LG
P38 20OR WT
C301
P38 20OR WT
P37 18LG
POWER DOOR UNLOCK RELAY (8W-61-4)
POWER DOOR LOCK RELAY (8W-61-3)
P38 20OR/WT
C360
C321
P38 14OR WT
P38 14OR WT
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-5)
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-5)


ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 8
60A
C151
(7)
POWER DISTRIBUTION CENTER
A1 10RD
C173
S219
8W-70-16
A1 12RD
A1 12RD
IGNITION SWITCH
ACC
OFF
RUN
START
C224
(4)
C224
(6)
A48 12VT
S211
8W-70-13
A1 12RD
ACC
OFF
RUN
START
(7)
(5)
A38 12OR
A48 12VT
A48 12VT
REAR WIPER/ WASHER SWITCH (8W-53-5)
(36)
(24)
(26)
C201
FUSE BLOCK
REAR WINDOW DEFOGGER RELAY (8W-48-3)
FUSE 19 20A
FUSE 18 2A
FUSE 12 30A
FUSE 13 15A
FUSE 14 20A
(27)
(35)
(23)
(25)
(27)
C201
V15 18LB RD
F83 18YL DG
B236 18LG YL
F81 12TN
F85 18VT WT
ABS MAIN RELAY (8W-35-4)
C175
C227
C175
V11 18BK/TN
(NOT USED)
B236 18LG YL
S207
8W-70-12
B236 18LG/YL
S110
8W-70-5
F81 12TN
CONTROLLER ANTI-LOCK BRAKE CAVITY A5 (8W-35-4)
B236 18LG/YL
C329
F85 18VT WT
F85 18VT WT
F85 18VT WT
F81 12TN
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-60-4)
C360
F81 14TN
RADIO (8W-47-4,8)
CIGAR LIGHTER (8W-41-4)
LCD ILLUMINATION RELAY (8W-47-5,9)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
A3 12RD WT
C174
A3 12RD/WT
S201
8W-70-10
A3 12RD WT
FUSE BLOCK
(18)
(50) C201
FUSE 9 15A
FUSE 25 5A
(17)
(49) C201
L7 18BK YL
E2 200R BK
E2 200R BK
TRANSFER CASE LAMP (8W-44-7)
BUZZER MODULE (8W-44-8)
L7 18BK/YL
(B2) C207
(I) C207
HEADLAMP SWITCH
HEAD
OFF
BRIGHT
PARK
DIMMER
PRNDL LAMP (8W-44-7)
E2 200R
E2 200R
S220
8W-70-17
S208
8W-70-13
E2 200R/BK
E2 200R BK
C226
E2 200R
C302
C317
E2 200R
E2 200R BK
E2 200R BK
E2 200R BK
E2 180R BK
E2 200R BK
A/C-HEATER CONTROL LAMP (8W-44-6)
REAR WIPER/WASHER SWITCH LAMP (8W-44-6)
RADIO (8W-47-3,7)
LCD ILLUMINATION RELAY (8W-44-10) (8W-47-4,8)
E2 200R BK
E2 200R BK
E2 200R BK
FOG LAMP SWITCH ILLUMINATION LAMP (8W-44-7)
REAR WINDOW DEFOGGER SWITCH LAMP (8W-44-6)
INSTRUMENT CLUSTER (8W-40-6) (8W-44-6,7)



Mopar AUTHENTIC RESTORATION PRODUCT

8W-11 POWER DISTRIBUTION

DESCRIPTION AND OPERATION

INTRODUCTION

This section covers the power distribution center and all circuits involved with it. For additional information on system operation, refer to the appropriate section of the wiring diagrams.

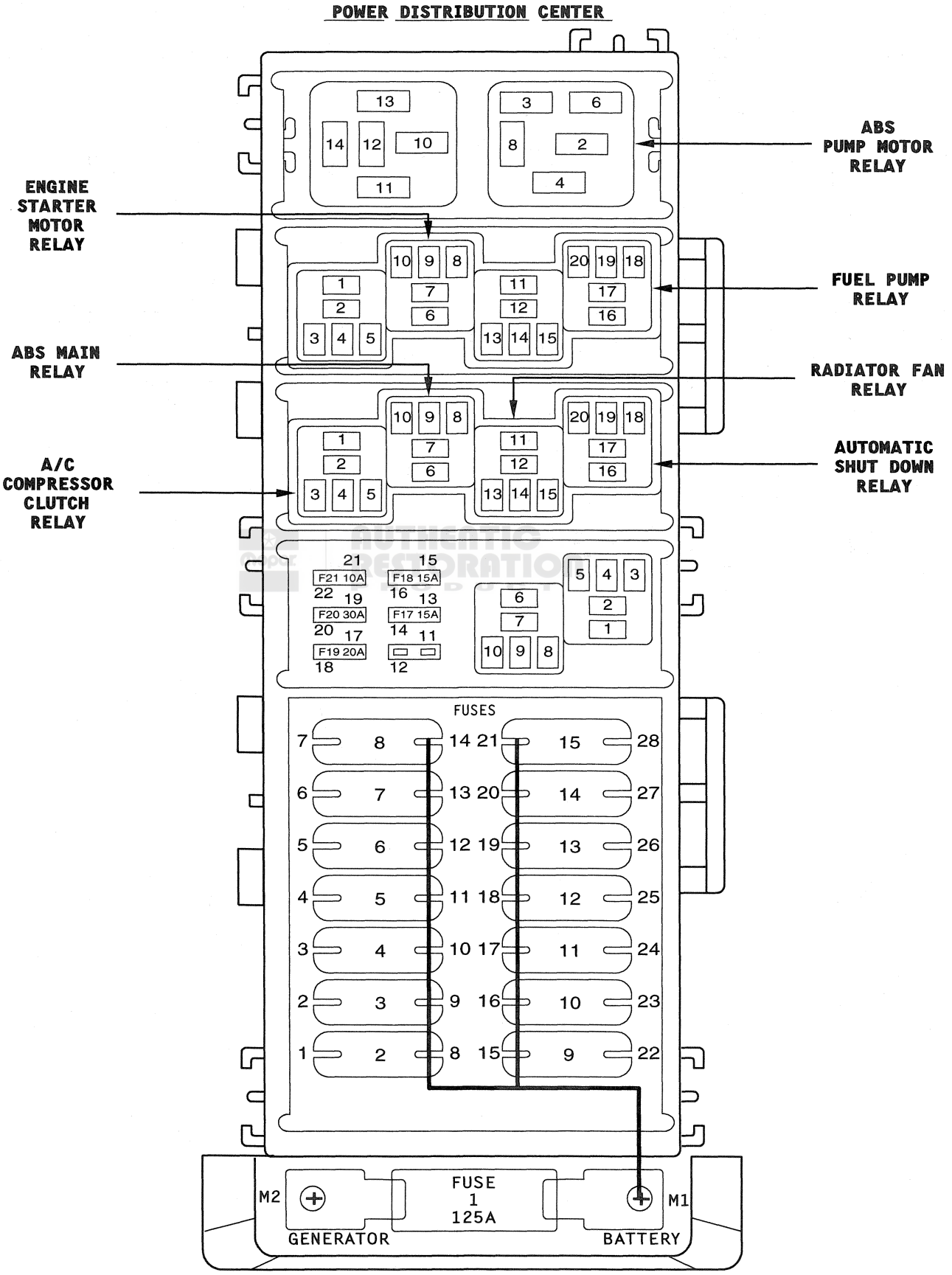
Mopar AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

Component	Page
ABS Main Relay	8W-11-3, 7
ABS Pump Motor Relay	8W-11-3, 8
A/C Compressor Clutch Relay	8W-11-3, 13
Automatic Shut Down Relay	8W-11-3, 12
Battery	8W-11-6 through 15
Circuit Breaker 1	8W-11-8
Engine Starter Motor Relay	8W-11-3, 6
Fuel Pump Relay	8W-11-3, 9
Fuse 2	8W-11-6
Fuse 5	8W-11-8
Fuse 6	8W-11-8
Fuse 9	8W-11-15
Fuse 18	8W-11-7
Fuse 1 (PDC)	8W-11-8
Fuse 2 (PDC)	8W-11-14
Fuse 3 (PDC)	8W-11-6
Fuse 4 (PDC)	8W-11-8
Fuse 5 (PDC)	8W-11-8

Component	Page
Fuse 6 (PDC)	8W-11-9
Fuse 8 (PDC)	8W-11-6, 7, 9, 10, 11
Fuse 10 (PDC)	8W-11-13
Fuse 13 (PDC)	8W-11-15
Fuse 14 (PDC)	8W-11-7
Fuse 15 (PDC)	8W-11-13
Fuse 17 (PDC)	8W-11-14
Fuse 18 (PDC)	8W-11-11
Fuse 19 (PDC)	8W-11-15
Fuse 20 (PDC)	8W-11-12
Fuse 21 (PDC)	8W-11-10
Ignition Switch	8W-11-6, 7, 9, 10, 11
PDC Application Chart	8W-11-4
PDC Face Illustration	8W-11-3
PDC Relay Chart	8W-11-5
Radiator Fan Relay	8W-11-3, 13
Relay Bank Face Illustration	8W-11-16
Relay Bank Relay Chart	8W-11-16, 17

Mopar AUTHENTIC RESTORATION PRODUCT


POWER DISTRIBUTION CENTER
ENGINE STARTER MOTOR RELAY
ABS MAIN RELAY
A/C COMPRESSOR CLUTCH RELAY
ABS PUMP MOTOR RELAY
FUEL PUMP RELAY
RADIATOR FAN RELAY
AUTOMATIC SHUT DOWN RELAY
F21 10A
F20 30A
F19 20A
F18 15A
F17 15A
FUSES
FUSE 1 125A
M2
M1
GENERATOR
BATTERY

FUSES

FUSE NO.	AMPS	CIRCUIT	FUNCTION
1	125	A0 6RD	B(+)
2	20	L9 18BK/WT	FUSED B(+)
3	40	A4 12BK/RD	FUSED B(+)
		A4 14BK/RD	FUSED B(+)
4	40	A7 12RD/YL	FUSED B(+)
5	40	A10 12RD/DG	FUSED B(+)
6	30	A14 14RD	FUSED B(+)
7	–	–	–
8	60	A1 10RD	FUSED B(+)
9	–	–	–
10	30	A17 14RD/BK	FUSED B(+)
11	–	–	–
12	–	–	–
13	40	A3 12RD/WT	FUSED B(+)
14	30	A20 14RD/DG	FUSED B(+)
15	30	F141 14LG/RD	FUSED B(+)
16	–	–	–
17	15	F39 18PK/LG	FUSED B(+)
		F39 18PK/LG	FUSED B(+)
18	15	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
19	20	A6 18RD/BK	FUSED B(+)
		A6 18RD/BK	FUSED B(+)
20	30	A18 14RD/BK	FUSED B(+)
21	10	T17 18YL	FUSED IGNITION FEED (RUN/START)

RELAYS

A/C COMPRESSOR CLUTCH RELAY

CAVITY	CIRCUIT	FUNCTION
B1	A17 14RD/BK	FUSED B(+)
B2	C3 14DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
B3	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B5	C13 20DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL

ABS MAIN RELAY

CAVITY	CIRCUIT	FUNCTION
B6	B235 14GY/YL	ABS MAIN RELAY OUTPUT
	B235 14GY/YL	ABS MAIN RELAY OUTPUT
B7	A20 14RD/DG	FUSED B(+)
B8	B236 18LG/YL	FUSED IGNITION FEED (RUN/START)
B9	Z12 12BK/TN	GROUND
B10	B207 18PK	ABS MAIN RELAY CONTROL

RADIATOR FAN RELAY

CAVITY	CIRCUIT	FUNCTION
B11	F141 14LG/RD	FUSED B(+)
B12	C25 14LG	RADIATOR FAN RELAY OUTPUT
B13	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B15	C27 20DB/PK	RADIATOR FAN CONTROL RELAY

AUTOMATIC SHUT DOWN RELAY

CAVITY	CIRCUIT	FUNCTION
B16	A18 14RD/BK	FUSED B(+)
B17	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
B18	A21 12DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B20	K51 20DB/YL	AUTO SHUT DOWN RELAY CONTROL

ENGINE STARTER MOTOR RELAY

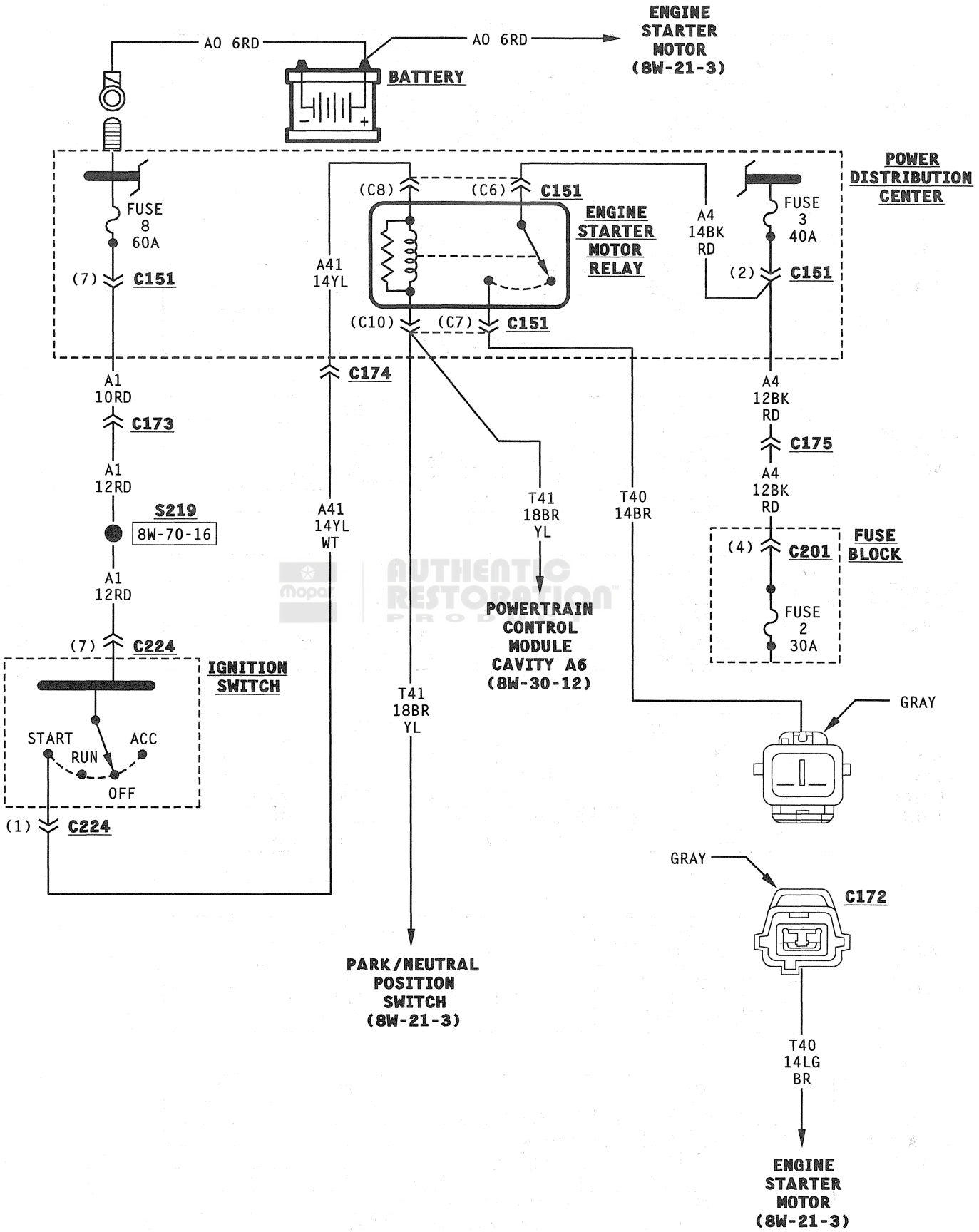
CAVITY	CIRCUIT	FUNCTION
C6	A4 14BK/RD	FUSED B(+)
C7	T40 14BR	START RELAY OUTPUT
C8	A41 14YL	FUSED IGNITION SWITCH OUTPUT (START)
C10	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE
	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE

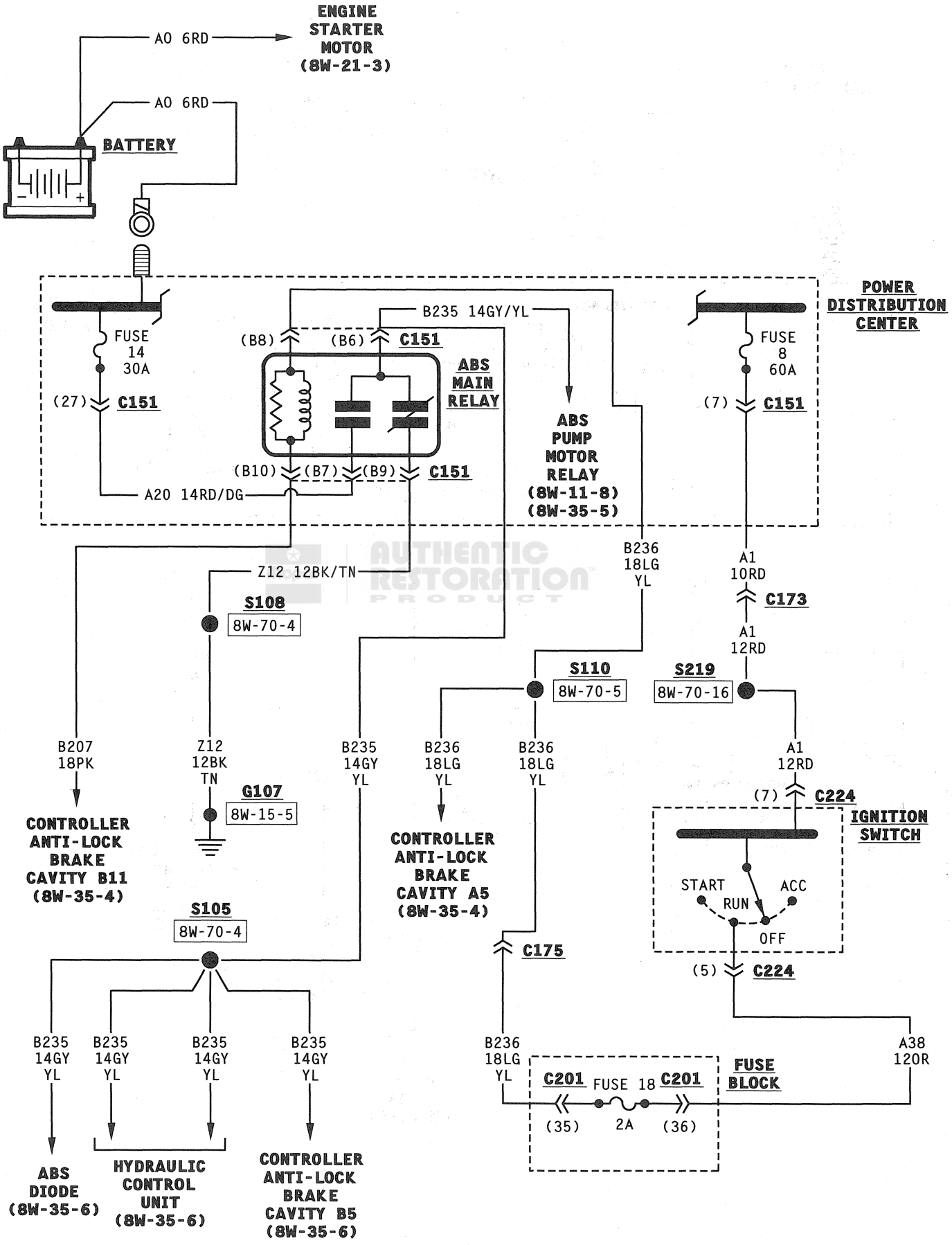
FUEL PUMP RELAY

CAVITY	CIRCUIT	FUNCTION
C16	A14 14RD	FUSED B(+)
C17	A141 14DG/WT	FUEL PUMP RELAY OUTPUT
C18	A21 12DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
C20	K31 20BR	FUEL PUMP RELAY CONTROL

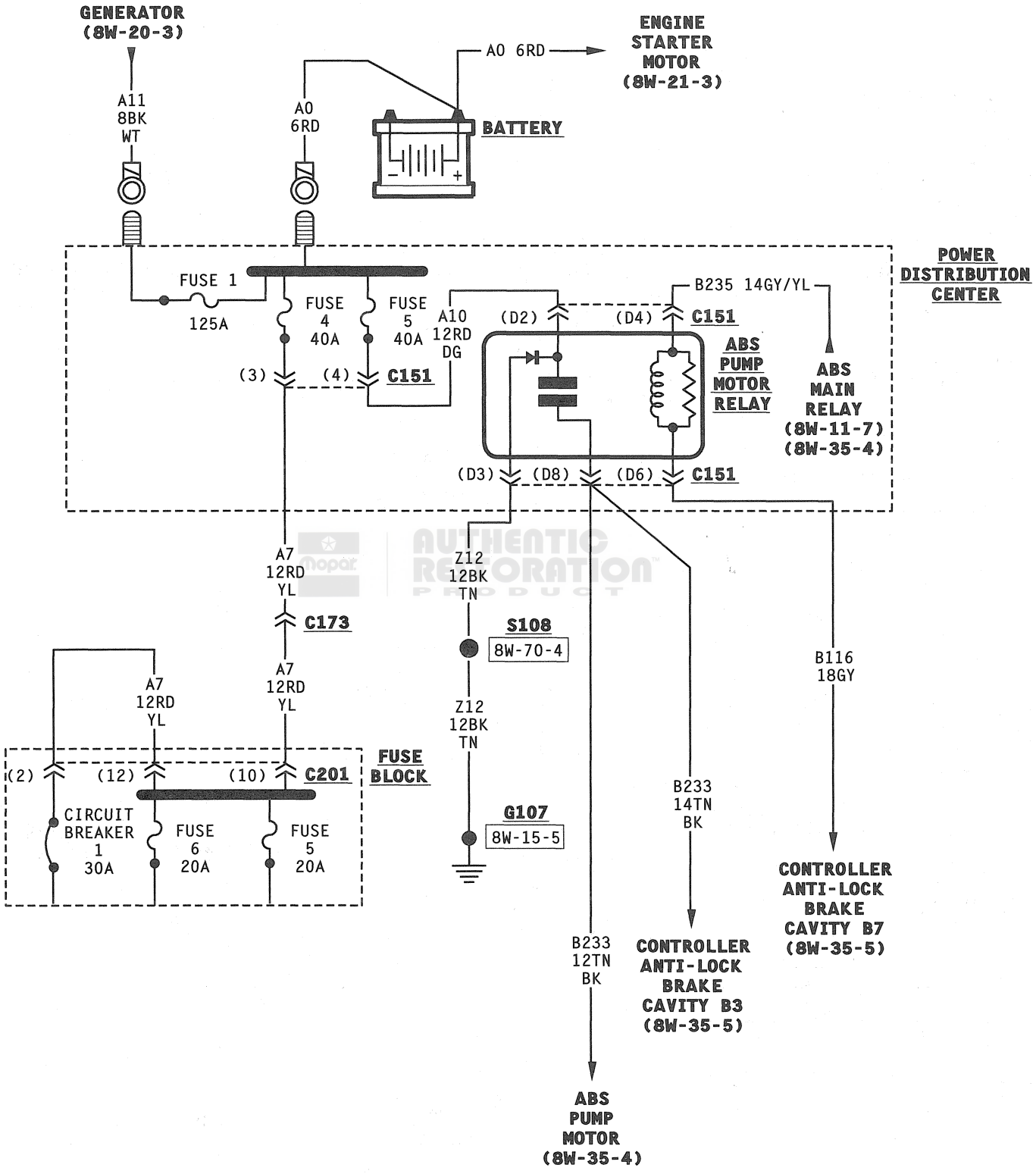
ABS PUMP MOTOR RELAY

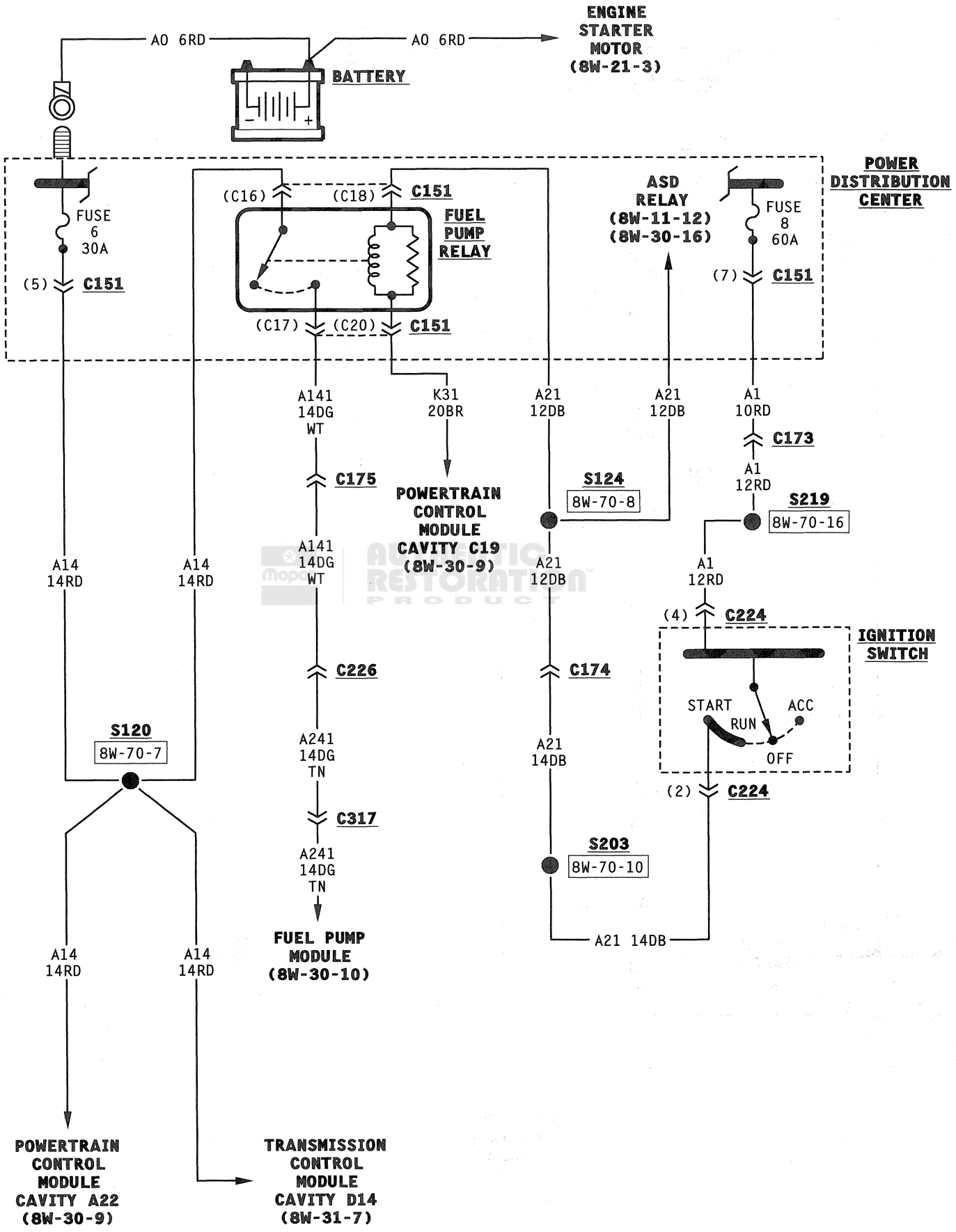
CAVITY	CIRCUIT	FUNCTION
D2	A10 12RD/DG	FUSED B(+)
D3	Z12 14BK/TN	GROUND
D4	B235 14GY/YL	ABS MAIN RELAY OUTPUT
D6	B116 18GY	ABS PUMP MOTOR RELAY CONTROL
D8	B233 12TN/BK	ABS PUMP MOTOR RELAY OUTPUT
	B233 14TN/BK	ABS PUMP MOTOR RELAY OUTPUT

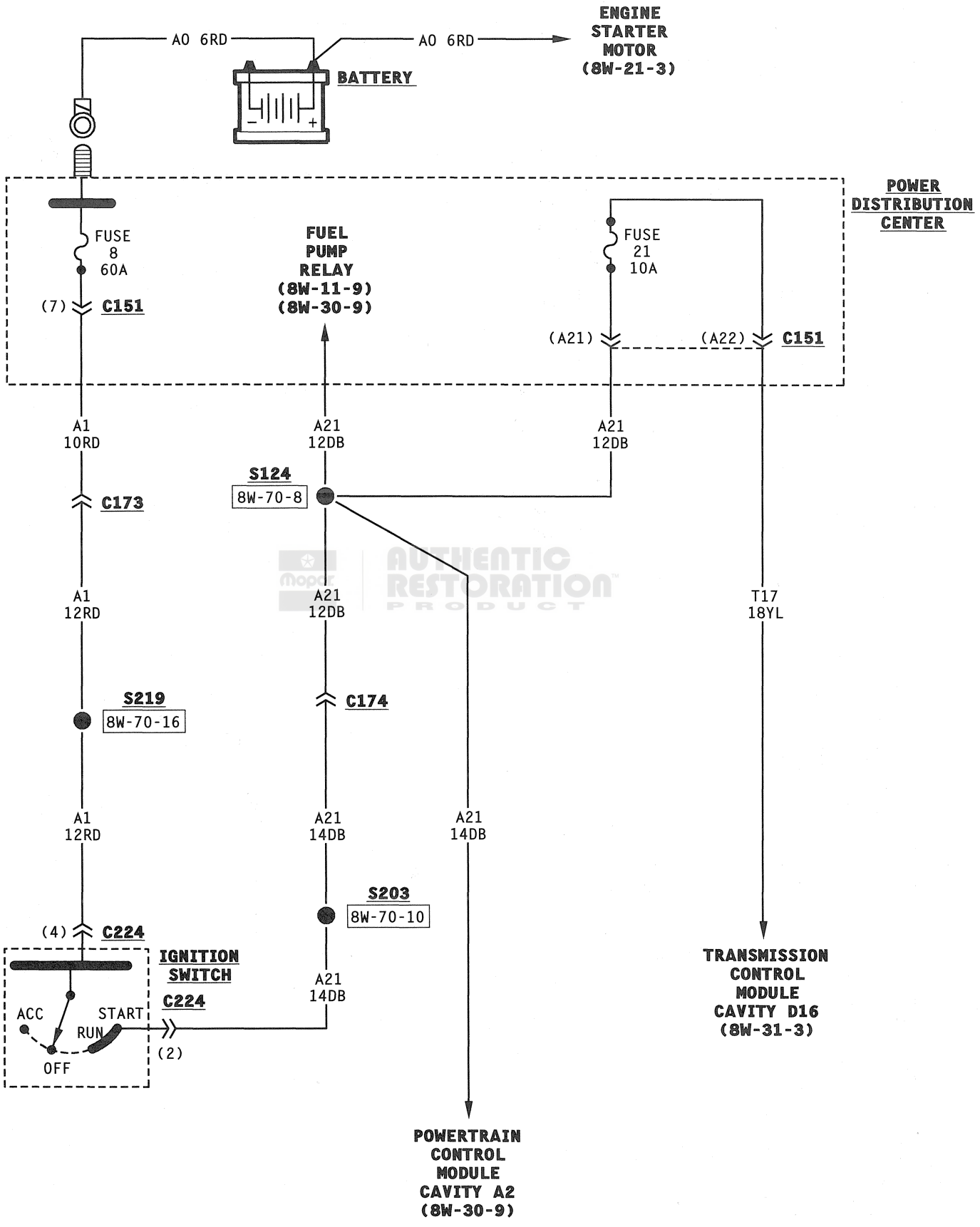

A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
(C8)
(C6) C151
ENGINE STARTER MOTOR RELAY
A41 14YL
A4 14BK RD
FUSE 3 40A
(2) C151
(C10)
(C7) C151
C174
A1 10RD
C173
A1 12RD
S219
8W-70-16
A1 12RD
(7) C224
IGNITION SWITCH
START
ACC
RUN
OFF
(1) C224
A41 14YL WT
T41 18BR YL
POWERTRAIN CONTROL MODULE CAVITY A6 (8W-30-12)
T40 14BR
A4 12BK RD
C175
A4 12BK RD
(4) C201
FUSE BLOCK
FUSE 2 30A
GRAY
GRAY
C172
T41 18BR YL
PARK/NEUTRAL POSITION SWITCH (8W-21-3)
T40 14LG BR
ENGINE STARTER MOTOR (8W-21-3)



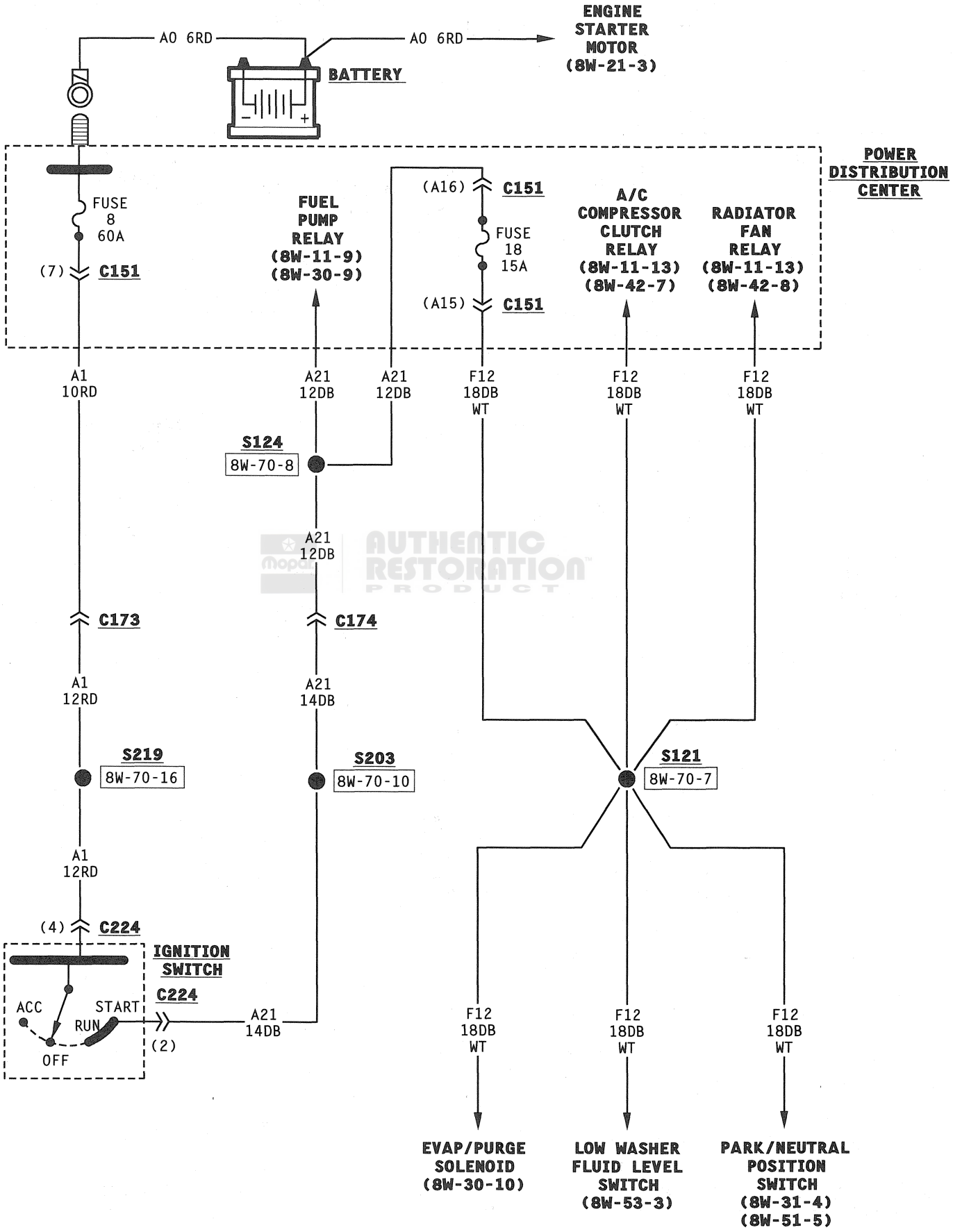
AUTHENTIC RESTORATION PRODUCT


GENERATOR
(8W-20-3)
A11
8BK
WT
A0
6RD
A0 6RD
ENGINE
STARTER
MOTOR
(8W-21-3)
BATTERY
POWER
DISTRIBUTION
CENTER
FUSE 1
125A
FUSE
4
40A
FUSE
5
40A
A10
12RD
DG
(2)
(D4)
C151
B235 14GY/YL
ABS
PUMP
MOTOR
RELAY
ABS
MAIN
RELAY
(8W-11-7)
(8W-35-4)
(3)
(4)
C151
(D3)
(D8)
(D6)
C151
A7
12RD
YL
C173
Z12
12BK
TN
S108
8W-70-4
B116
18GY
A7
12RD
YL
A7
12RD
YL
Z12
12BK
TN
(2)
(12)
(10)
C201
FUSE
BLOCK
CIRCUIT
BREAKER
1
30A
FUSE
6
20A
FUSE
5
20A
G107
8W-15-5
B233
14TN
BK
CONTROLLER
ANTI-LOCK
BRAKE
CAVITY B7
(8W-35-5)
B233
12TN
BK
CONTROLLER
ANTI-LOCK
BRAKE
CAVITY B3
(8W-35-5)
ABS
PUMP
MOTOR
(8W-35-4)

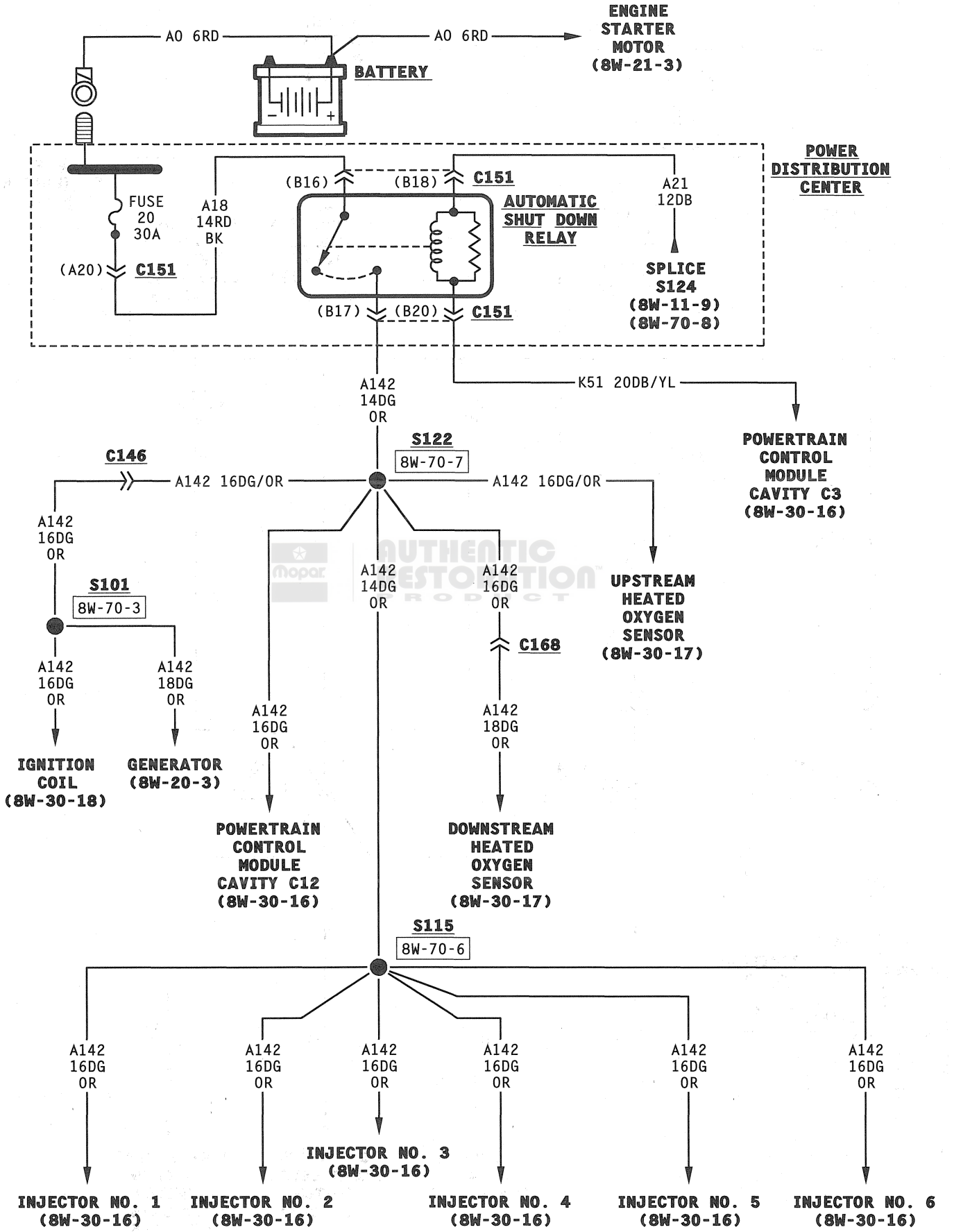

A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 6 30A
(5) C151
(C16)
(C18)
C151
FUEL PUMP RELAY
(C17)
(C20)
C151
ASD RELAY (8W-11-12) (8W-30-16)
FUSE 8 60A
(7) C151
A141 14DG WT
K31 20BR
A21 12DB
A21 12DB
A1 10RD
C173
A1 12RD
S219
8W-70-16
C175
POWERTRAIN CONTROL MODULE CAVITY C19 (8W-30-9)
S124
8W-70-8
A14 14RD
A14 14RD
A141 14DG WT
A21 12DB
A1 12RD
(4) C224
IGNITION SWITCH
START
RUN
ACC
OFF
C226
C174
S120
8W-70-7
A241 14DG TN
A21 14DB
(2) C224
C317
S203
8W-70-10
A241 14DG TN
A21 14DB
FUEL PUMP MODULE (8W-30-10)
A14 14RD
A14 14RD
POWERTRAIN CONTROL MODULE CAVITY A22 (8W-30-9)
TRANSMISSION CONTROL MODULE CAVITY D14 (8W-31-7)

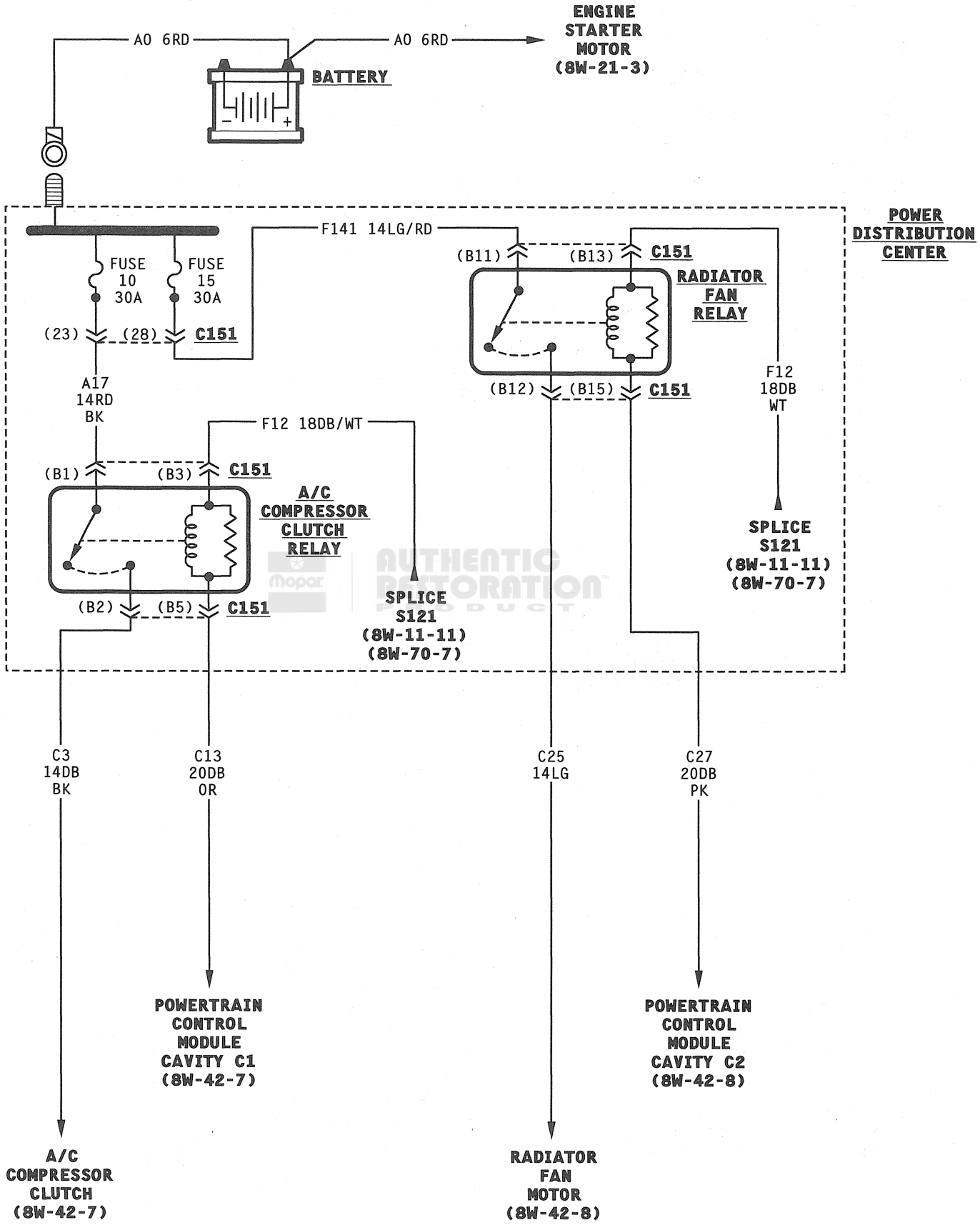


Mopar AUTHENTIC RESTORATION PRODUCT

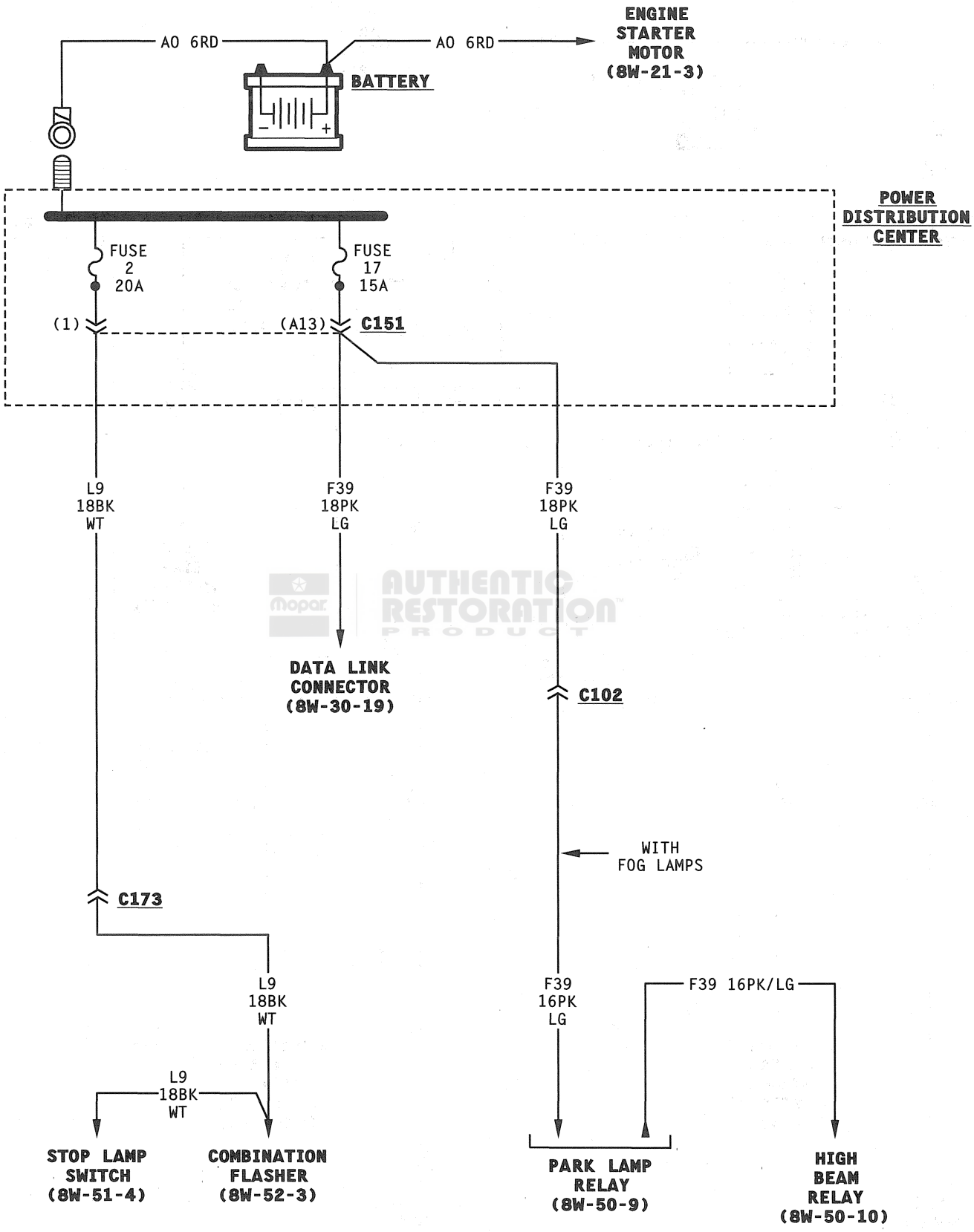


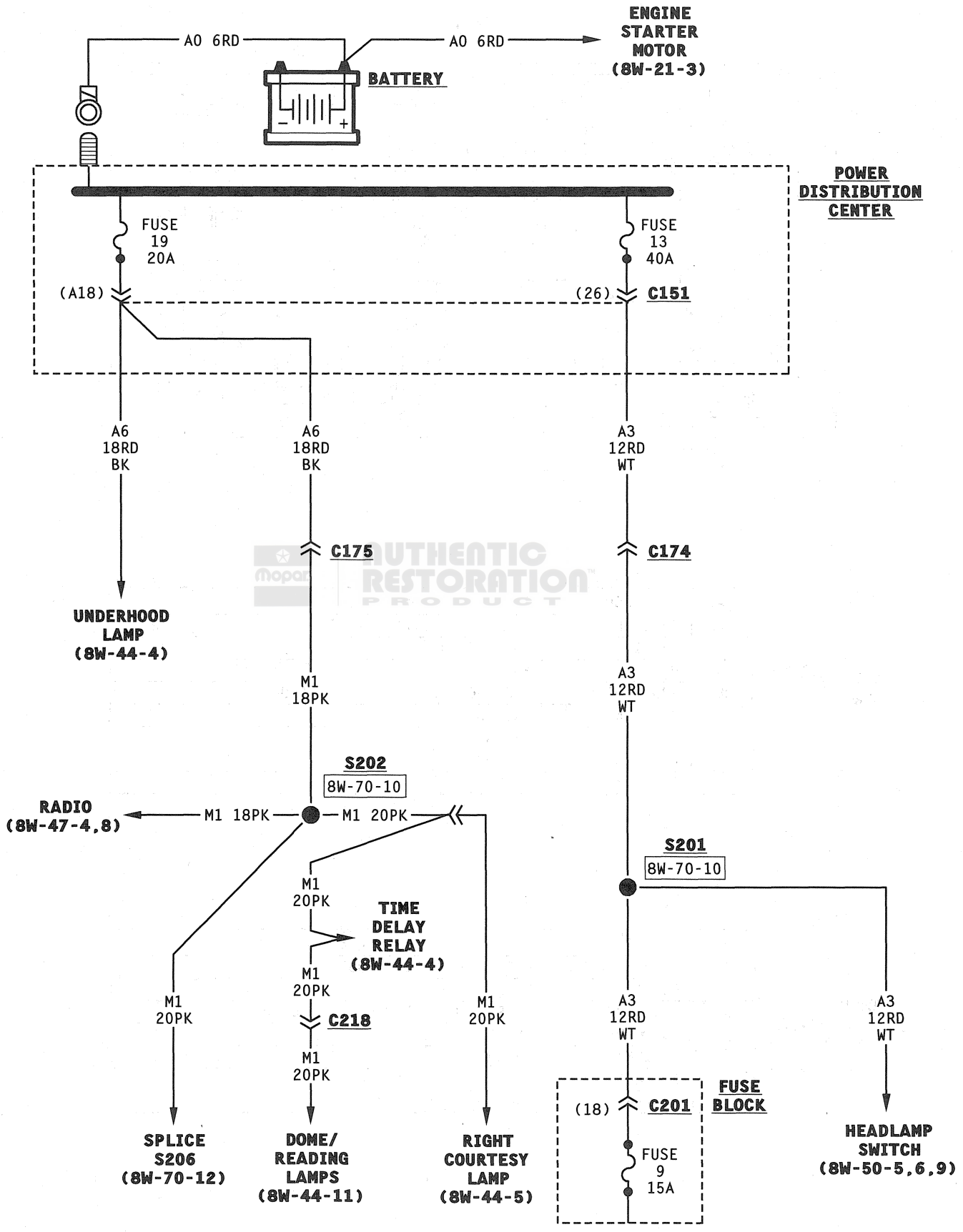
AUTHENTIC RESTORATION PRODUCT


A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 20 30A
A18 14RD BK
(A20)
C151
(B16)
(B18)
C151
AUTOMATIC SHUT DOWN RELAY
A21 12DB
SPLICE S124 (8W-11-9) (8W-70-8)
(B17)
(B20)
C151
A142 14DG OR
K51 20DB/YL
POWERTRAIN CONTROL MODULE CAVITY C3 (8W-30-16)
S122
8W-70-7
C146
A142 16DG/OR
A142 16DG/OR
A142 16DG OR
S101
8W-70-3
A142 14DG OR
A142 16DG OR
UPSTREAM HEATED OXYGEN SENSOR (8W-30-17)
C168
A142 16DG OR
A142 18DG OR
A142 16DG OR
A142 18DG OR
IGNITION COIL (8W-30-18)
GENERATOR (8W-20-3)
POWERTRAIN CONTROL MODULE CAVITY C12 (8W-30-16)
DOWNSTREAM HEATED OXYGEN SENSOR (8W-30-17)
S115
8W-70-6
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
A142 16DG OR
INJECTOR NO. 3 (8W-30-16)
INJECTOR NO. 1 (8W-30-16)
INJECTOR NO. 2 (8W-30-16)
INJECTOR NO. 4 (8W-30-16)
INJECTOR NO. 5 (8W-30-16)
INJECTOR NO. 6 (8W-30-16)



AUTHENTIC RESTORATION PRODUCT

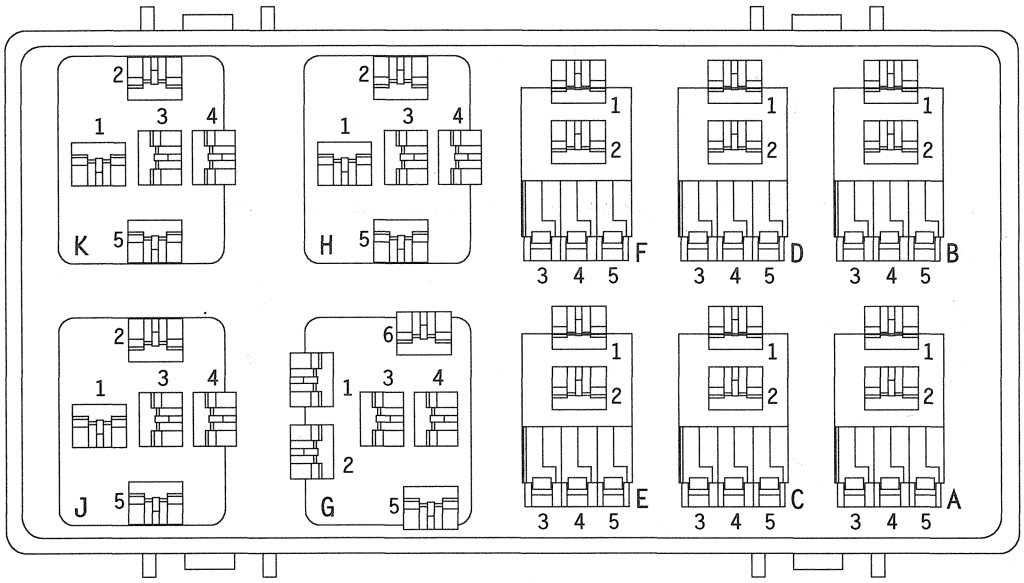

A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
BATTERY
POWER DISTRIBUTION CENTER
FUSE 2 20A
FUSE 17 15A
(1)
(A13)
C151
L9 18BK WT
F39 18PK LG
F39 18PK LG
DATA LINK CONNECTOR (8W-30-19)
C102
WITH FOG LAMPS
C173
L9 18BK WT
L9 18BK WT
F39 16PK LG
F39 16PK/LG
STOP LAMP SWITCH (8W-51-4)
COMBINATION FLASHER (8W-52-3)
PARK LAMP RELAY (8W-50-9)
HIGH BEAM RELAY (8W-50-10)



Mopar AUTHENTIC RESTORATION PRODUCT

RELAY BANK

C242



Mopar AUTHENTIC RESTORATION PRODUCT

POWER DOOR LOCK RELAY (8W-61-3)

CAV	CIRCUIT	FUNCTION
A1	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
A2	P37 18LG	FUSED B(+)
	P37 18LG	FUSED B(+)
A3	P35 20OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
A4	Z1 18BK	GROUND
	Z1 18BK	GROUND
A5	Z1 18BK	GROUND
	Z1 18BK	GROUND

POWER DOOR UNLOCK RELAY (8W-61-4)

CAV	CIRCUIT	FUNCTION
B1	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT
B2	P37 18LG	FUSED B(+)
B3	P36 20PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
B4	Z1 18BK	GROUND
	Z1 18BK	GROUND
B5	Z1 18BK	GROUND
	Z1 18BK	GROUND

LCD ILLUMINATION RELAY (8W-44-10) (8W-47-5,9)

CAV	CIRCUIT	FUNCTION
C1	X5 18LB/RD	RADIO DISPLAY OUTPUT
C2	E2 20OR/BK	PANEL LAMPS DRIVER
C3	Z1 18BK	GROUND
C4	F85 18VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
C5	L90 18DB/RD	PARK LAMP SWITCH OUTPUT

HORN RELAY (8W-41-3)

CAV	CIRCUIT	FUNCTION
F1	X4 16GY/OR	FUSED B(+)
F2	X2 18DG/RD	HORN RELAY OUTPUT
F3	X3 20BK/RD	HORN RELAY CONTROL
F4	–	–
F5	X4 16GY/OR	FUSED B(+)
	X4 16GY/OR	FUSED B(+)

Mopar AUTHENTIC RESTORATION PRODUCT

REAR WINDOW DEFOGGER RELAY (8W-48-3)

CAV	CIRCUIT	FUNCTION
H1	C15 12BK/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
H2	Z1 18BK	GROUND
	Z1 18BK	GROUND
H3	C80 18DB/WT	REAR WINDOW DEFOGGER SWITCH
H4	F82 12WT	FUSED B(+)
H5	F83 18YL/DG	FUSED IGNITION SWITCH OUTPUT (ACC/RUN)

COMBINATION FLASHER (8W-52-3)

CAV	CIRCUIT	FUNCTION
J1	A21 14DB	–
J2	L9 18BK/WT	FUSED B(+)
	L9 18BK/WT	FUSED B(+)
J3	L12 18VT/TN	COMBINATION FLASHER OUTPUT (HAZARD)
J4	L5 18BK/WT	COMBINATION FLASHER OUTPUT (TURN SIGNALS)
J5	Z1 18BK	GROUND
	Z1 18BK	GROUND

8W-15 GROUND DISTRIBUTION

DESCRIPTION AND OPERATION

INTRODUCTION

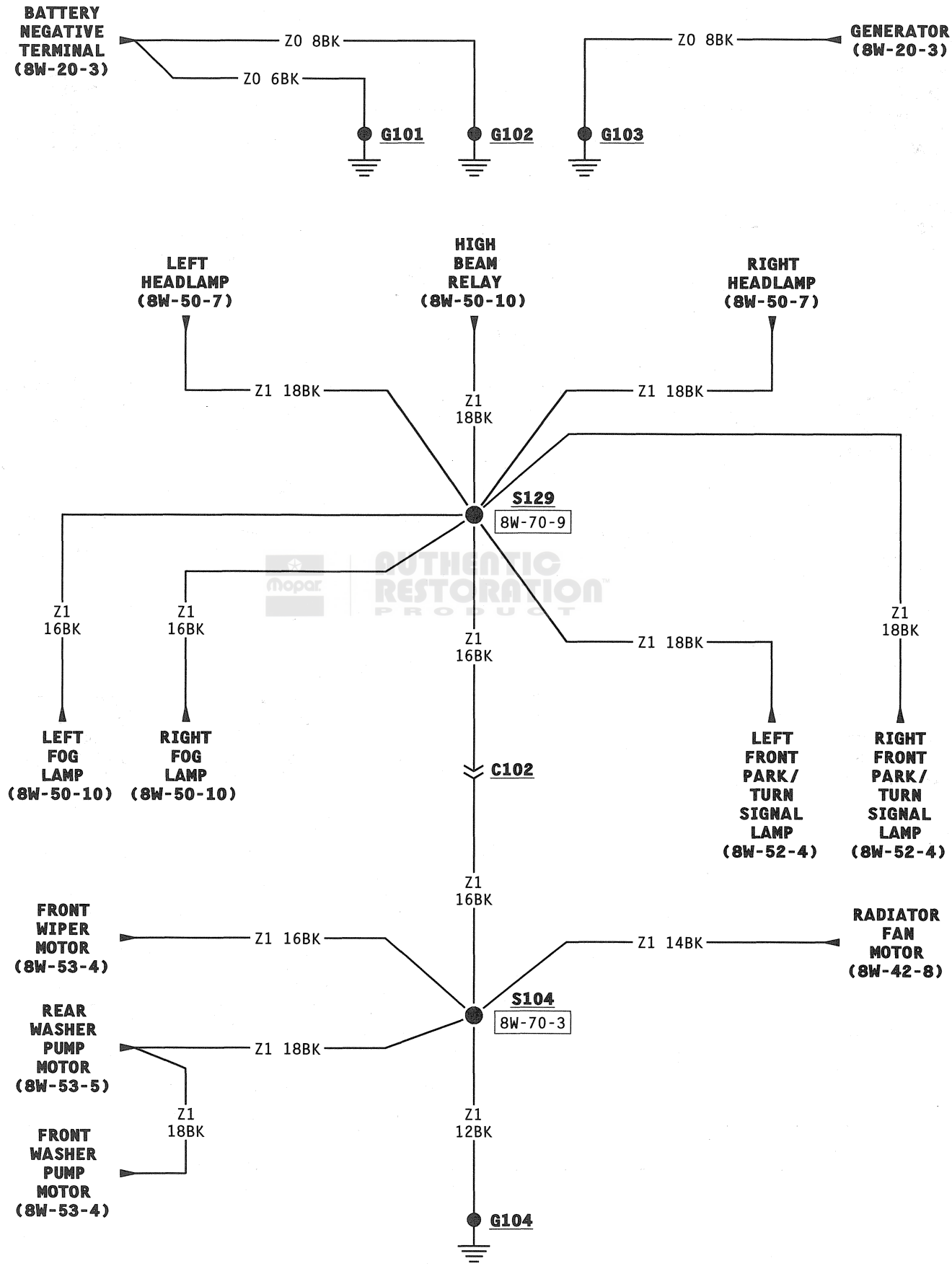
This section identifies the grounds, splices that connect to those grounds, and the components that connect those grounds. For additional information on system operation, refer to the appropriate section of the wiring diagrams. For an illustration of the physical location of each ground, refer to group 8W-90.

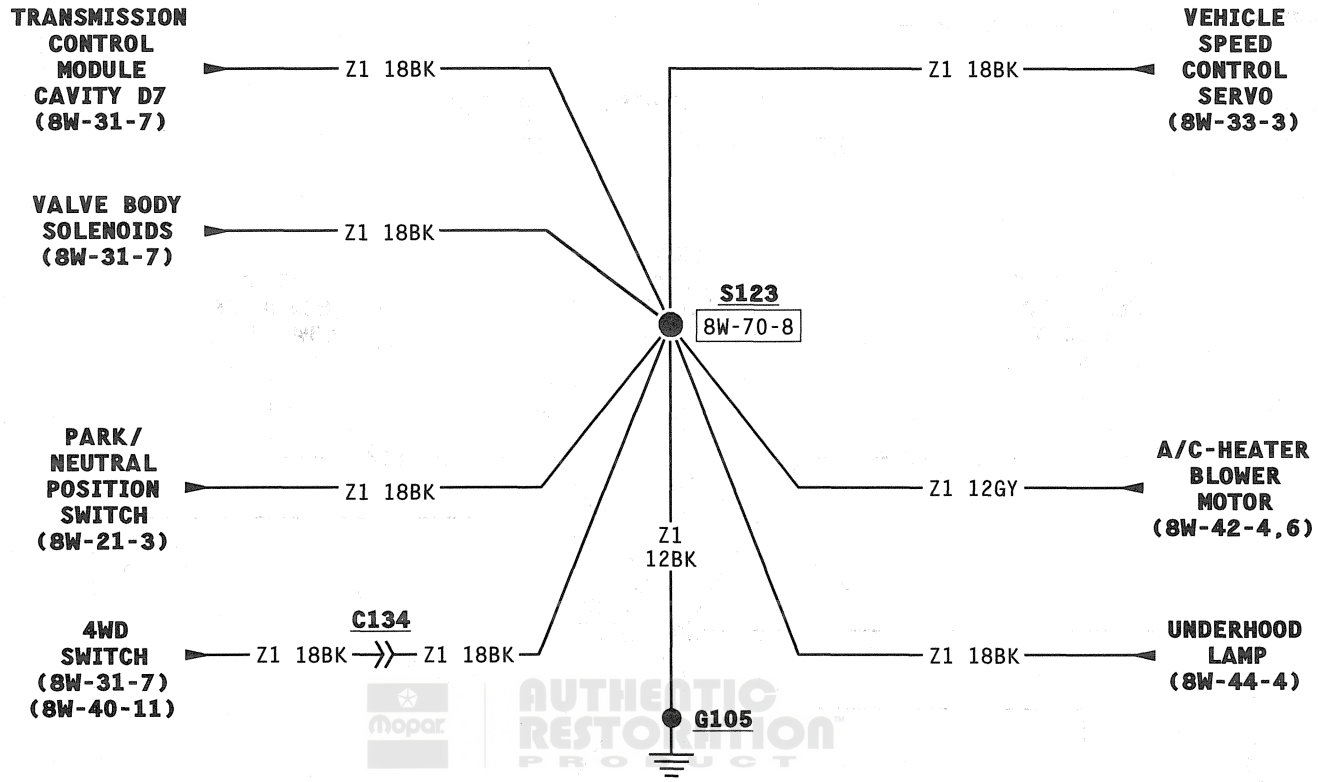
Mopar | AUTHENTIC RESTORATION PRODUCT

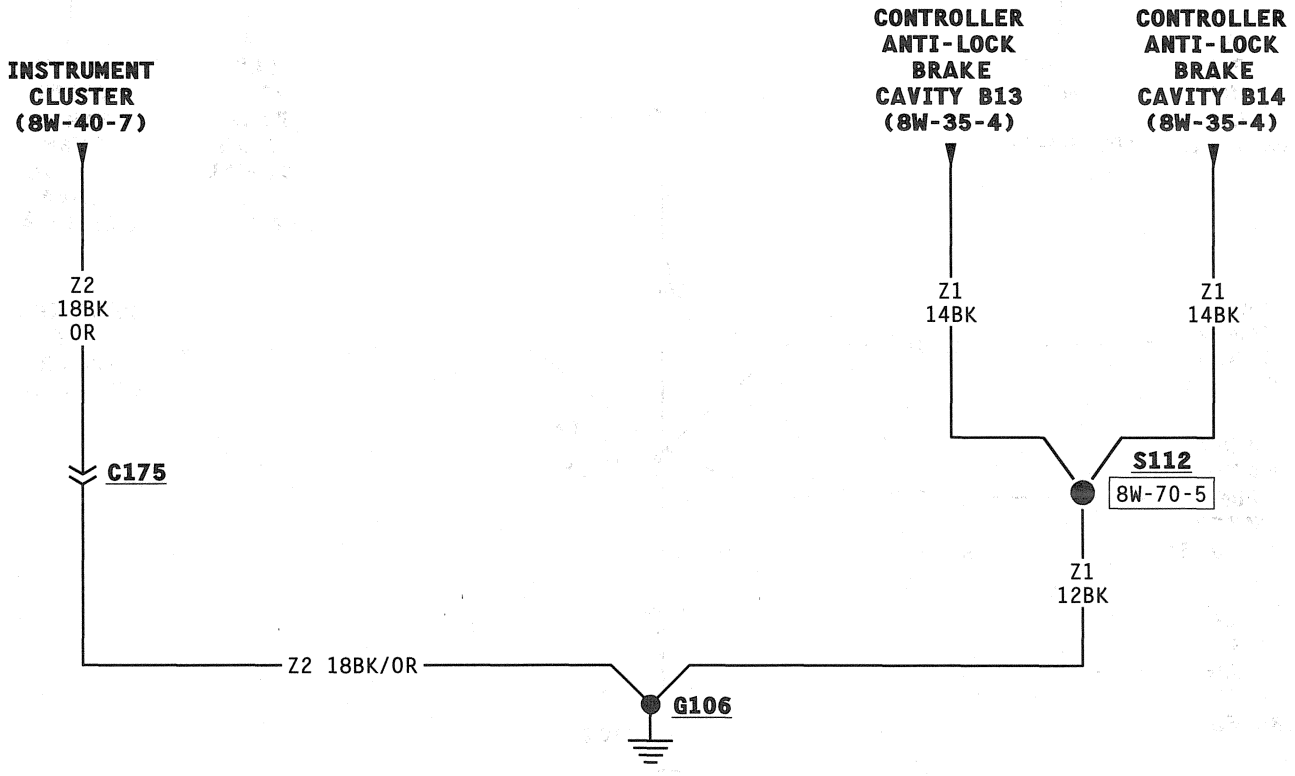
DIAGRAM INDEX

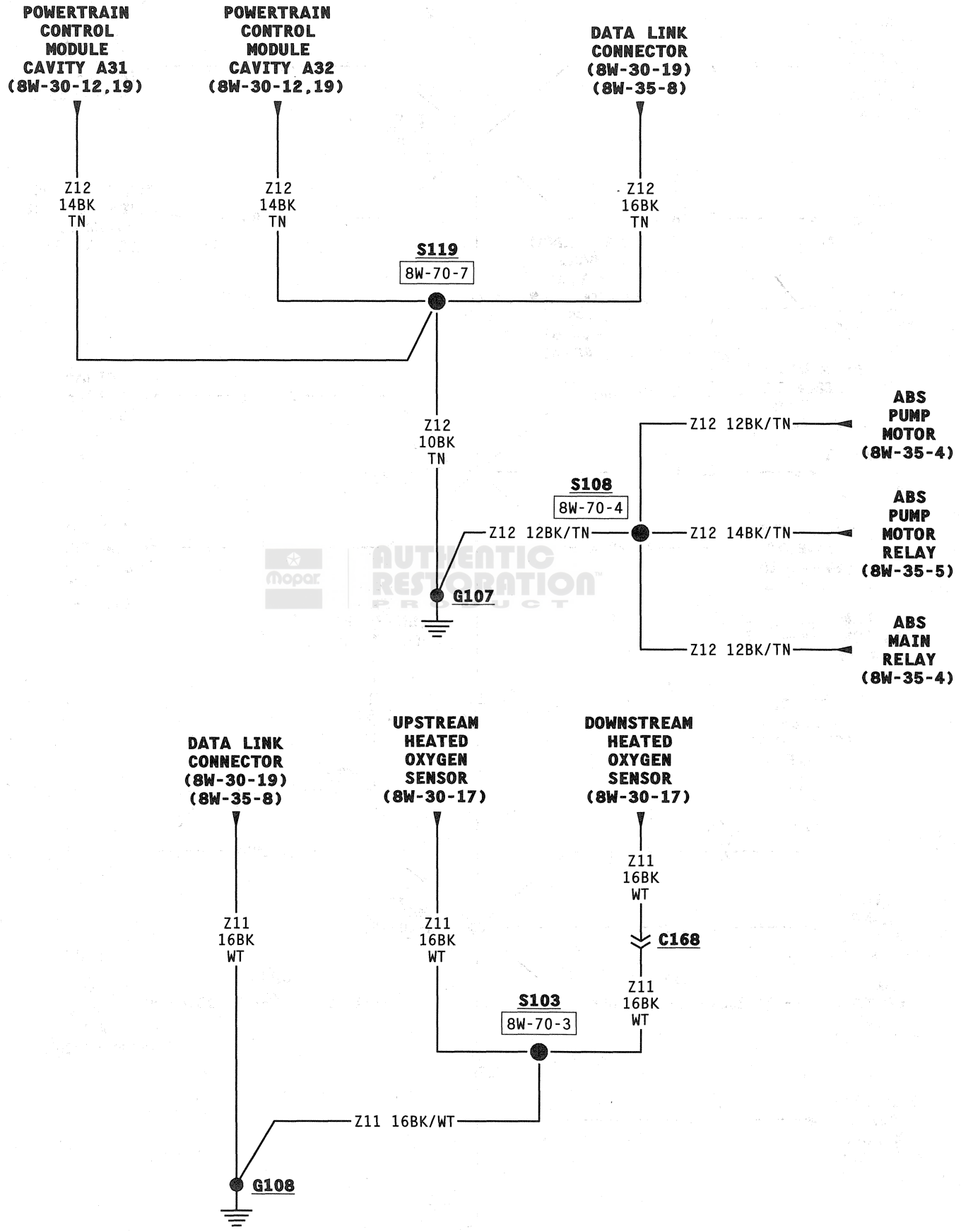
Component	Page
G101	8W-15-3
G102	8W-15-3
G103	8W-15-3
G104	8W-15-3
G105	8W-15-4
G106	8W-15-4
G107	8W-15-5
G108	8W-15-5
G200	8W-15-6, 7
G300	8W-15-8, 9

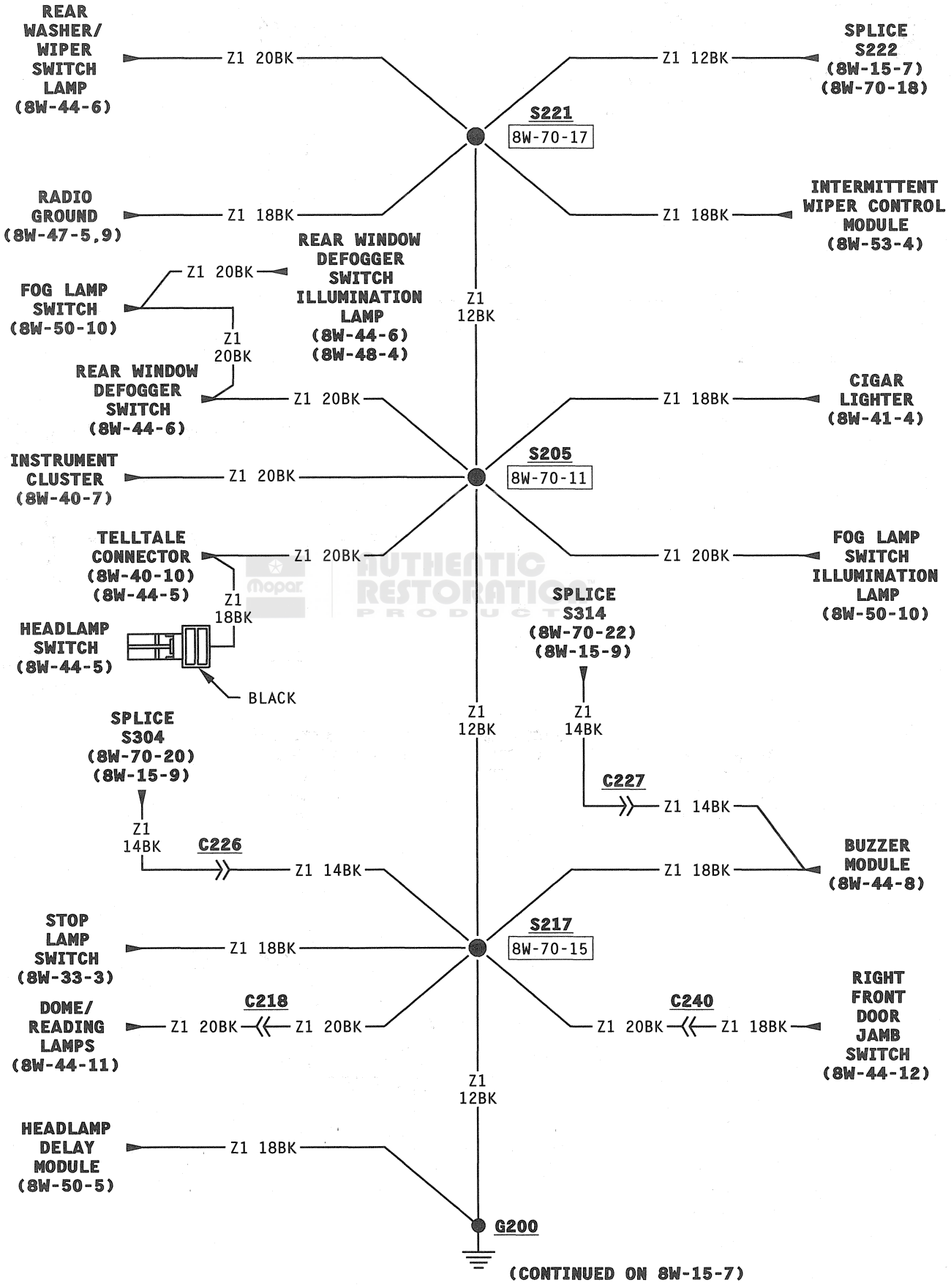
Mopar AUTHENTIC RESTORATION PRODUCT

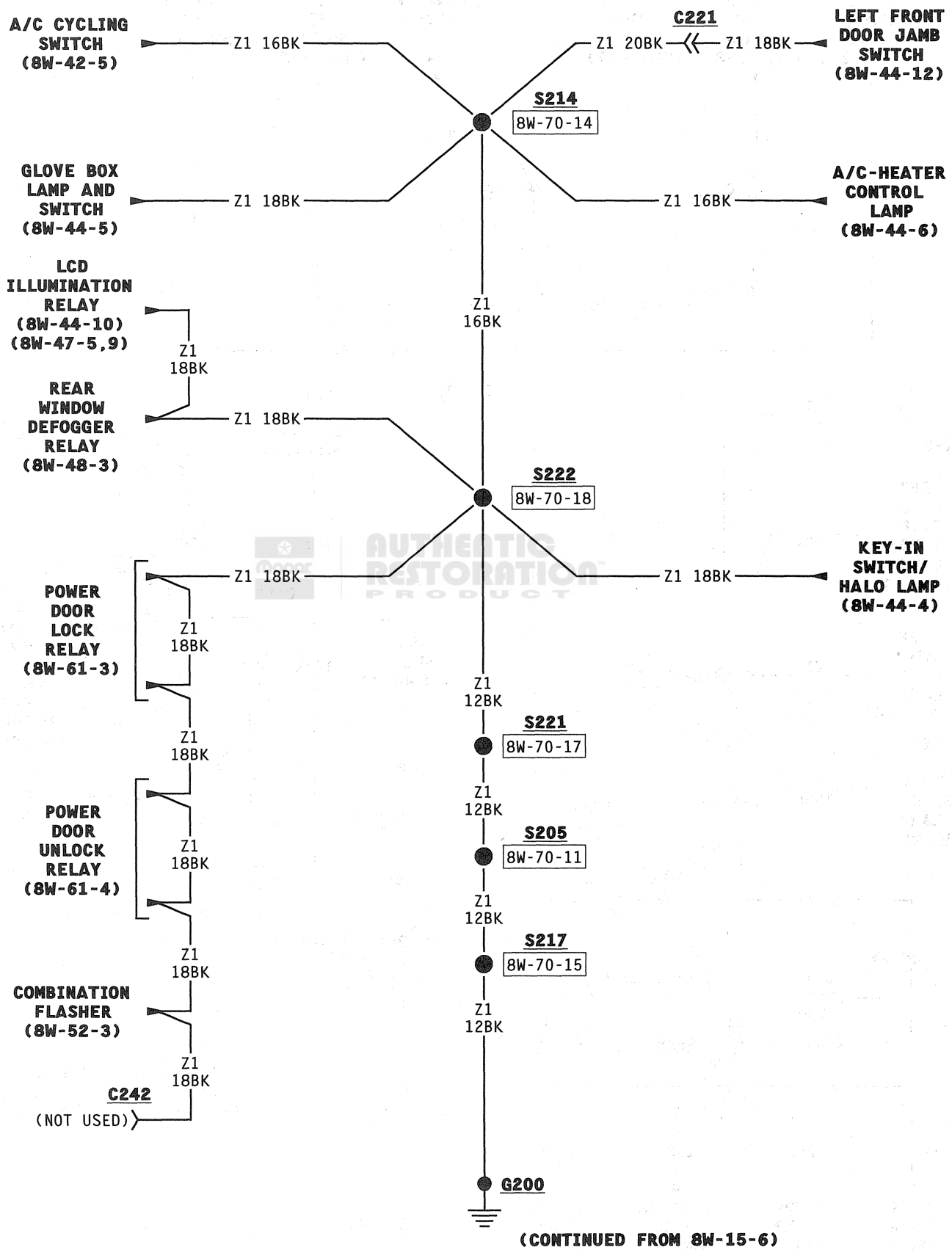

BATTERY NEGATIVE TERMINAL (8W-20-3)
Z0 8BK
Z0 6BK
G101
G102
Z0 8BK
GENERATOR (8W-20-3)
G103
LEFT HEADLAMP (8W-50-7)
HIGH BEAM RELAY (8W-50-10)
RIGHT HEADLAMP (8W-50-7)
Z1 18BK
Z1 18BK
Z1 18BK
S129
8W-70-9
Z1 16BK
Z1 16BK
Z1 16BK
Z1 18BK
Z1 18BK
LEFT FOG LAMP (8W-50-10)
RIGHT FOG LAMP (8W-50-10)
C102
LEFT FRONT PARK/ TURN SIGNAL LAMP (8W-52-4)
RIGHT FRONT PARK/ TURN SIGNAL LAMP (8W-52-4)
Z1 16BK
FRONT WIPER MOTOR (8W-53-4)
Z1 16BK
Z1 14BK
RADIATOR FAN MOTOR (8W-42-8)
S104
8W-70-3
REAR WASHER PUMP MOTOR (8W-53-5)
Z1 18BK
Z1 18BK
Z1 12BK
FRONT WASHER PUMP MOTOR (8W-53-4)
G104

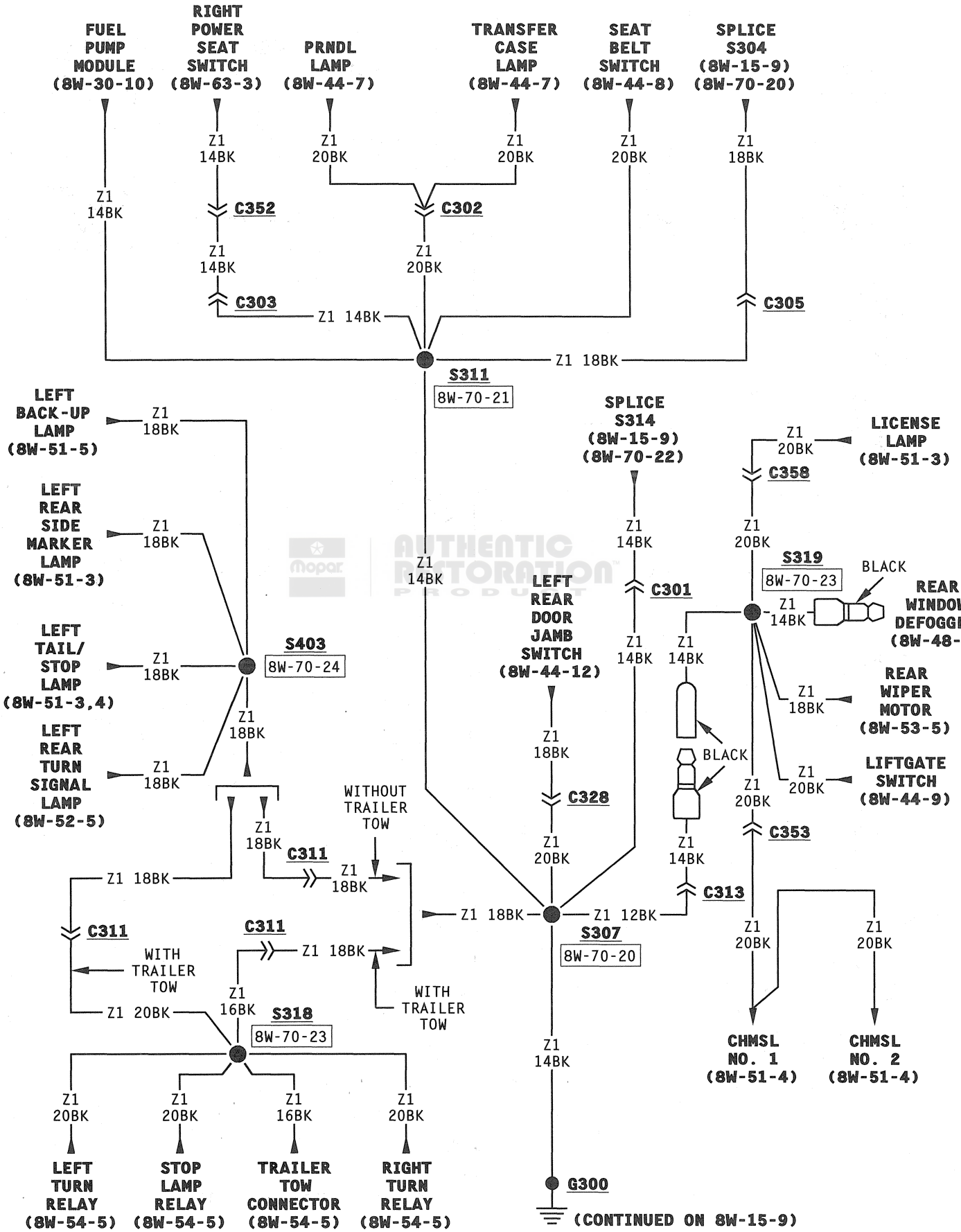

TRANSMISSION CONTROL MODULE CAVITY D7 (8W-31-7)
Z1 18BK
VALVE BODY SOLENOIDS (8W-31-7)
Z1 18BK
PARK/ NEUTRAL POSITION SWITCH (8W-21-3)
Z1 18BK
4WD SWITCH (8W-31-7) (8W-40-11)
Z1 18BK
C134
Z1 18BK
S123
8W-70-8
Z1 12BK
G105
Z1 18BK
VEHICLE SPEED CONTROL SERVO (8W-33-3)
Z1 12GY
A/C-HEATER BLOWER MOTOR (8W-42-4,6)
Z1 18BK
UNDERHOOD LAMP (8W-44-4)


INSTRUMENT CLUSTER (8W-40-7)
Z2 18BK OR
C175
CONTROLLER ANTI-LOCK BRAKE CAVITY B13 (8W-35-4)
Z1 14BK
CONTROLLER ANTI-LOCK BRAKE CAVITY B14 (8W-35-4)
Z1 14BK
S112
8W-70-5
Z1 12BK
Z2 18BK/OR
G106

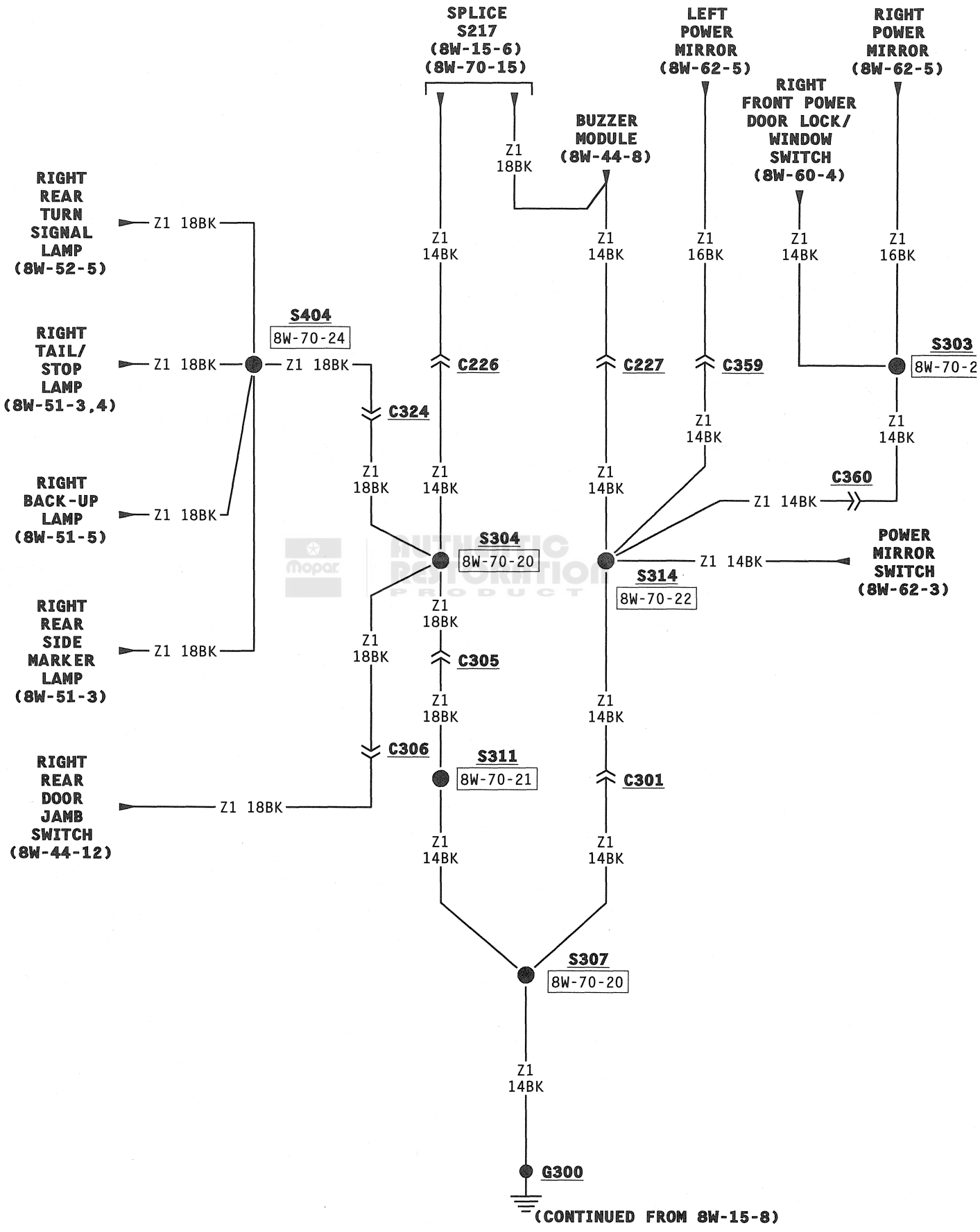

POWERTRAIN CONTROL MODULE CAVITY A31 (8W-30-12,19)
POWERTRAIN CONTROL MODULE CAVITY A32 (8W-30-12,19)
DATA LINK CONNECTOR (8W-30-19) (8W-35-8)
Z12 14BK TN
Z12 14BK TN
Z12 16BK TN
S119
8W-70-7
Z12 10BK TN
Z12 12BK/TN
ABS PUMP MOTOR (8W-35-4)
S108
8W-70-4
Z12 12BK/TN
Z12 14BK/TN
ABS PUMP MOTOR RELAY (8W-35-5)
G107
Z12 12BK/TN
ABS MAIN RELAY (8W-35-4)
DATA LINK CONNECTOR (8W-30-19) (8W-35-8)
UPSTREAM HEATED OXYGEN SENSOR (8W-30-17)
DOWNSTREAM HEATED OXYGEN SENSOR (8W-30-17)
Z11 16BK WT
Z11 16BK WT
Z11 16BK WT
C168
Z11 16BK WT
S103
8W-70-3
Z11 16BK/WT
G108


REAR WASHER/ WIPER SWITCH LAMP (8W-44-6)
Z1 20BK
Z1 12BK
SPLICE S222 (8W-15-7) (8W-70-18)
S221
8W-70-17
RADIO GROUND (8W-47-5,9)
Z1 18BK
Z1 18BK
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6) (8W-48-4)
Z1 20BK
FOG LAMP SWITCH (8W-50-10)
Z1 20BK
Z1 12BK
REAR WINDOW DEFOGGER SWITCH (8W-44-6)
Z1 20BK
Z1 18BK
CIGAR LIGHTER (8W-41-4)
INSTRUMENT CLUSTER (8W-40-7)
Z1 20BK
S205
8W-70-11
TELLTALE CONNECTOR (8W-40-10) (8W-44-5)
Z1 20BK
Z1 20BK
FOG LAMP SWITCH ILLUMINATION LAMP (8W-50-10)
Z1 18BK
HEADLAMP SWITCH (8W-44-5)
BLACK
SPLICE S314 (8W-70-22) (8W-15-9)
Z1 12BK
Z1 14BK
SPLICE S304 (8W-70-20) (8W-15-9)
C227
Z1 14BK
Z1 14BK
C226
Z1 14BK
Z1 18BK
BUZZER MODULE (8W-44-8)
STOP LAMP SWITCH (8W-33-3)
Z1 18BK
S217
8W-70-15
C218
C240
DOME/ READING LAMPS (8W-44-11)
Z1 20BK
Z1 20BK
Z1 20BK
Z1 18BK
RIGHT FRONT DOOR JAMB SWITCH (8W-44-12)
Z1 12BK
HEADLAMP DELAY MODULE (8W-50-5)
Z1 18BK
G200
(CONTINUED ON 8W-15-7)


A/C CYCLING SWITCH (8W-42-5)
Z1 16BK
C221
Z1 20BK
Z1 18BK
LEFT FRONT DOOR JAMB SWITCH (8W-44-12)
S214
8W-70-14
GLOVE BOX LAMP AND SWITCH (8W-44-5)
Z1 18BK
Z1 16BK
A/C-HEATER CONTROL LAMP (8W-44-6)
LCD ILLUMINATION RELAY (8W-44-10) (8W-47-5,9)
Z1 18BK
REAR WINDOW DEFOGGER RELAY (8W-48-3)
Z1 18BK
Z1 16BK
S222
8W-70-18
KEY-IN SWITCH/ HALO LAMP (8W-44-4)
Z1 18BK
Z1 18BK
POWER DOOR LOCK RELAY (8W-61-3)
Z1 18BK
Z1 18BK
POWER DOOR UNLOCK RELAY (8W-61-4)
Z1 18BK
Z1 18BK
COMBINATION FLASHER (8W-52-3)
Z1 18BK
C242
(NOT USED)
Z1 12BK
S221
8W-70-17
Z1 12BK
S205
8W-70-11
Z1 12BK
S217
8W-70-15
Z1 12BK
G200
(CONTINUED FROM 8W-15-6)



Mopar AUTHENTIC RESTORATION PRODUCT


SPLICE S217 (8W-15-6) (8W-70-15)
LEFT POWER MIRROR (8W-62-5)
RIGHT POWER MIRROR (8W-62-5)
RIGHT FRONT POWER DOOR LOCK/ WINDOW SWITCH (8W-60-4)
BUZZER MODULE (8W-44-8)
Z1 18BK
RIGHT REAR TURN SIGNAL LAMP (8W-52-5)
Z1 18BK
Z1 14BK
Z1 14BK
Z1 16BK
Z1 14BK
Z1 16BK
S404
8W-70-24
RIGHT TAIL/ STOP LAMP (8W-51-3,4)
Z1 18BK
Z1 18BK
C226
C227
C359
S303
8W-70-2
C324
Z1 14BK
Z1 14BK
Z1 18BK
Z1 14BK
Z1 14BK
C360
Z1 14BK
RIGHT BACK-UP LAMP (8W-51-5)
Z1 18BK
S304
8W-70-20
Z1 14BK
POWER MIRROR SWITCH (8W-62-3)
S314
8W-70-22
Z1 18BK
RIGHT REAR SIDE MARKER LAMP (8W-51-3)
Z1 18BK
Z1 18BK
C305
Z1 18BK
Z1 14BK
C306
S311
8W-70-21
C301
RIGHT REAR DOOR JAMB SWITCH (8W-44-12)
Z1 18BK
Z1 14BK
Z1 14BK
S307
8W-70-20
Z1 14BK
G300
(CONTINUED FROM 8W-15-8)

8W-20 CHARGING SYSTEM

DESCRIPTION AND OPERATION

CHARGING SYSTEM

The charging system is an integral part of the battery and starting systems. Because all these systems work in conjunction, diagnose and test them together.

Circuit A11 connects to the generator output terminal and splices to fuse 1 in the Power Distribution Center (PDC). Circuit A0 connects the battery to the PDC. Circuit Z0 provides ground for the generator.

When the ignition switch is in either the START or RUN positions, it connects circuit A1 from fuse 8 in the PDC to circuit A21. Circuit A21 splices to supply current to the coil side of the Automatic Shut Down (ASD) relay. The Powertrain Control Module (PCM) provides ground for the relay on circuit K51. Circuit K51 connects to cavity C3 of the PCM.

When the PCM grounds the ASD relay, contacts inside the relay close and connect circuit A18 from fuse 20 in the PDC to circuit A142. Circuit A142 splices to the generator field terminal.

The PCM has an internal voltage regulator that controls generator output. The PCM controls the generator field on circuit K20. Circuit K20 connects to PCM cavity B10.

When the engine operates and there is current in the generator field, the generator produces a B+ voltage. The generator supplies B+ voltage to the battery through the A11 and A0 circuits.

HELPFUL INFORMATION

- The ignition switch also connects circuit A1 with circuits A41, A38, and A48.
- Circuit A21 also powers the coil side of the fuel pump relay.
- The ASD relay supplies battery voltage for the fuel injectors, ignition coil, and the heated oxygen sensor. The fuel pump relay powers the fuel pump module.

SCHEMATICS AND DIAGRAMS

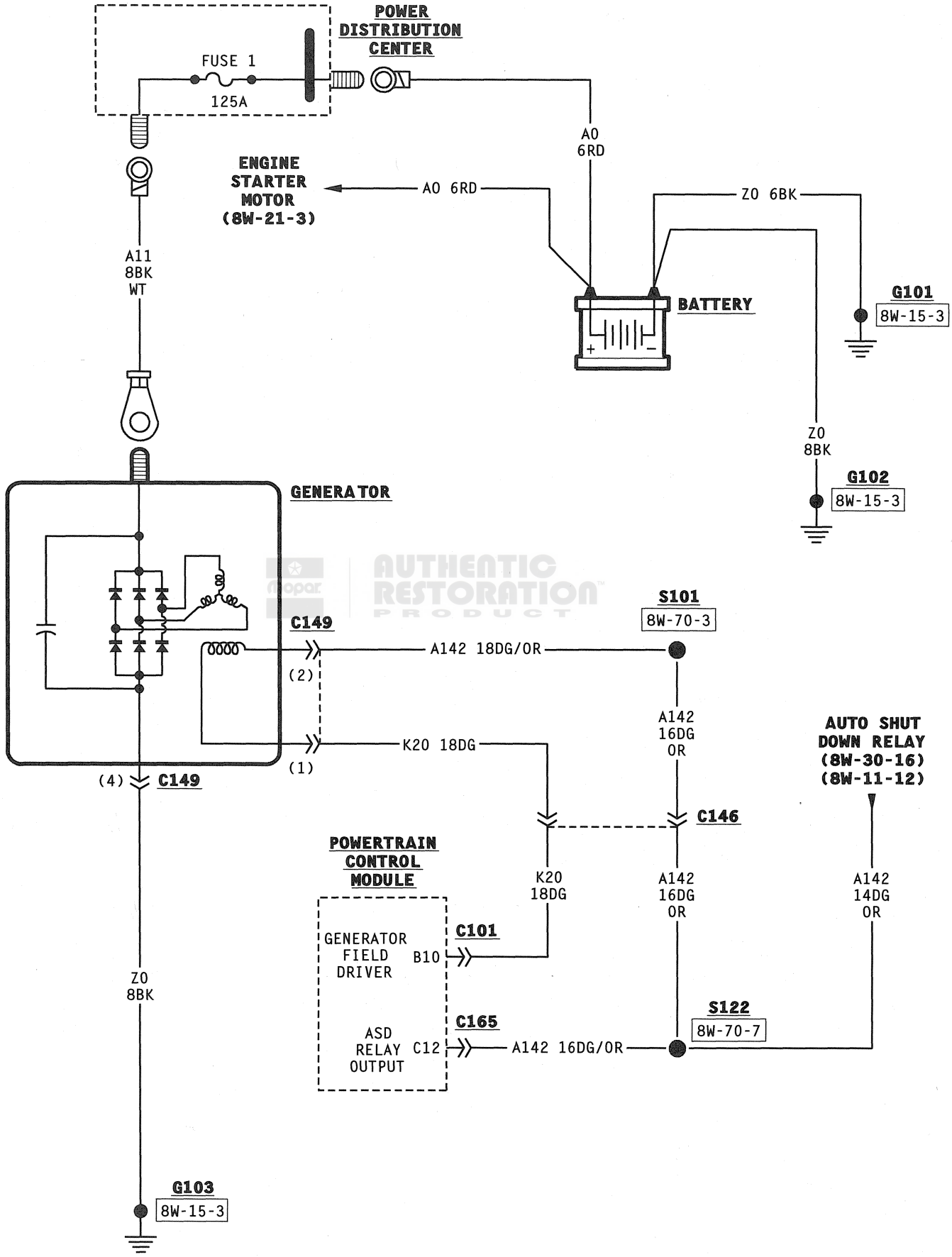
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Battery	8W-20-3
Fuse 1 (PDC)	8W-20-3
Generator	8W-20-3
Powertrain Control Module	8W-20-3

Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-21 STARTING SYSTEM

DESCRIPTION AND OPERATION

STARTING SYSTEM

Circuit A0 from the battery is double crimped at the positive battery post. One branch of circuit A0 (battery positive cable) connects to the engine starter motor. The other A0 branch supplies voltage to the bus bar in the Power Distribution Center (PDC).

Fuse 3 in the PDC supplies battery voltage to the contact side of the engine starter motor relay on circuit A4. When the coil side of the engine starter motor relay energizes, the contacts close and connect circuit A4 to circuit T40. Circuit T40 supplies battery voltage to the starter motor solenoid.

The ignition switch supplies battery voltage to the coil side of the starter motor relay on circuit A41 when the key is moved to the START position. Ground for the coil side of the starter motor relay is supplied by the Park/Neutral position switch. Circuit T41 connects the coil side of the relay to the Park/Neutral position switch.

When the starter motor relay energizes and the contacts close, circuit T40 supplies battery voltage to the starter motor solenoid. Circuit A0 from the battery supplies voltage to the starter motor when the solenoid energizes.

HELPFUL INFORMATION

- The Park/Neutral switch closes when the transmission is in either the PARK or NEUTRAL positions.
- Circuit A4 is double crimped at fuse 3 in the PDC. One branch connects to the engine starter motor relay, the other connects to fuse 2 in the fuse block.

SCHEMATICS AND DIAGRAMS

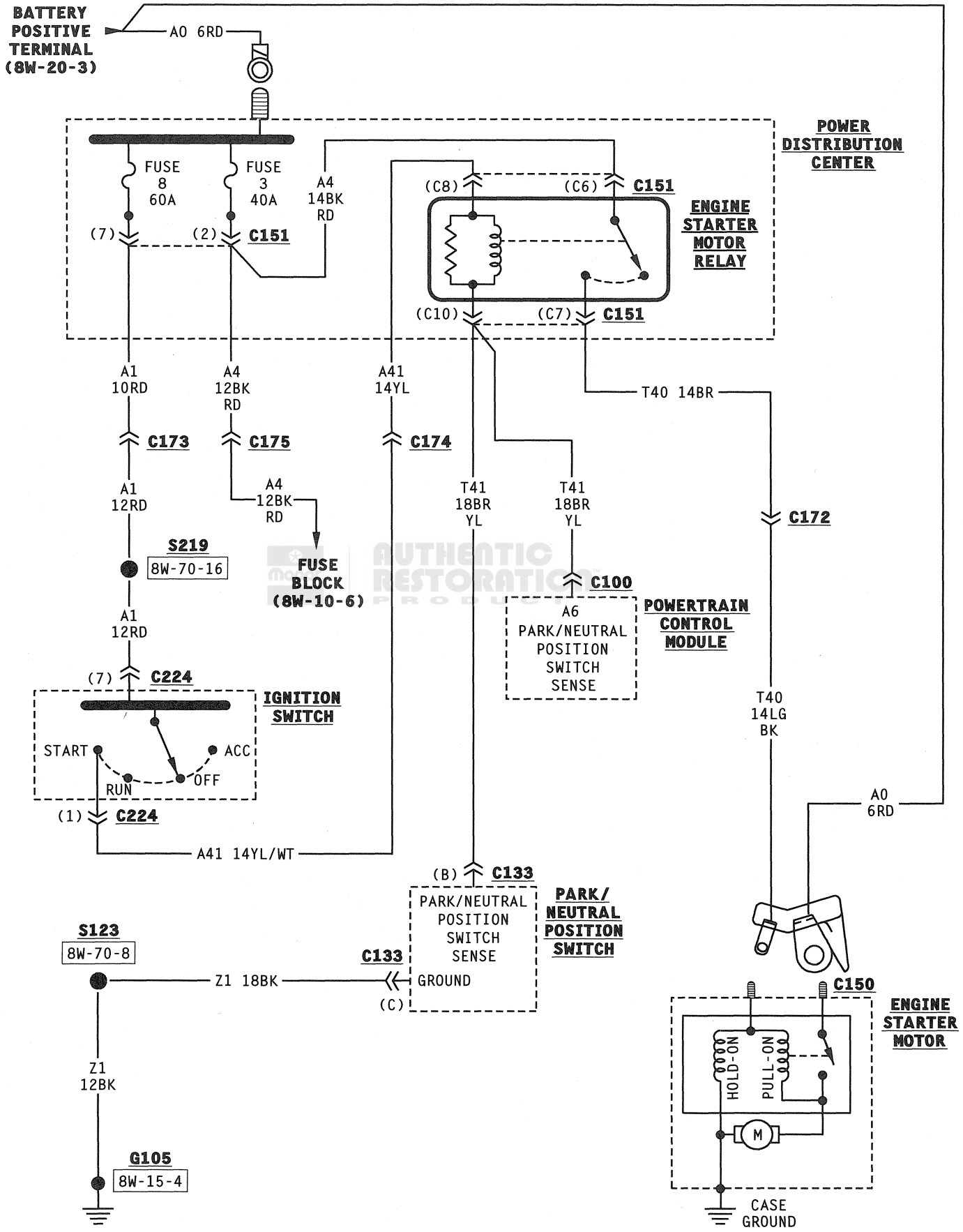
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Engine Starter Motor	8W-21-3
Engine Starter Motor Relay (PDC)	8W-21-3
Fuse 3 (PDC)	8W-21-3
Fuse 8 (PDC)	8W-21-3
Ignition Switch	8W-21-3
Park/Neutral Position Switch	8W-21-3
Powertrain Control Module	8W-21-3

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8 60A
FUSE 3 40A
A4 14BK RD
(7)
(2)
C151
(C8)
(C6)
C151
ENGINE STARTER MOTOR RELAY
(C10)
(C7)
C151
A1 10RD
A4 12BK RD
A41 14YL
T40 14BR
C173
C175
C174
A1 12RD
A4 12BK RD
T41 18BR YL
T41 18BR YL
C172
S219
8W-70-16
FUSE BLOCK (8W-10-6)
C100
A6 PARK/NEUTRAL POSITION SWITCH SENSE
POWERTRAIN CONTROL MODULE
A1 12RD
T40 14LG BK
(7)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
(1)
C224
A0 6RD
A41 14YL/WT
(B)
C133
PARK/NEUTRAL POSITION SWITCH SENSE
GROUND
(C)
C133
PARK/ NEUTRAL POSITION SWITCH
S123
8W-70-8
Z1 18BK
C150
ENGINE STARTER MOTOR
HOLD-ON
PULL-ON
M
Z1 12BK
G105
8W-15-4
CASE GROUND

8W-30 FUEL/IGNITION SYSTEMS

INDEX

page

DESCRIPTION AND OPERATION
- AUTOMATIC SHUT DOWN (ASD) RELAY 2
- BATTERY FEED 1
- BATTERY TEMPERATURE SENSOR 3
- CAMSHAFT POSITION SENSOR 3
- CRANKSHAFT POSITION SENSOR 3
- DATA LINK CONNECTOR 1
- DUTY CYCLE EVAP\PURGE SOLENOID 5
- ENGINE COOLANT TEMPERATURE SENSOR . . . 3
- FUEL INJECTORS 4
- FUEL PUMP MODULE 2
- FUEL PUMP RELAY 2
- GROUND 1
- HEATED OXYGEN SENSORS 2
- IDLE AIR CONTROL (IAC) MOTOR 5
- IGNITION COIL 5
- IGNITION SWITCH 1
- INTAKE AIR TEMPERATURE SENSOR 4
- MALFUNCTION INDICATOR LAMP (MIL) 5
- MANIFOLD ABSOLUTE PRESSURE SENSOR . . . 4
- PARK/NEUTRAL POSITION SWITCH 4
- TACHOMETER SIGNAL 5
- THROTTLE POSITION SENSOR 4
- VEHICLE SPEED SENSOR 2

SCHEMATICS AND DIAGRAMS
- WIRING DIAGRAM INDEX 5

DESCRIPTION AND OPERATION

IGNITION SWITCH

Circuit A1 from fuse 8 in the power distribution center (PDC), supplies battery voltage to the ignition switch. Depending upon position, the ignition switch powers circuits A21, A38, A41, or A48.

START POSITION

In the START position, the ignition switch connects circuit A1 to circuit A41. Circuit A41 connects to the coil side of the starter motor relay.

Additionally in the START position, the case grounded ignition switch provides ground for the brake lamp switch and the warning lamps in the instrument cluster.

START OR RUN POSITION

In the START or RUN position, the ignition switch connects circuit A1 to circuit A21. Circuit A21 splices to power the coil side of the Automatic Shut Down (ASD) relay and the fuel pump relay. Circuit A21 also connects to cavity A2 of the Powertrain Control Module.

RUN (ONLY) POSITION

When the ignition switch is in the RUN position, it connects circuit A1 to circuit A38. Circuit A38 feeds fuse 18 in the fuse block.

ACCESSORY OR RUN POSITIONS

In the ACCESSORY or RUN positions, the ignition switch connects circuit A1 to circuit A48. Circuit A48 feeds fuses 3 in the fuse block and the circuit breaker in cavity 3 of the fuse block.

BATTERY FEED

Circuit A14 from fuse 6 in the Power Distribution Center (PDC) supplies battery voltage to cavity A22 of the Powertrain Control Module (PCM).

HELPFUL INFORMATION

Circuit A14 also supplies power to the contact sides of the fuel pump relay.

GROUND

Circuit Z12 connects to cavities A31 and A32 of the PCM. The Z12 circuit provides ground for PCM internal drivers that operate high current devices like the injectors and ignition coil.

Internal to the PCM, the power (device) ground circuit connects to the PCM sensor return circuit (from circuit K4).

HELPFUL INFORMATION

- The grounding point for circuit Z12 is the right rear of the engine.
- If the system loses ground for the Z12 circuits at the rear of the engine, the vehicle will not operate. Check the connection at the ganged-ground circuit eyelet.

DATA LINK CONNECTOR

Circuit F39 from the Power Distribution Center (PDC) supplies battery voltage to the data link connector.

Circuit T137 from the Transmission Control Module (TCM) connects to the data link connector. Circuit T137 originates at cavity C4 of the TCM.

Circuit D20 connects to cavity C29 of the PCM. Circuit D20 is the SCI receive circuit for the Power-

DESCRIPTION AND OPERATION (Continued)

train Control Module (PCM). Circuit D21 connects to cavity C27 of the PCM and cavity A3 of the Controller- Anti Lock Brakes. Circuit D21 is the SCI transmit circuit for the PCM. CCD Bus Circuits D1 and D2 connect to the data link connector.

Circuits Z11 and Z12 provide ground for the data link connector. Circuit Z12 also connects to cavities A31 and A32 of the PCM.

AUTOMATIC SHUT DOWN (ASD) RELAY

When the ignition switch is in either the START or RUN positions, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 supplies battery voltage to the coil side of the Automatic Shut Down (ASD) relay. The Powertrain Control Module (PCM) provides ground for the relay on circuit K51. Circuit K51 connects to cavity C3 of the PCM.

When the PCM grounds the ASD relay, contacts inside the relay close and connect circuit A18 from fuse 20 in the PDC to circuit A142. Circuit A142 splices to the generator field terminal, fuel injectors, ignition coil and the upstream and downstream heated oxygen sensors. Circuit A142 also connects to cavity C12 of the PCM.

HELPFUL INFORMATION

Along with supplying voltage to the coil side of the ASD relay, circuit A21 also supplies voltage to the coil side of the fuel pump relay.

FUEL PUMP RELAY

When the ignition switch is in either the START or RUN positions, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 supplies battery voltage to the coil side of the fuel pump relay. The Powertrain Control Module (PCM) provides ground for the relay on circuit K31. Circuit K31 connects to cavity C19 of the PCM.

When the PCM grounds the fuel pump relay, contacts inside the relay close and connect circuit A14 from fuse 6 in the PDC to circuit A141. Circuit A141 connects to circuit A241. Circuit A241 supplies voltage to the fuel pump motor (part of the in-tank fuel pump module).

HELPFUL INFORMATION

Circuit A14 also splices to supply battery voltage to cavity A22 of the PCM.

FUEL PUMP MODULE

The in-tank fuel pump module contains the fuel pump motor and fuel level sensor.

FUEL PUMP MOTOR

When the fuel pump relay contacts close, the relay supplies voltage to the fuel pump motor. Circuit A141 from the relay supplies voltage to circuit A241. Circuit A241 powers the fuel pump module. Circuit Z1 provides ground for the fuel pump motor.

FUEL LEVEL SENSOR

The fuel level sensor is a variable resistor. Circuit G4 connects the fuel level sensor to the fuel gauge in the instrument cluster. Circuit G4 also supplies the fuel level sensor signal to cavity C26 of the Powertrain Control Module (PCM). Circuit F87 from fuse 26 in the fuse block supplies voltage to the fuel gauge. The fuel level sensor draws voltage from circuit F87 through the fuel gauge on circuit G4. Circuit Z1 provides the ground path for the fuel level sensor.

HELPFUL INFORMATION

As current flows through the coils in the fuel gauge, it creates a magnetic field. One of the coils in the gauge receives fixed current. The other coil is connected to the level sensor. The magnetic field controls the position of the fuel gauge pointer.

The fuel level sensor contains a variable resistor. As the position of the float arm on the fuel level sensor changes, the resistor changes the current flow through second coil in the fuel gauge. A change in current flow alters the magnetic field in the fuel gauge, which changes the pointer position.

VEHICLE SPEED SENSOR

Circuit K7 supplies 8 volts from the Powertrain Control Module (PCM) to the vehicle speed sensor. The K7 circuit connects to cavity B31 of the PCM.

Circuit G7 from the vehicle speed sensor provides an input signal to the PCM. The G7 circuit connects to cavity B27 of the PCM.

The PCM provides a ground for the vehicle speed sensor signal (circuit G7) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Circuit G7 splices to the speedometer in the instrument cluster.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensor
- Camshaft position sensor
- Crankshaft position sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

HEATED OXYGEN SENSORS

When the Automatic Shut Down (ASD) relay contacts close, they connect circuits A18 and A142. Cir-

DESCRIPTION AND OPERATION (Continued)

cuit A142 splices to supply voltage to the upstream and downstream heated oxygen sensors.

Circuit K41 delivers the signal from the upstream heated oxygen sensor to the Powertrain Control Module (PCM). Circuit K41 connects to cavity A24 of the PCM. Circuit K341 supplies the signal from the downstream heated oxygen sensor to the PCM. Circuit K341 connects to PCM cavity A25.

The PCM provides a ground for the heated oxygen sensor signals (circuits K41 and K341) through circuit K4. Circuit K4 connects to cavity A4 of the PCM connector.

Circuit Z11 provides ground for the heater circuit in each sensor.

HELPFUL INFORMATION

Circuit A142 also supplies battery voltage to the fuel injectors, ignition coil, and generator.

Circuit K4 splices to supply ground for the signals from the following:

- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

BATTERY TEMPERATURE SENSOR

The Powertrain Control Module (PCM) determines battery temperature on circuit K118. Circuit K118 connects the PCM to the battery temperature sensor. Circuit K118 connects to cavity C15 of the PCM. Circuit K4 provides ground for the sensor and connects to PCM cavity A4.

CRANKSHAFT POSITION SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the crankshaft position sensor on circuit K6. Circuit K6 connects to cavity A17 of the PCM.

The PCM receives the crankshaft position sensor signal on circuit K24. Circuit K24 connects to cavity A8 of the PCM.

The PCM provides a ground for the crankshaft position sensor (circuit K24) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

- Circuit K6 splices to supply 5 volts to the camshaft position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensor
- Camshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

CAMSHAFT POSITION SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the camshaft position sensor (in distributor) on circuit K6. Circuit K6 connects to cavity A17 of the PCM.

The PCM receives the camshaft position sensor signal on circuit K44. Circuit K44 connects to cavity A18 of the PCM.

The PCM provides a ground for the camshaft position sensor signal (circuit K44) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

- Circuit K6 splices to supply 5 volts to the crankshaft position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K2. From circuit K2, the engine coolant temperature sensor draws up to 5 volts from the PCM. The sensor is a variable resistor. As coolant temperature changes, the resistance in the sensor changes, causing a change in current draw. The K2 circuit connects to cavity A16 of the PCM.

The PCM provides a ground for the engine coolant temperature sensor signal (circuit K2) through circuit K4. Circuit K4 connects to cavity A4 of the PCM connector.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Battery temperature sensor
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Upstream and downstream heated oxygen sensor
- Vehicle speed sensor

DESCRIPTION AND OPERATION (Continued)

THROTTLE POSITION SENSOR

From the Powertrain Control Module (PCM), circuit K6 supplies 5 volts to the throttle position sensor (TPS). Circuit K6 connects to cavity A17 of the PCM.

Circuit K22 delivers the TPS signal to the PCM. Circuit K22 connects to cavity A23 of the PCM.

The PCM provides a ground for the throttle position sensor signal (circuit K22) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Refer to Group 14 for throttle position sensor operation.

Circuit K6 splices to supply 5 volts to the manifold absolute pressure sensor, battery temperature sensor, camshaft position sensor, and crankshaft position sensor.

On vehicles equipped with the 4.0L engine and automatic transmission, circuit K22 splices to the transmission control module.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

MANIFOLD ABSOLUTE PRESSURE SENSOR

From the Powertrain Control Module (PCM), circuit K6 supplies 5 volts to the manifold absolute pressure (MAP) sensor. Circuit K6 connects to cavity A17 of the PCM.

Circuit K1 delivers the MAP signal to the PCM. Circuit K1 connects to cavity A27 of the PCM.

The PCM provides a ground for the MAP sensor signal (circuit K1) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Refer to Group 14 for MAP sensor operation.

Circuit K6 splices to supply 5 volts to the camshaft position sensor, crankshaft position sensor and throttle position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

INTAKE AIR TEMPERATURE SENSOR

The intake air temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K21. Circuit K21 connects to cavity A15 of the PCM.

From circuit K21, the intake air temperature sensor draws voltage from the PCM. The sensor is a variable resistor. As intake air temperature changes, the resistance in the sensor changes, causing a change in current draw.

The PCM provides a ground for the intake air temperature sensor signal (circuit K21) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

HELPFUL INFORMATION

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Camshaft position sensor
- Crankshaft position sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

PARK/NEUTRAL POSITION SWITCH

When closed, the park/neutral position switch provides a ground path on circuit T41 for the coil side of the starter motor relay. Circuit A41 from the ignition switch provides battery voltage to the coil side of the relay.

Circuit T41 is double crimped at the coil side of the relay and connects to cavity A6 of the Powertrain Control Module (PCM). The park/neutral position switch provides an input to the PCM.

FUEL INJECTORS

When the Automatic Shut Down (ASD) relay contacts close, they connect circuits A18 and A142. Circuit A142 supplies voltage to the fuel injectors. Each injector has a separate ground circuit controlled by the Powertrain Control Module (PCM).

Circuit K11 provides ground for injector number one. The K11 circuit connects to cavity B4 of the PCM.

Circuit K12 provides ground for injector number two. The K12 circuit connects to cavity B15 of the PCM.

Circuit K13 provides ground for injector number three. The K13 circuit connects to cavity B5 of the PCM.

Circuit K14 provides ground for injector number four. The K14 circuit connects to cavity B16 of the PCM.

DESCRIPTION AND OPERATION (Continued)

On the 4.0L engine, circuit K38 provides ground for injector number five. The K38 circuit connects to cavity B6 of the PCM.

Also on the 4.0L engine, circuit K58 provides ground for injector number six. The K58 circuit connects to cavity B12 of the PCM.

HELPFUL INFORMATION

- Circuit A142 splices to supply voltage to the upstream and downstream heated oxygen sensors, ignition coil, PCM, and generator.
- For information about fuel injector operation, refer to Group 14.

IGNITION COIL

When the Automatic Shut Down (ASD) relay contacts close, they connect circuits A18 and A142. Circuit A142 splices to supply voltage to the ignition coil. The Powertrain Control Module (PCM) controls the ground path for the ignition coil on circuit K19. Circuit K19 connects to cavity A7 of the PCM.

HELPFUL INFORMATION

Circuit A142 splices to supply voltage to the fuel injectors, PCM, heated oxygen sensors, and generator.

IDLE AIR CONTROL (IAC) MOTOR

The Powertrain Control Module (PCM) operates the idle air control motor through 4 circuits; K39, K40, K59, and K60. Each circuit connects to separate cavities in the PCM connector.

- Circuit K39 connects to cavity A19 of the PCM
- Circuit K40 connects to cavity A11 of the PCM
- Circuit K59 connects to cavity A20 of the PCM
- Circuit K60 connects to cavity A10 of the PCM

DUTY CYCLE EVAP\PURGE SOLENOID

When the ignition switch is in the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 powers circuit F12 through fuse 18 in the fuse block. Circuit F12 supplies power to the Duty Cycle EVAP/Purge solenoid.

The Powertrain Control Module (PCM) provides the ground path for the solenoid on circuit K52. Circuit K52 connects to cavity C20 of the PCM.

TACHOMETER SIGNAL

The Powertrain Control Module (PCM) supplies the signal for the tachometer on circuit G21. Circuit G21 connects to cavity C31 of the PCM.

MALFUNCTION INDICATOR LAMP (MIL)

The Powertrain Control Module (PCM) provides ground for the instrument cluster malfunction indicator lamp on circuit G3. Circuit G3 connects to cavity C17 of the PCM. Circuit F87 provides voltage for the lamp. The MIL displays the message CHECK ENGINE when illuminated.

For information regarding diagnostic trouble code access using the MIL lamp, refer to Group 14, Fuel Systems.

SCHEMATICS AND DIAGRAMS

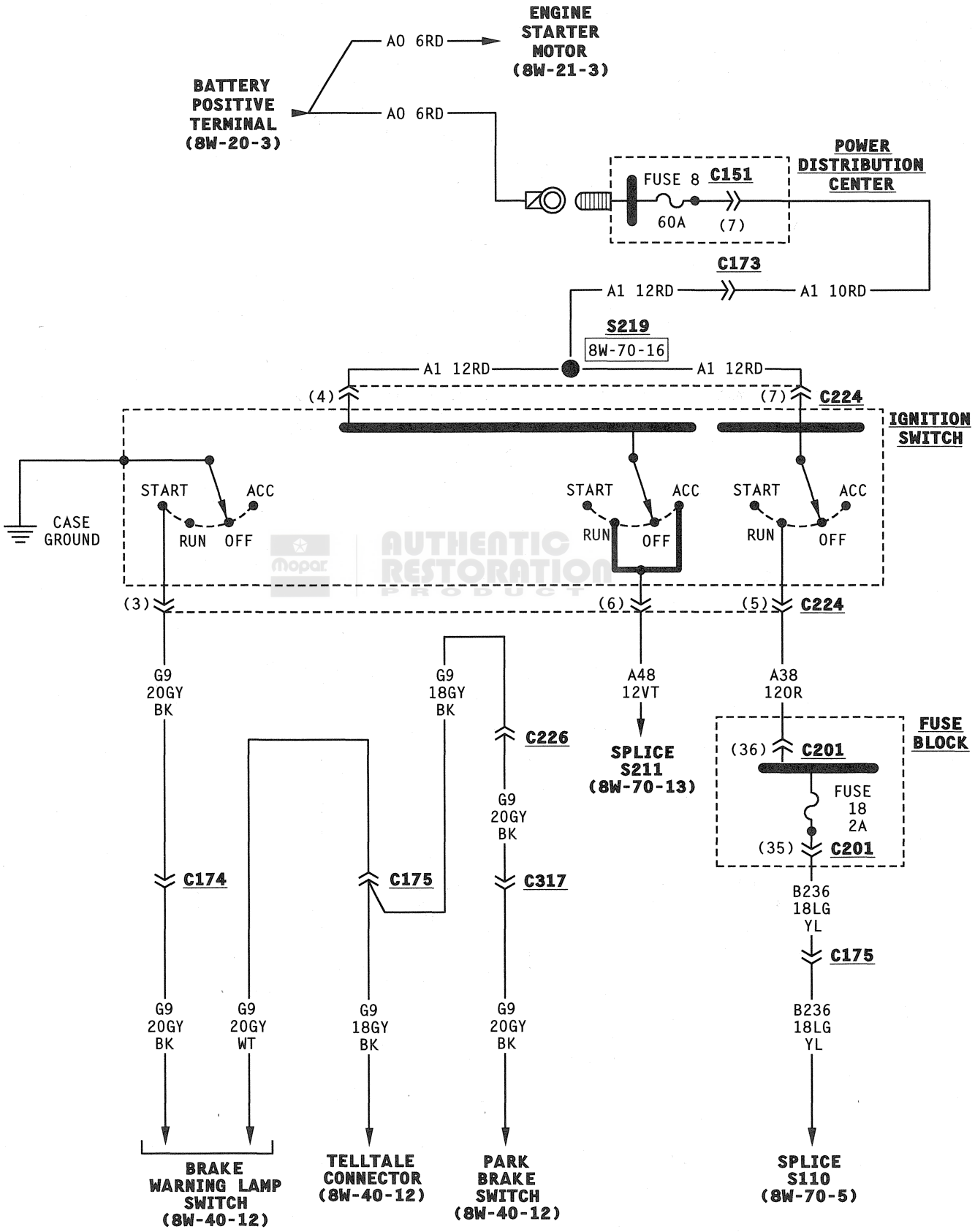
WIRING DIAGRAM INDEX

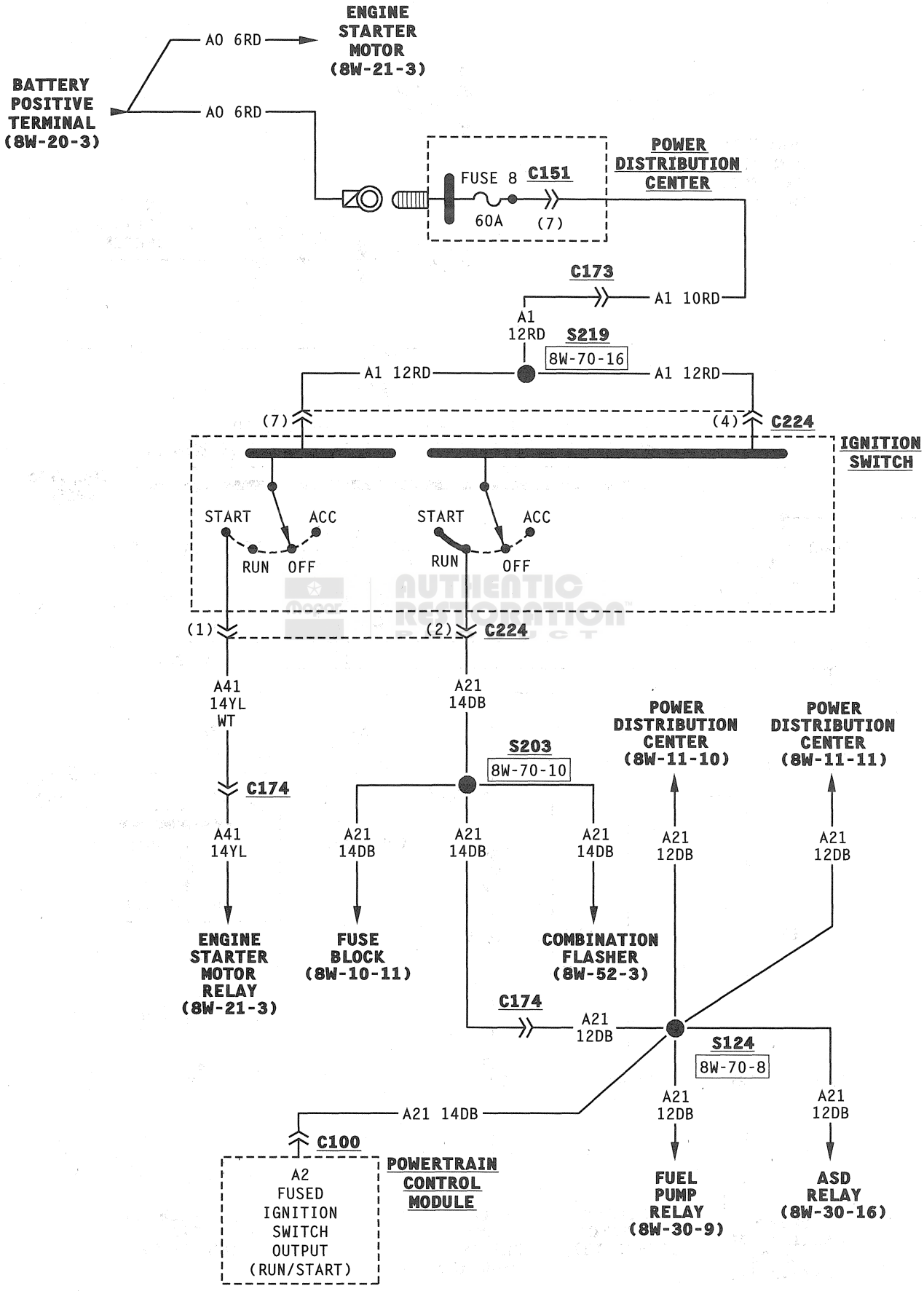
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

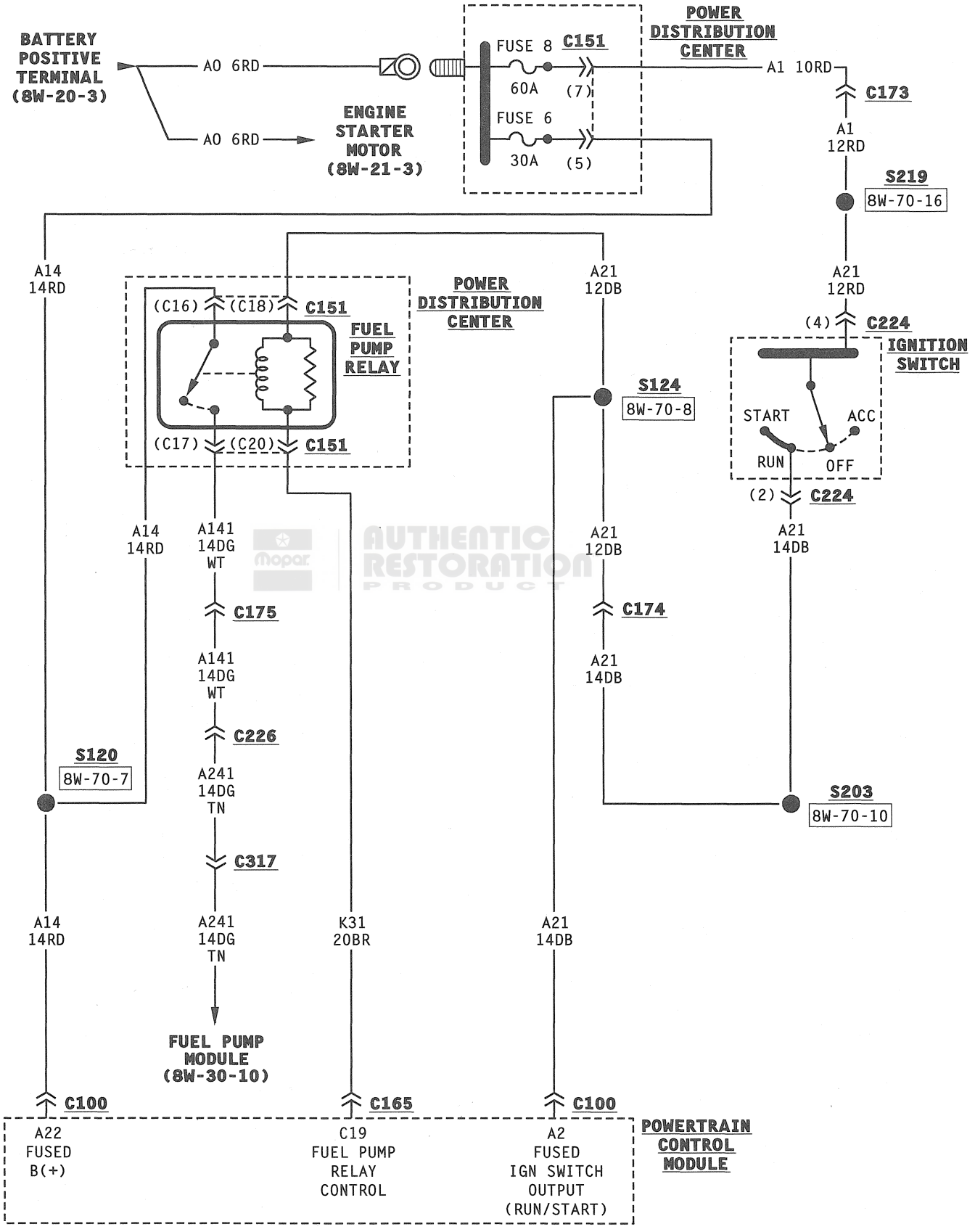
DIAGRAM INDEX

Component	Page
Automatic Shut Down Relay (PDC)	8W-30-16
Battery Temperature Sensor	8W-30-15
Camshaft Position Sensor	8W-30-13
Controller Anti-Lock Brake	8W-30-19
Crankshaft Position Sensor	8W-30-13
Data Link Connector	8W-30-19
Downstream Heated Oxygen Sensor	8W-30-17
Engine Coolant Temperature Sensor	8W-30-11
Evap/Purge Solenoid	8W-30-10
Fuel Pump Module	8W-30-10
Fuel Pump Relay (PDC)	8W-30-9
Fuse 18	8W-30-7
Fuse 6 (PDC)	8W-30-9
Fuse 8 (PDC)	8W-30-7, 8, 9, 10, 16
Fuse 17 (PDC)	8W-30-19
Fuse 18 (PDC)	8W-30-10
Fuse 20 (PDC)	8W-30-16
Generator	8W-30-18
Idle Air Control Motor	8W-30-11
Ignition Coil	8W-30-18
Ignition Switch	8W-30-7, 8, 9, 10, 16
Injectors	8W-30-16
Instrument Cluster	8W-30-12
Intake Air Temperature Sensor	8W-30-14
Manifold Absolute Pressure Sensor	8W-30-14
Powertrain Control Module	8W-30-8 through 20
Telltale Connector	8W-30-12
Throttle Position Sensor	8W-30-15
Transmission Control Module	8W-30-19
Upstream Heated Oxygen Sensor	8W-30-17
Vehicle Speed Sensor	8W-30-20

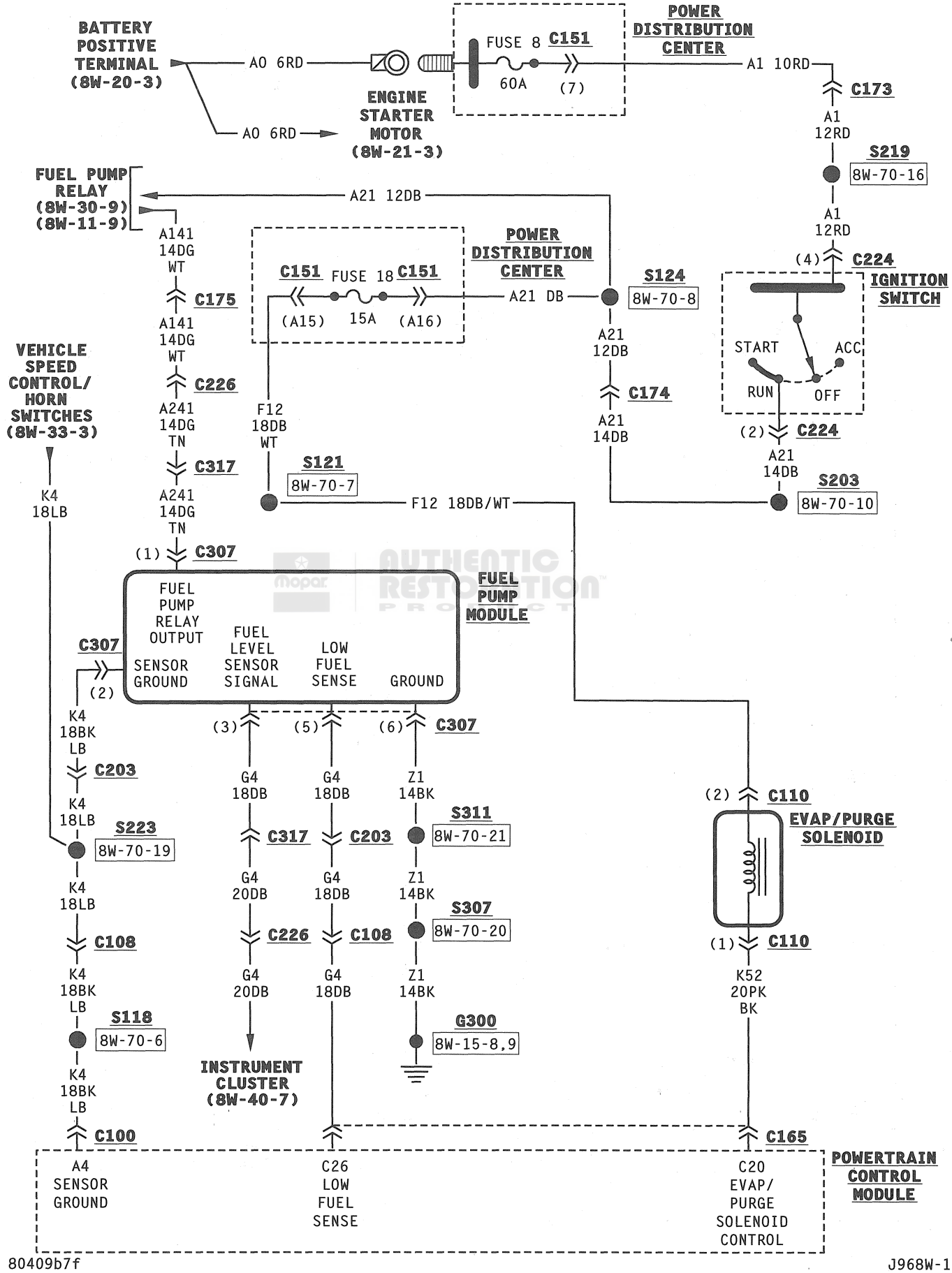
Mopar AUTHENTIC RESTORATION PRODUCT


ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8 C151
60A
(7)
C173
A1 12RD
A1 10RD
S219
8W-70-16
A1 12RD
A1 12RD
(4)
(7) C224
IGNITION SWITCH
START
ACC
RUN
OFF
CASE GROUND
(3)
(6)
(5) C224
G9 20GY BK
G9 18GY BK
A48 12VT
A38 12OR
C226
SPLICE S211 (8W-70-13)
FUSE BLOCK
(36) C201
FUSE 18 2A
(35) C201
G9 20GY BK
C174
C175
C317
B236 18LG YL
C175
G9 20GY BK
G9 20GY WT
G9 18GY BK
G9 20GY BK
B236 18LG YL
BRAKE WARNING LAMP SWITCH (8W-40-12)
TELLTALE CONNECTOR (8W-40-12)
PARK BRAKE SWITCH (8W-40-12)
SPLICE S110 (8W-70-5)

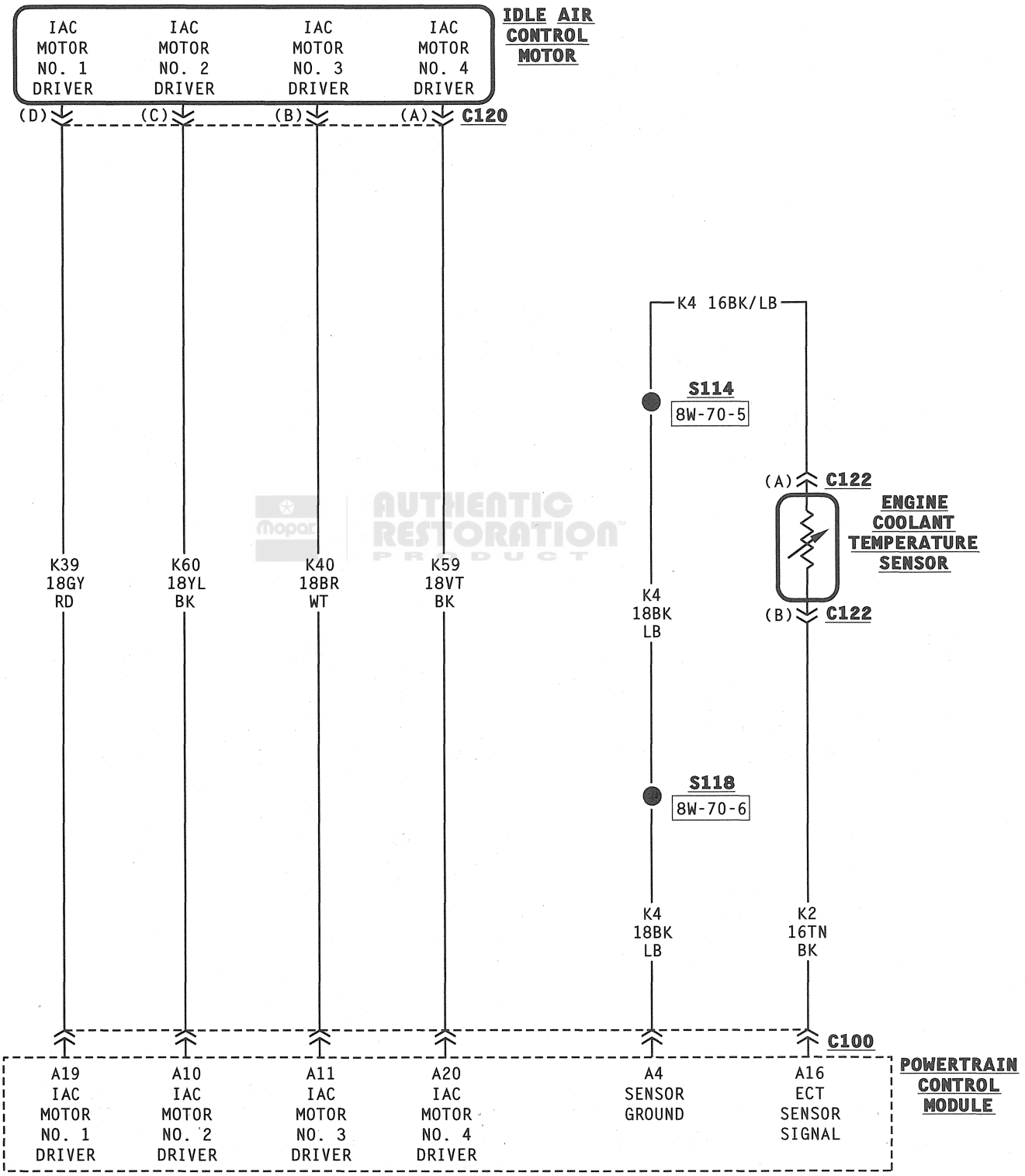

ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
C173
A1 10RD
A1 12RD
S219
8W-70-16
A1 12RD
A1 12RD
(7)
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
START
ACC
RUN
OFF
(1)
(2)
C224
A41 14YL WT
A21 14DB
POWER DISTRIBUTION CENTER (8W-11-10)
POWER DISTRIBUTION CENTER (8W-11-11)
S203
8W-70-10
C174
A41 14YL
A21 14DB
A21 14DB
A21 14DB
A21 12DB
A21 12DB
ENGINE STARTER MOTOR RELAY (8W-21-3)
FUSE BLOCK (8W-10-11)
COMBINATION FLASHER (8W-52-3)
C174
A21 12DB
S124
8W-70-8
A21 14DB
A21 12DB
A21 12DB
C100
A2 FUSED IGNITION SWITCH OUTPUT (RUN/START)
POWERTRAIN CONTROL MODULE
FUEL PUMP RELAY (8W-30-9)
ASD RELAY (8W-30-16)



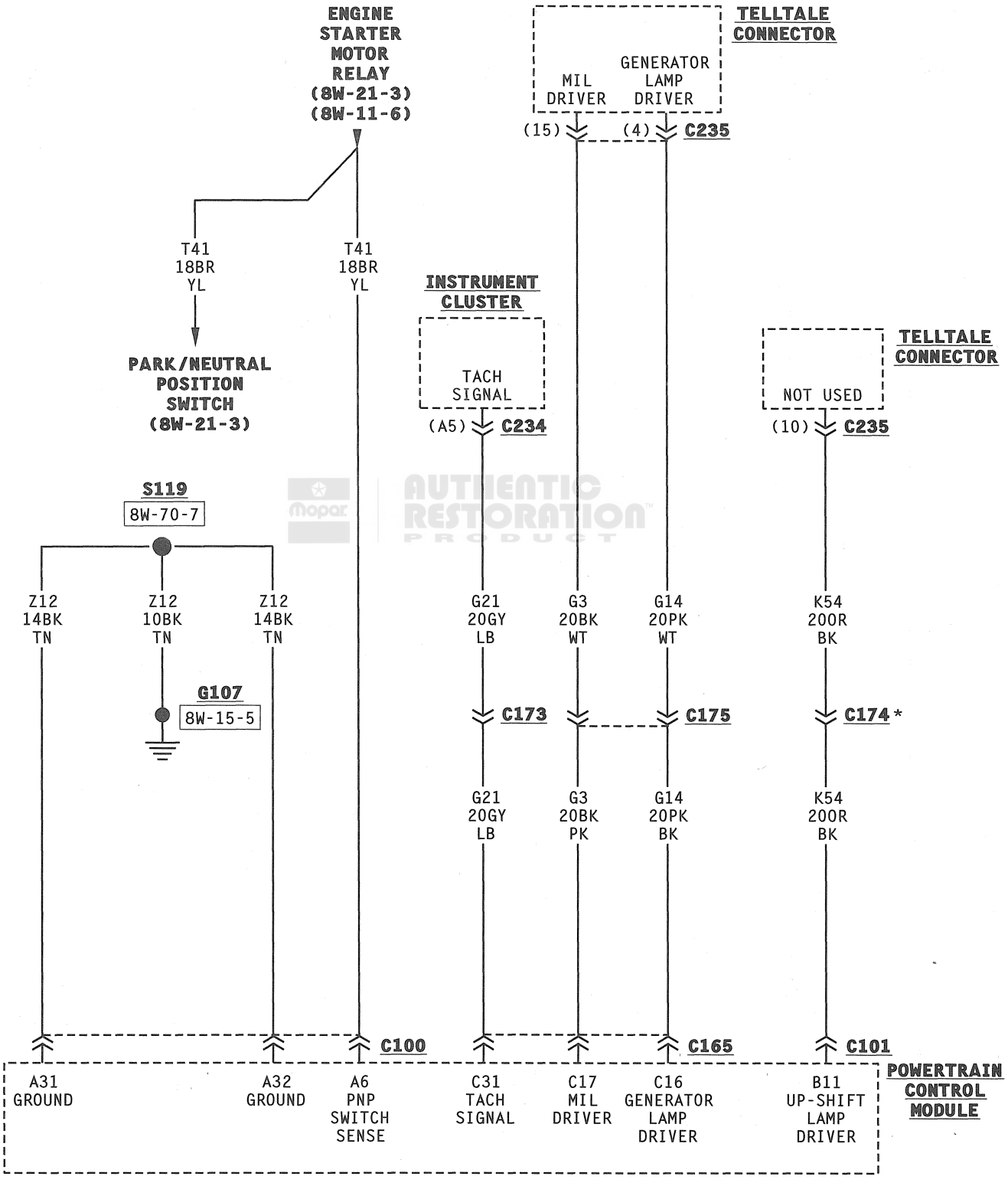
Mopar AUTHENTIC RESTORATION PRODUCT



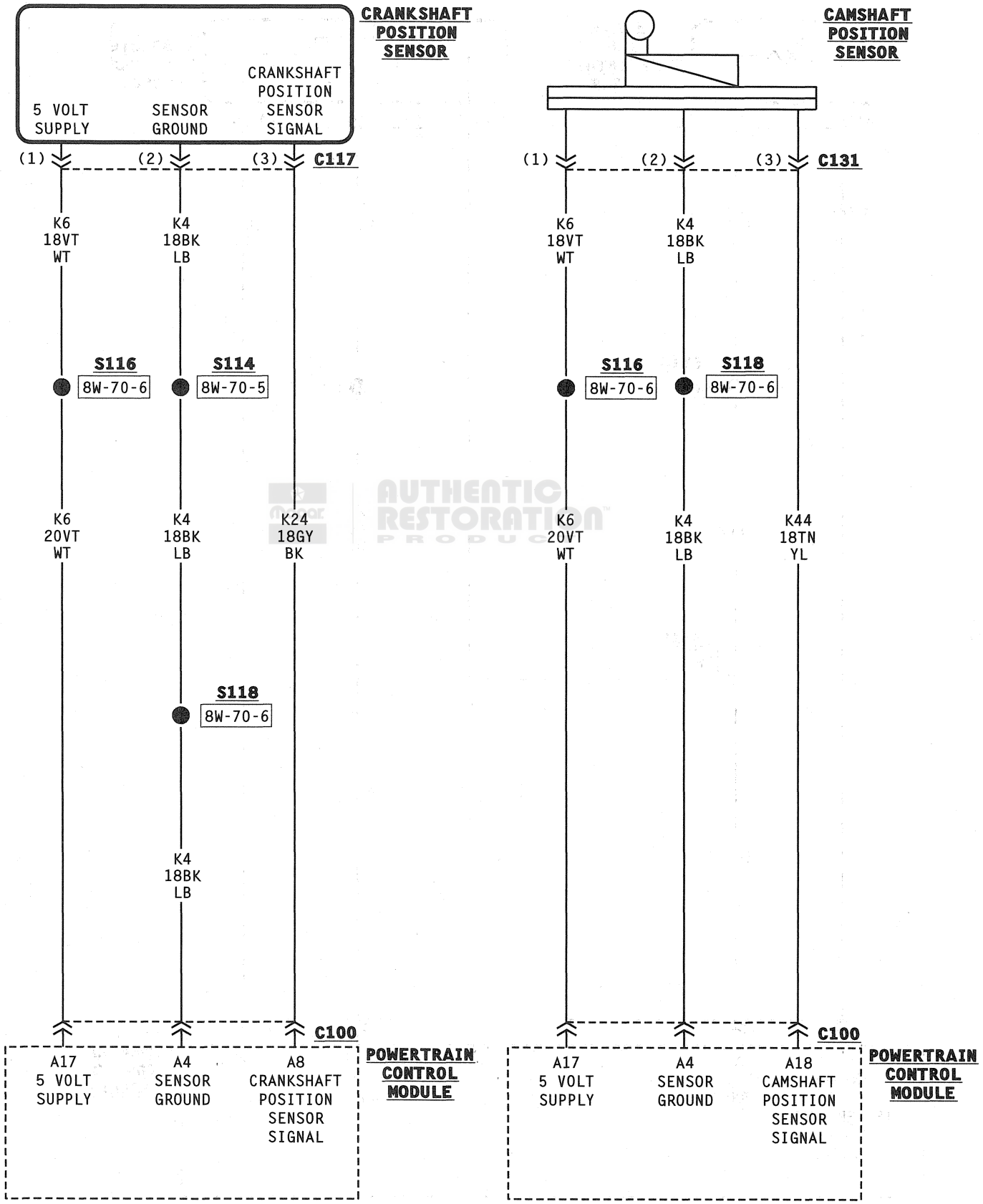
Mopar AUTHENTIC RESTORATION PROJECT



Mopar AUTHENTIC RESTORATION PRODUCT


ENGINE STARTER MOTOR RELAY (8W-21-3) (8W-11-6)
T41 18BR YL
T41 18BR YL
PARK/NEUTRAL POSITION SWITCH (8W-21-3)
S119
8W-70-7
Z12 14BK TN
Z12 10BK TN
Z12 14BK TN
G107
8W-15-5
INSTRUMENT CLUSTER
TACH SIGNAL
(A5) C234
TELLTALE CONNECTOR
MIL DRIVER
GENERATOR LAMP DRIVER
(15) (4) C235
TELLTALE CONNECTOR
NOT USED
(10) C235
G21 20GY LB
G3 20BK WT
G14 20PK WT
K54 200R BK
C173
C175
C174 *
G21 20GY LB
G3 20BK PK
G14 20PK BK
K54 200R BK
C100
C165
C101
A31 GROUND
A32 GROUND
A6 PNP SWITCH SENSE
C31 TACH SIGNAL
C17 MIL DRIVER
C16 GENERATOR LAMP DRIVER
B11 UP-SHIFT LAMP DRIVER
POWERTRAIN CONTROL MODULE

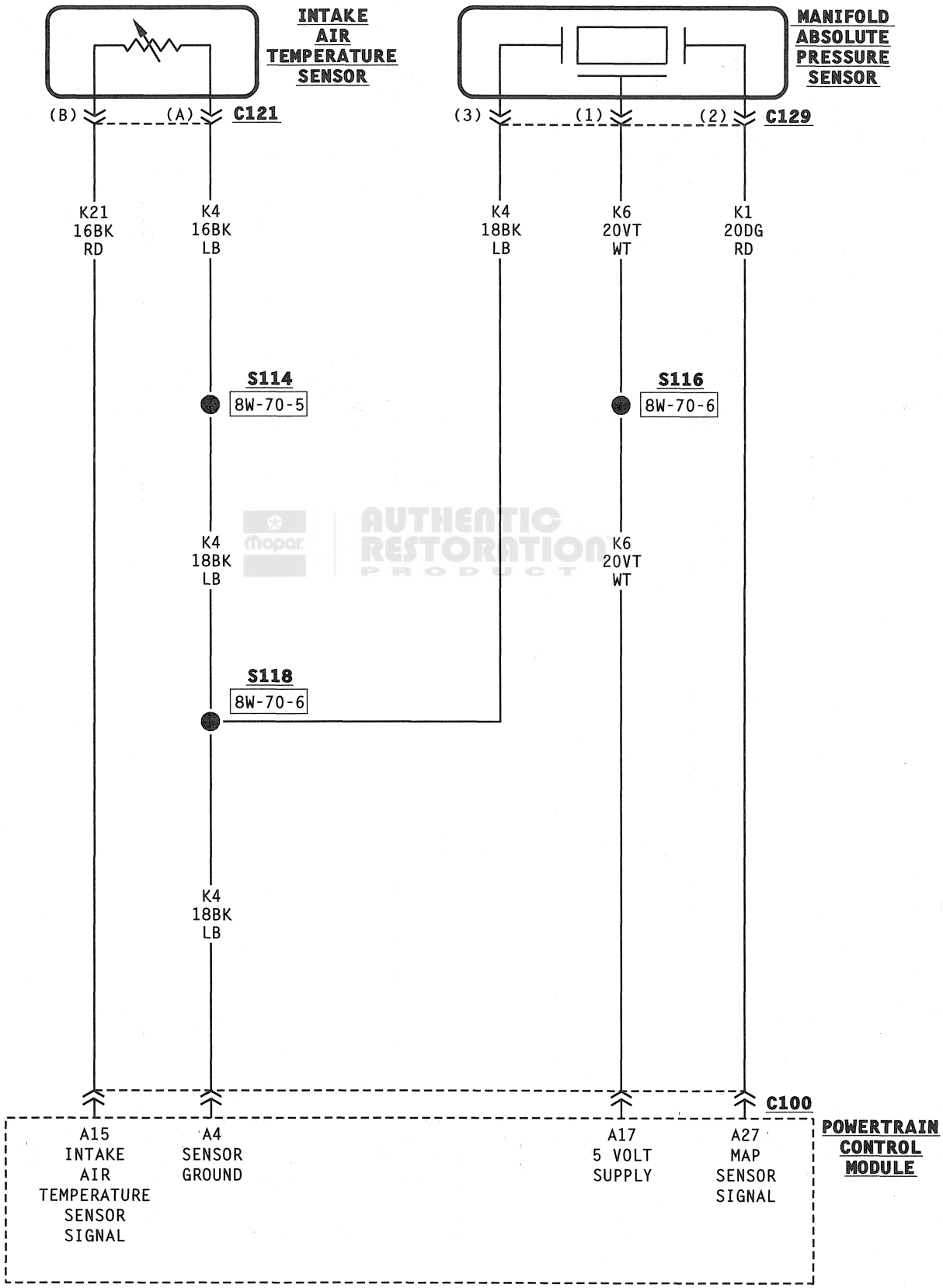
*NOT USED



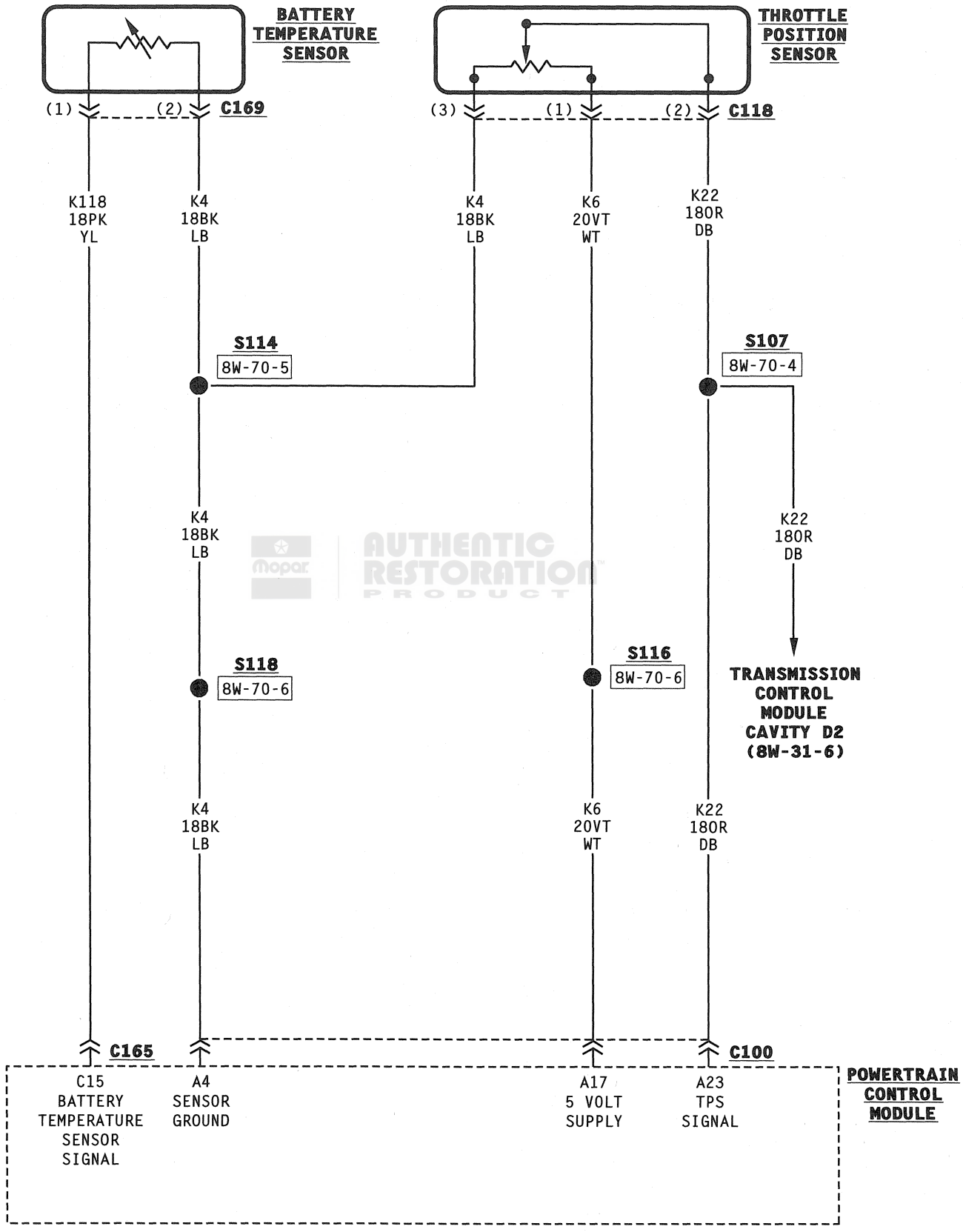
AUTHENTIC RESTORATION PRODUCTS

80409b82

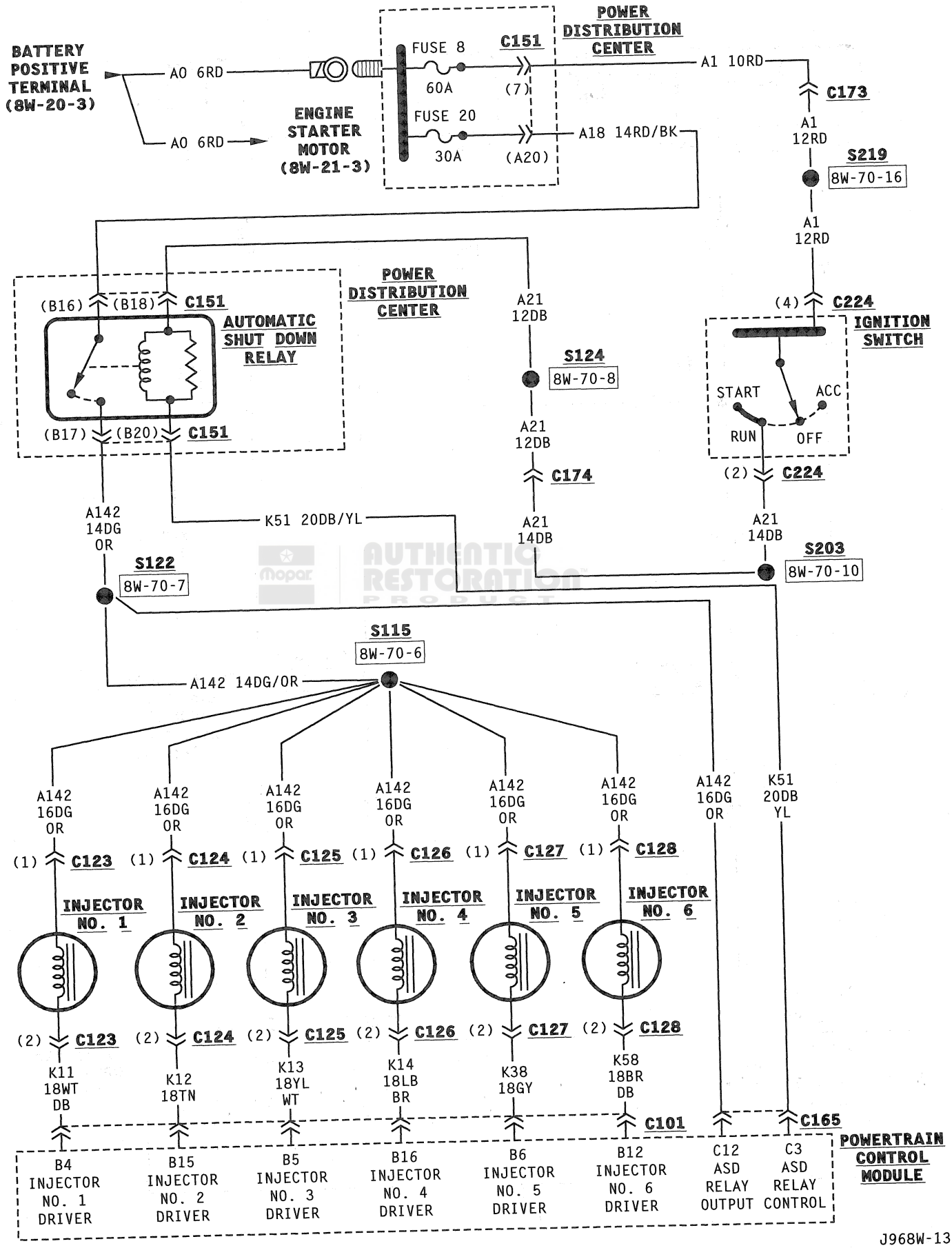
J968W-13



Mopar AUTHENTIC RESTORATION PRODUCT



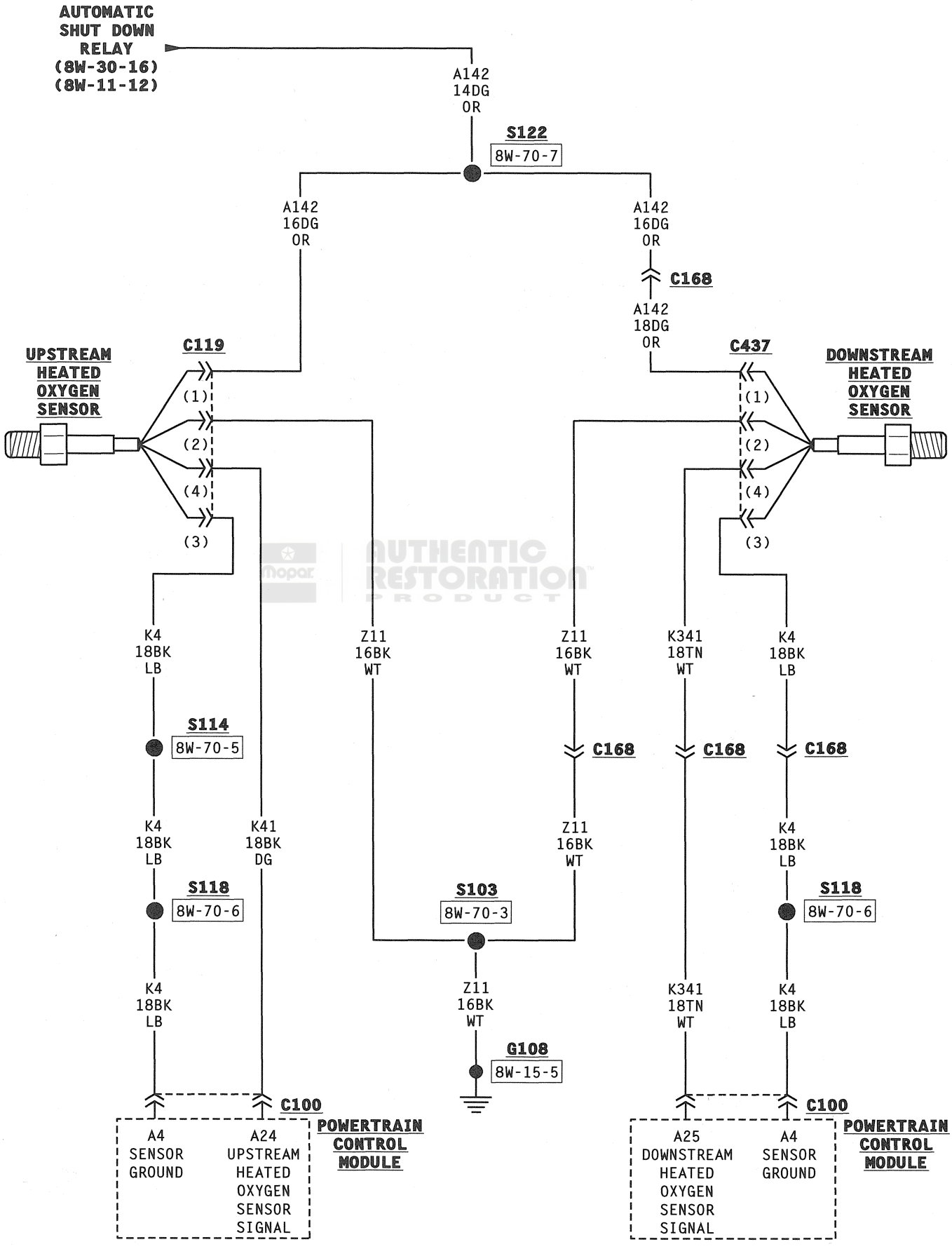
Mopar AUTHENTIC RESTORATION PRODUCT



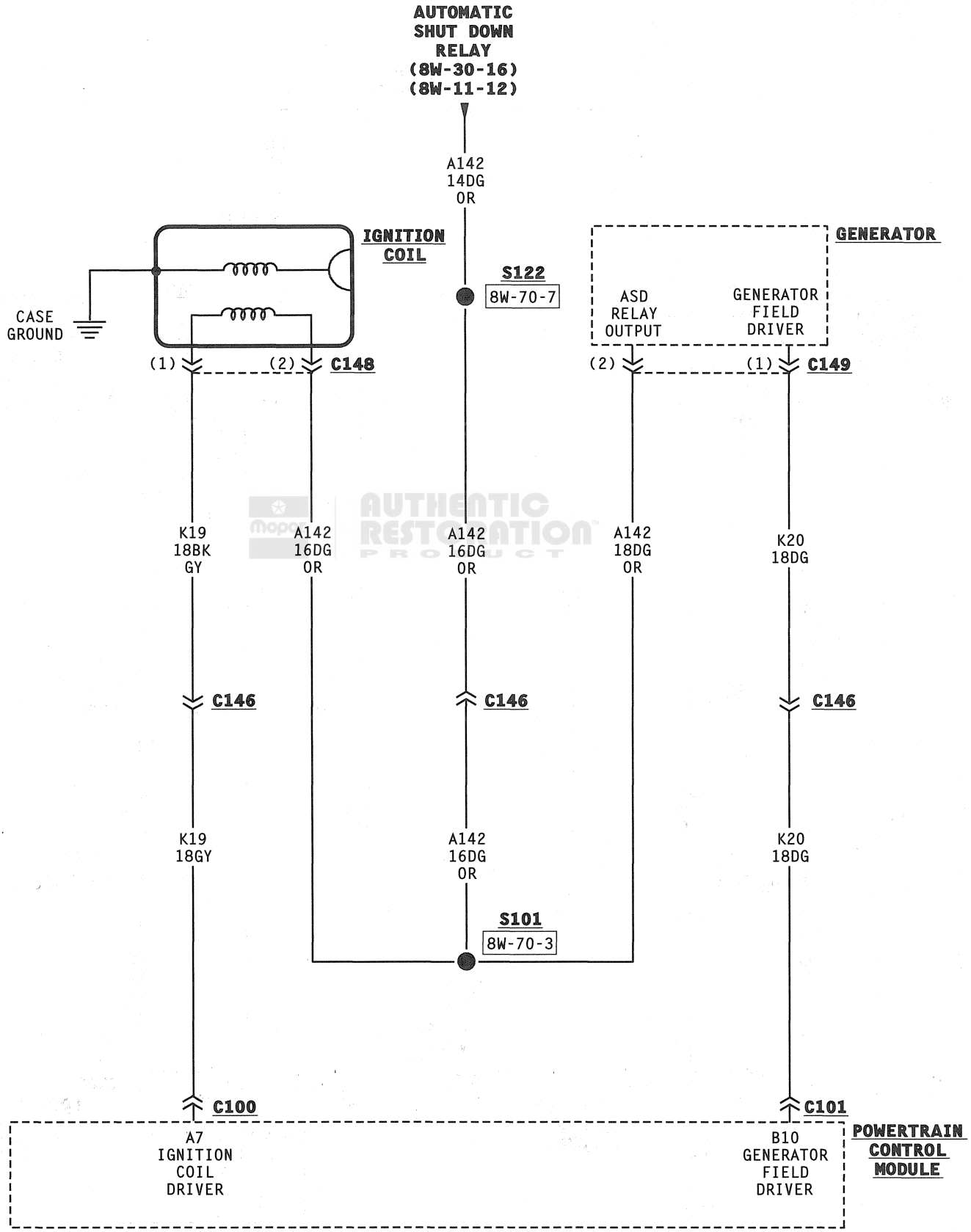
Mopar AUTHENTIC RESTORATION PARTS

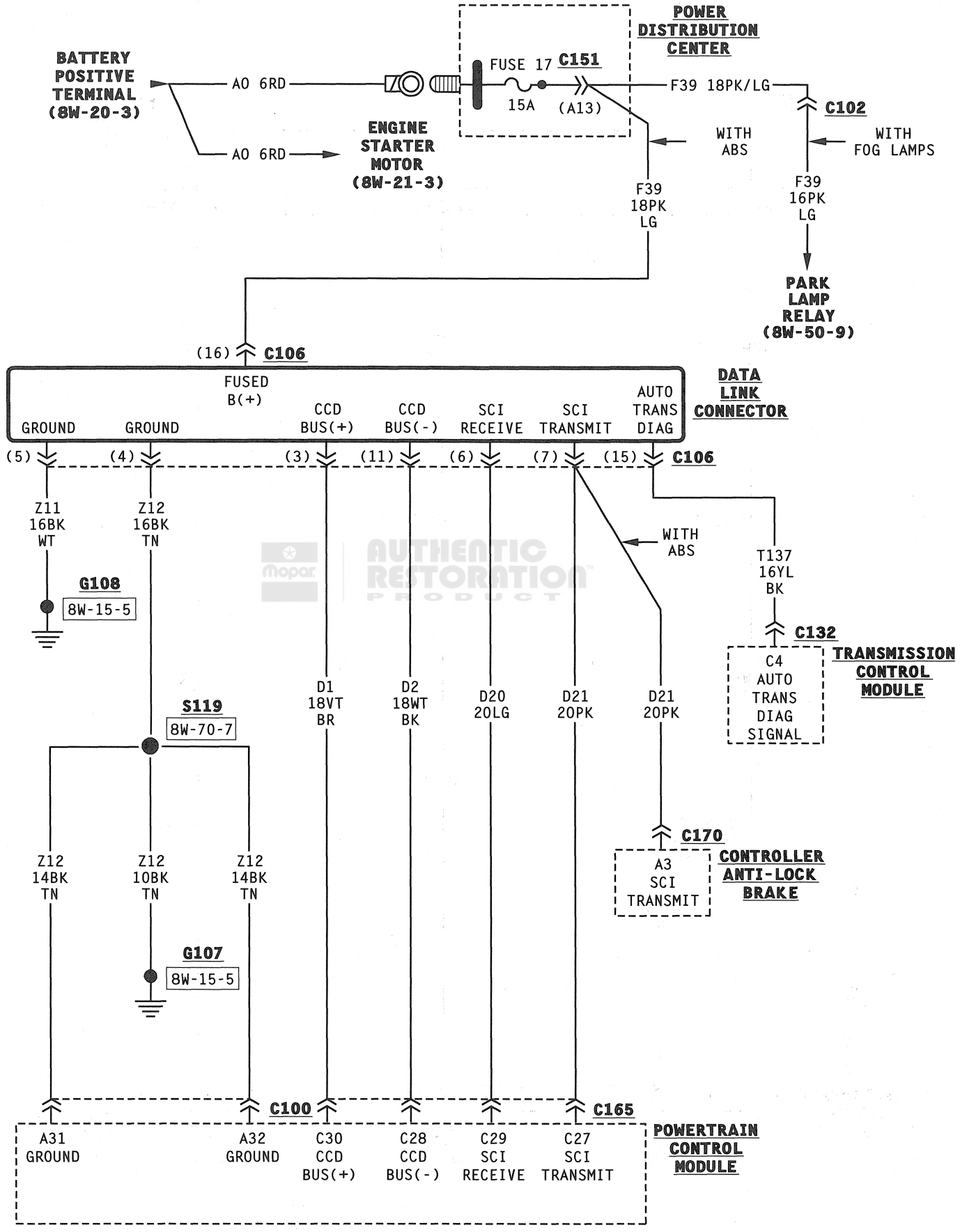
J968W-13

80409b85

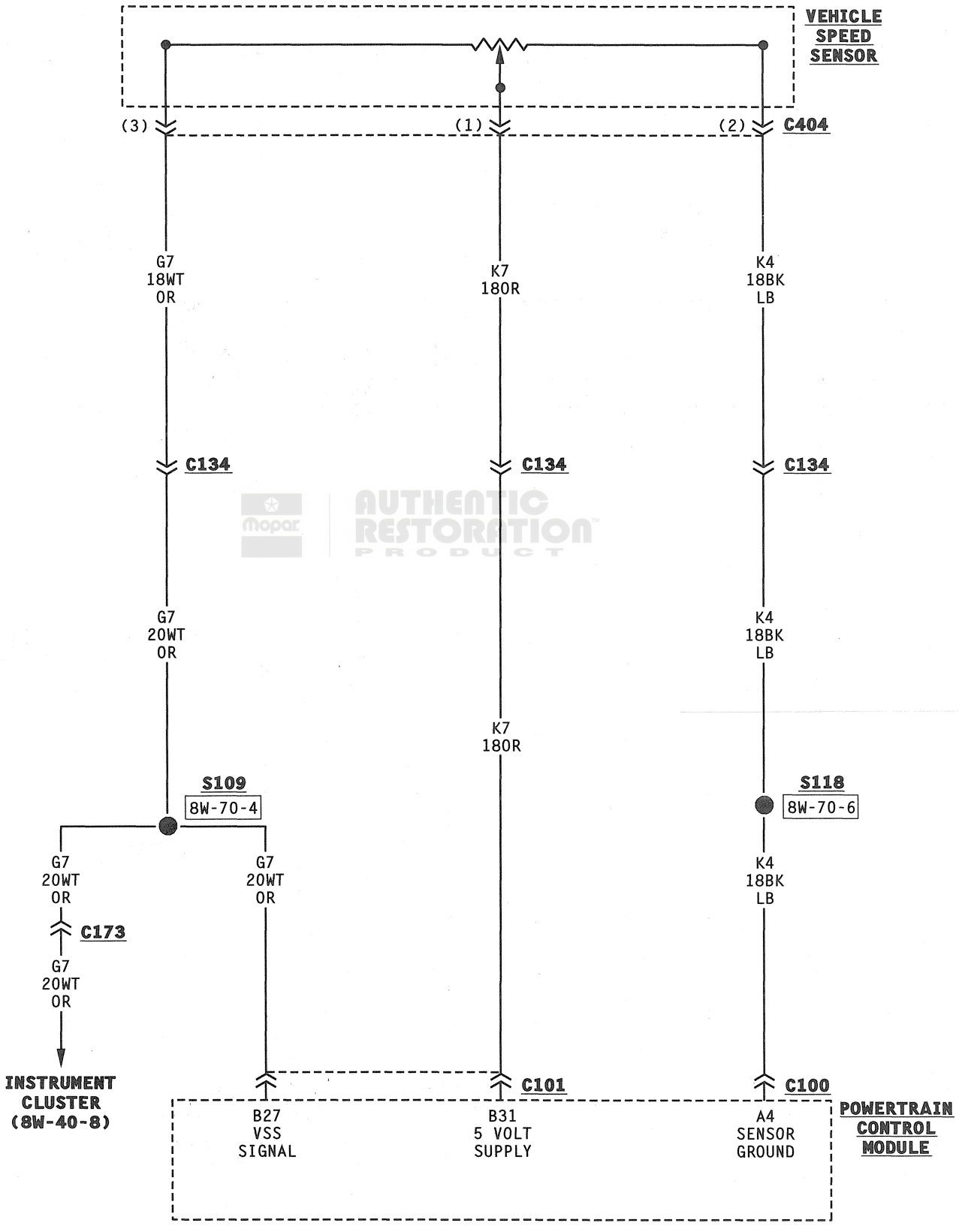


Mopar AUTHENTIC RESTORATION PRODUCT


AUTOMATIC SHUT DOWN RELAY (8W-30-16) (8W-11-12)
A142 14DG OR
IGNITION COIL
S122
8W-70-7
GENERATOR
ASD RELAY OUTPUT
GENERATOR FIELD DRIVER
CASE GROUND
(1)
(2)
C148
(2)
(1)
C149
K19 18BK GY
A142 16DG OR
A142 16DG OR
A142 18DG OR
K20 18DG
C146
C146
C146
K19 18GY
A142 16DG OR
K20 18DG
S101
8W-70-3
C100
C101
A7 IGNITION COIL DRIVER
B10 GENERATOR FIELD DRIVER
POWERTRAIN CONTROL MODULE



Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-31 TRANSMISSION CONTROL SYSTEM

DESCRIPTION AND OPERATION

FOUR-WHEEL DRIVE (4WD) SWITCH

When the 4WD switch CLOSES, circuit Z1 provides ground for the 4WD indicator lamp in the instrument cluster. Circuit F87 connects to the instrument cluster and supplies battery voltage to the 4WD indicator lamp. Circuit G107 connects the indicator lamp to the 4WD switch.

On vehicles equipped with the 4.0L engine and an automatic transmission, circuit G107 connects to the solenoid assembly in the transmission. Circuit G106 from the solenoid assembly provides ground during 4WD Full Time operation.

SHIFT INTERLOCK

The shift interlock prevents the operator from shifting the vehicle out of PARK unless the brake pedal is depressed. When the ignition switch is in the START or RUN position, circuit A21 feeds circuit F87 through fuse 26 in the fuse block. Circuit F87 provides splices to power the shift interlock.

When the brake pedal is not depressed, the stop lamp switch provides ground for interlock by connecting circuit K29 to ground circuit Z1. When grounded, the interlock prevents shifting the transmission out of PARK. When the brake pedal depresses, the stop lamp switch disconnects circuits K29 and Z1, removing ground from the shift interlock.

TRANSMISSION CONTROL MODULE—4.0L ENGINE ONLY

Vehicles equipped with the 4.0L engine have electronically controlled solenoids in the automatic transmission valve body.

The Transmission Control Module (TCM) receives inputs from the Throttle Position Sensor (TPS) on circuit K22 and the stop lamp switch on circuit K29. Circuit K4 connects to the TCM to provide ground for the TPS signal. The TCM receives the transmission output speed sensor signal on circuit T505. Circuit A14 from fuse 6 in the Power Distribution Center (PDC) supplies battery voltage to the TCM. Circuit Z1 provides ground for the TCM.

The TCM powers the S1 solenoid on circuit T510, the S2 solenoid on circuit T509, and the S3 solenoid on circuit T508. Circuit Z1 provides ground for the S1, S2, and S3 solenoids.

SCHEMATICS AND DIAGRAMS

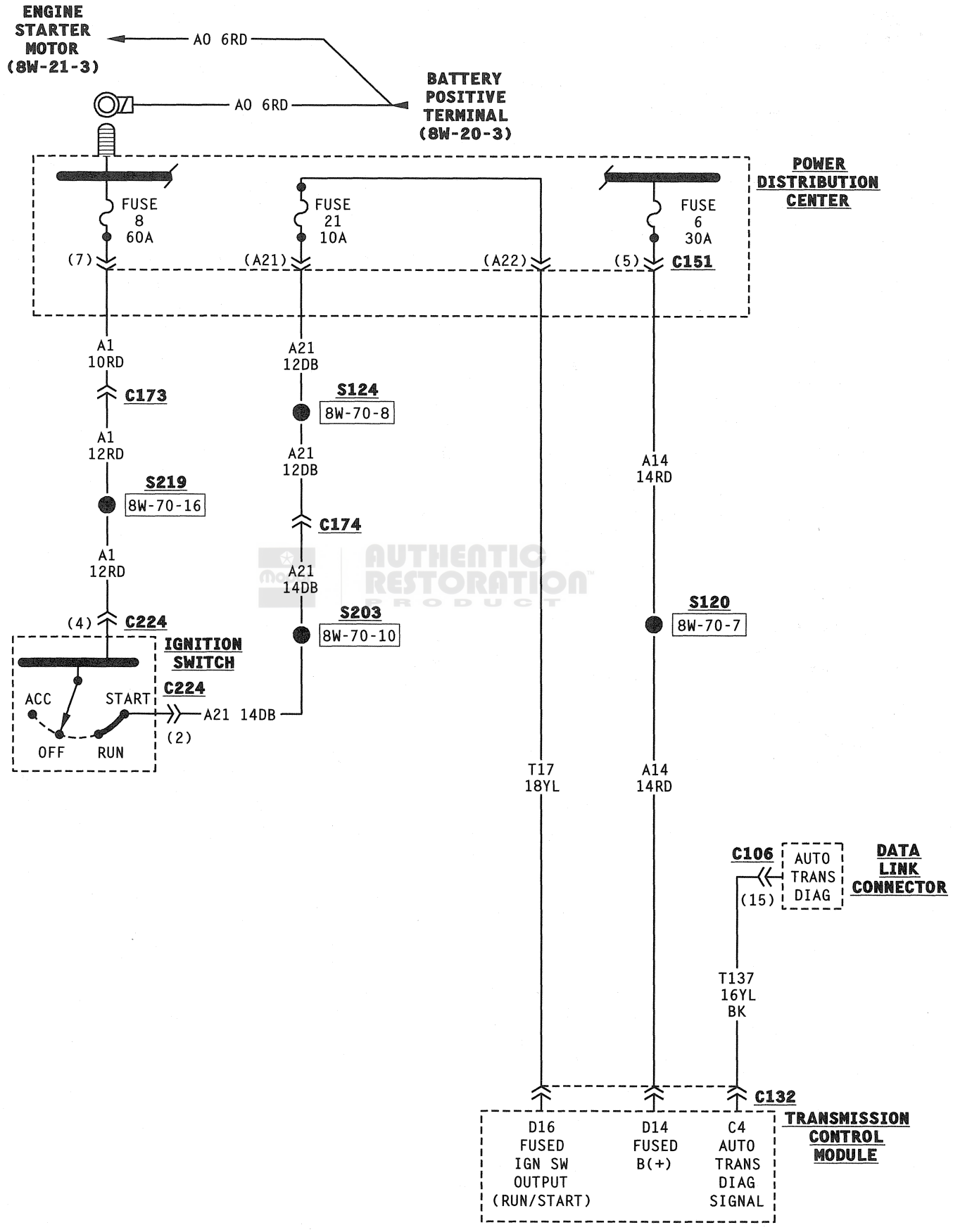
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

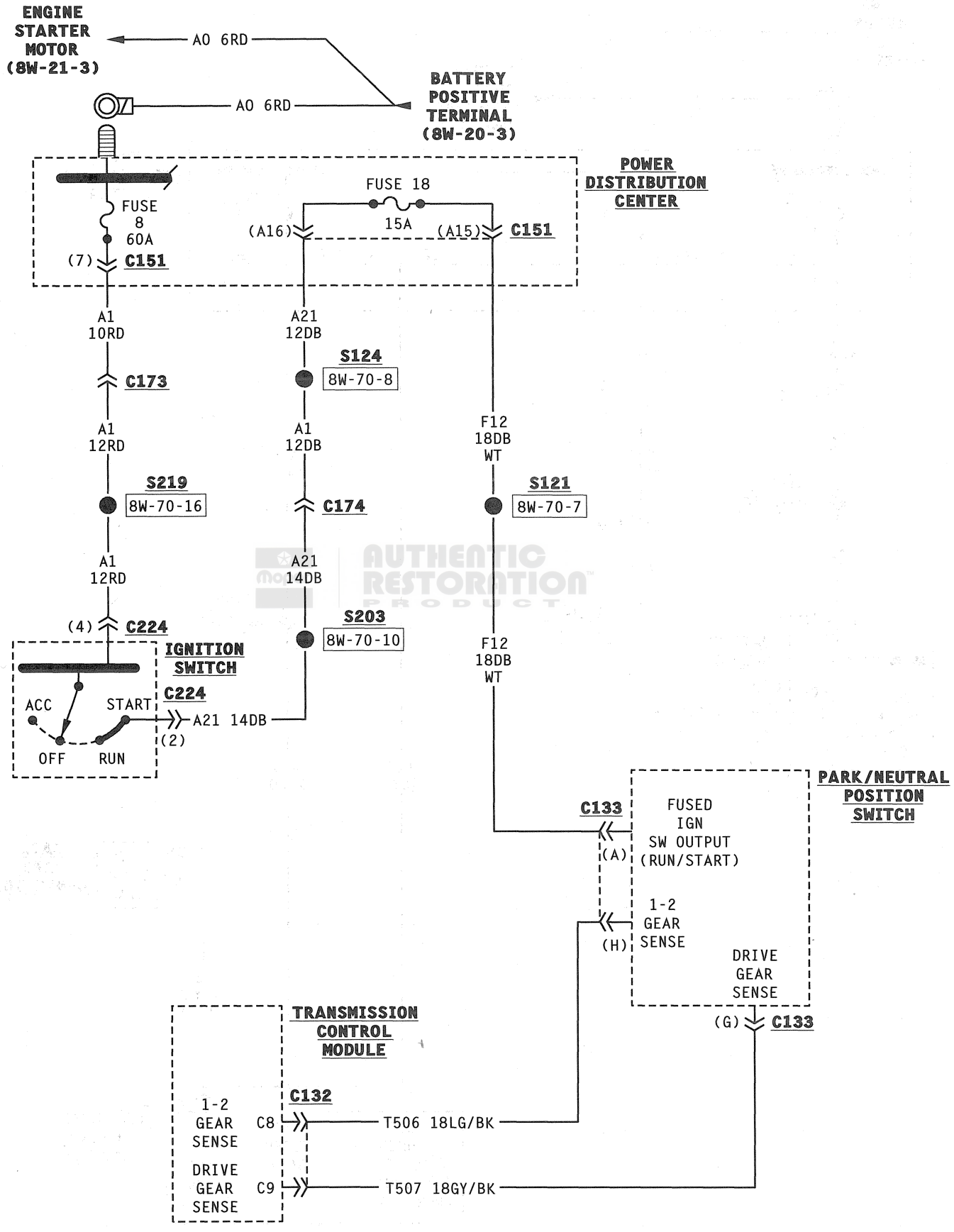
DIAGRAM INDEX

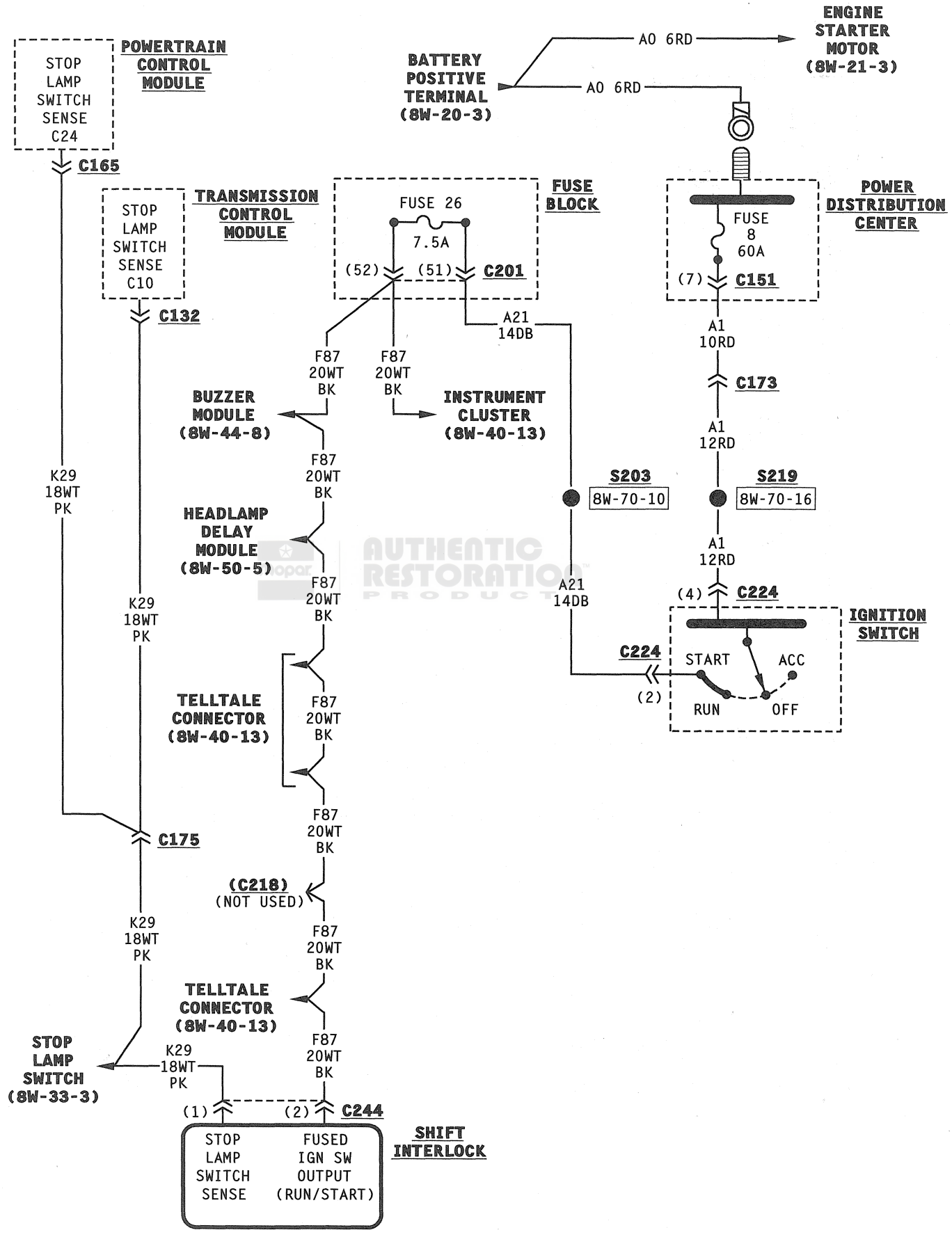
Component	Page
Data Link Connector	8W-31-3
Four Wheel Drive (4WD) Switch	8W-31-7
Fuse 26	8W-31-5
Fuse 6 (PDC)	8W-31-3, 7
Fuse 8 (PDC)	8W-31-3, 4, 5
Fuse 18 (PDC)	8W-31-4
Fuse 21 (PDC)	8W-31-3
Ignition Switch	8W-31-3, 4, 5
Park/Neutral Position Switch	8W-31-4
Powertrain Control Module	8W-31-5, 6
Shift Interlock	8W-31-5
Telltale Connector	8W-31-7
Throttle Position Sensor	8W-31-6
Transmission Control Module	8W-31-3, 4, 5, 6, 7
Valve Body Solenoids	8W-31-7

Mopar AUTHENTIC RESTORATION PRODUCT

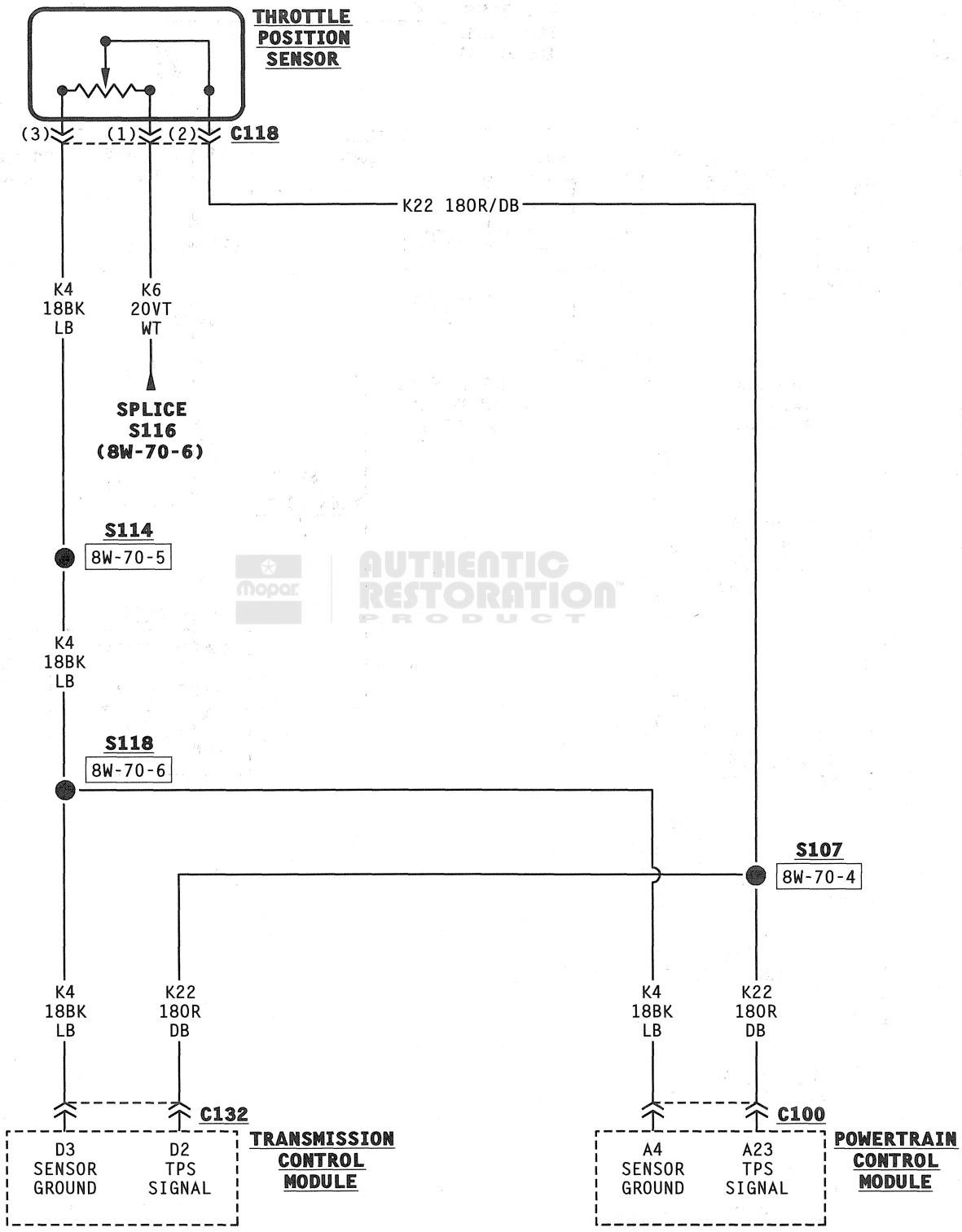


AUTHENTIC RESTORATION PRODUCT

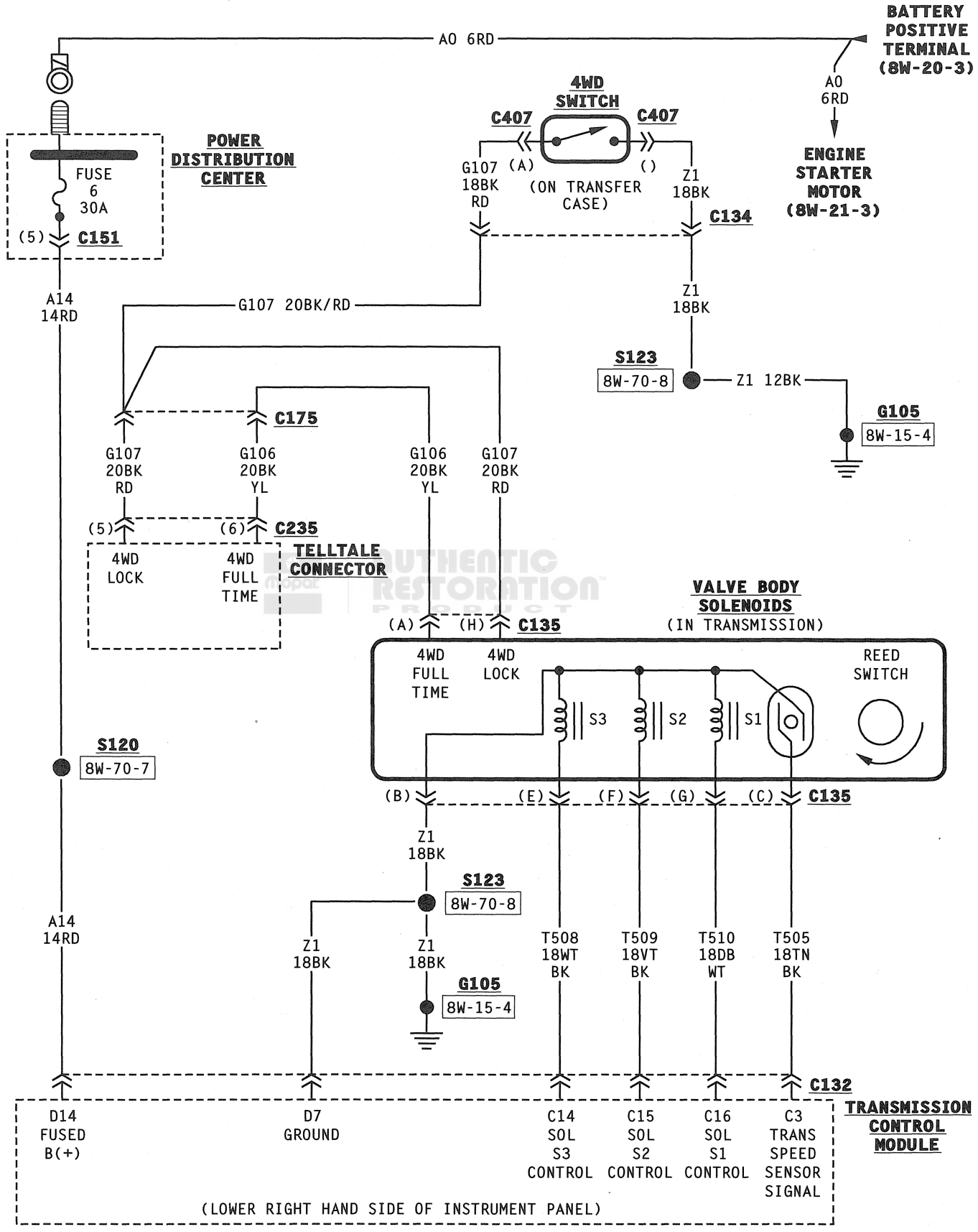

ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
FUSE 18 15A
(A16)
(A15) C151
A1 10RD
C173
A1 12RD
S219 8W-70-16
A1 12RD
(4) C224
IGNITION SWITCH
C224
ACC
START
OFF
RUN
(2)
A21 14DB
A21 12DB
S124 8W-70-8
A1 12DB
C174
A21 14DB
S203 8W-70-10
F12 18DB WT
S121 8W-70-7
F12 18DB WT
PARK/NEUTRAL POSITION SWITCH
C133
(A)
FUSED IGN SW OUTPUT (RUN/START)
(H)
1-2 GEAR SENSE
DRIVE GEAR SENSE
(G) C133
TRANSMISSION CONTROL MODULE
C132
1-2 GEAR SENSE C8
T506 18LG/BK
DRIVE GEAR SENSE C9
T507 18GY/BK



Mopar AUTHENTIC RESTORATION PRODUCTS



Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
4WD SWITCH
C407
C407
G107 18BK RD
(A)
()
(ON TRANSFER CASE)
Z1 18BK
C134
POWER DISTRIBUTION CENTER
FUSE 6 30A
(5) C151
A14 14RD
G107 20BK/RD
Z1 18BK
S123 8W-70-8
Z1 12BK
G105 8W-15-4
C175
G107 20BK RD
G106 20BK YL
G106 20BK YL
G107 20BK RD
(5)
(6)
C235
TELLTALE CONNECTOR
4WD LOCK
4WD FULL TIME
VALVE BODY SOLENOIDS (IN TRANSMISSION)
(A)
(H)
C135
4WD FULL TIME
4WD LOCK
REED SWITCH
S3
S2
S1
S120 8W-70-7
(B)
(E)
(F)
(G)
(C)
C135
Z1 18BK
S123 8W-70-8
A14 14RD
Z1 18BK
Z1 18BK
G105 8W-15-4
T508 18WT BK
T509 18VT BK
T510 18DB WT
T505 18TN BK
C132
TRANSMISSION CONTROL MODULE
D14 FUSED B(+)
D7 GROUND
C14 SOL S3 CONTROL
C15 SOL S2 CONTROL
C16 SOL S1 CONTROL
C3 TRANS SPEED SENSOR SIGNAL
(LOWER RIGHT HAND SIDE OF INSTRUMENT PANEL)

8W-33 VEHICLE SPEED CONTROL

DESCRIPTION AND OPERATION

VEHICLE SPEED CONTROL

The Powertrain Control Module (PCM) operates the vehicle speed control system. The vehicle speed control switches are located in the steering wheel.

Circuit V32 from cavity C11 of the PCM supplies 12 volts to the Light Emitting Diode (LED) used for the speed control indicator lamp and the vehicle speed control switches. Circuit V32 also connects to circuit V30 through the stop lamp switch. Circuit V30 powers the vehicle speed control servo.

Circuit V33 from PCM cavity C32 connects to the vehicle speed control switches. The switches are wired in parallel and each contains a separate resistor. The voltage level present on circuit V33 (at PCM cavity C32) depends on which speed control switch is selected. Circuit K4 from PCM cavity A4 supplies ground for the speed control switches.

- When the ON/OFF switch is open, the voltage level on circuit V33 at PCM cavity C32 has a nominal value of 5.0 volts with a range from 4.8 to 5.0 volts.
- When the ON/OFF switch closes, the voltage level on circuit V33 at PCM cavity C32 has nominal value of 1.51 volts with a range from 1.31 to 1.61 volts.
- When the SET/COAST switch closes, the voltage level on circuit V33 at PCM cavity C32 has nominal value of 3.8 volts with a range from 3.6 to 3.9 volts.
- When the RESUME/ACCEL switch closes, the voltage level on circuit V33 at PCM cavity C32 has nominal value of 4.4 volts with a range from 4.2 to 4.5 volts.

The PCM controls the vent and vacuum functions of the vehicle speed control servo on circuits V35 and V36. Depending on the signal it receives from vehicle speed control switches, the PCM either applies vacuum to or vents vacuum from the servo. Circuit V36 from cavity C4 of the PCM sends the vacuum signal to the servo. Circuit V35 from cavity C5 sends the vent signal.

Circuit K29 provides the stop lamp switch sense input to the PCM at cavity C24. The stop lamp switch connects circuit K29 to ground on circuit Z1. When the brake pedal is depressed, the stop lamp switch opens and disconnects circuits K29 and Z1, and circuits V32 and V30. When the stop lamp switch disconnects circuits V32 and V30, power is removed from the speed control servo.

HELPFUL INFORMATION

Circuit K4 also provides ground for some of the engine control sensors that provide inputs to the PCM.

SCHEMATICS AND DIAGRAMS

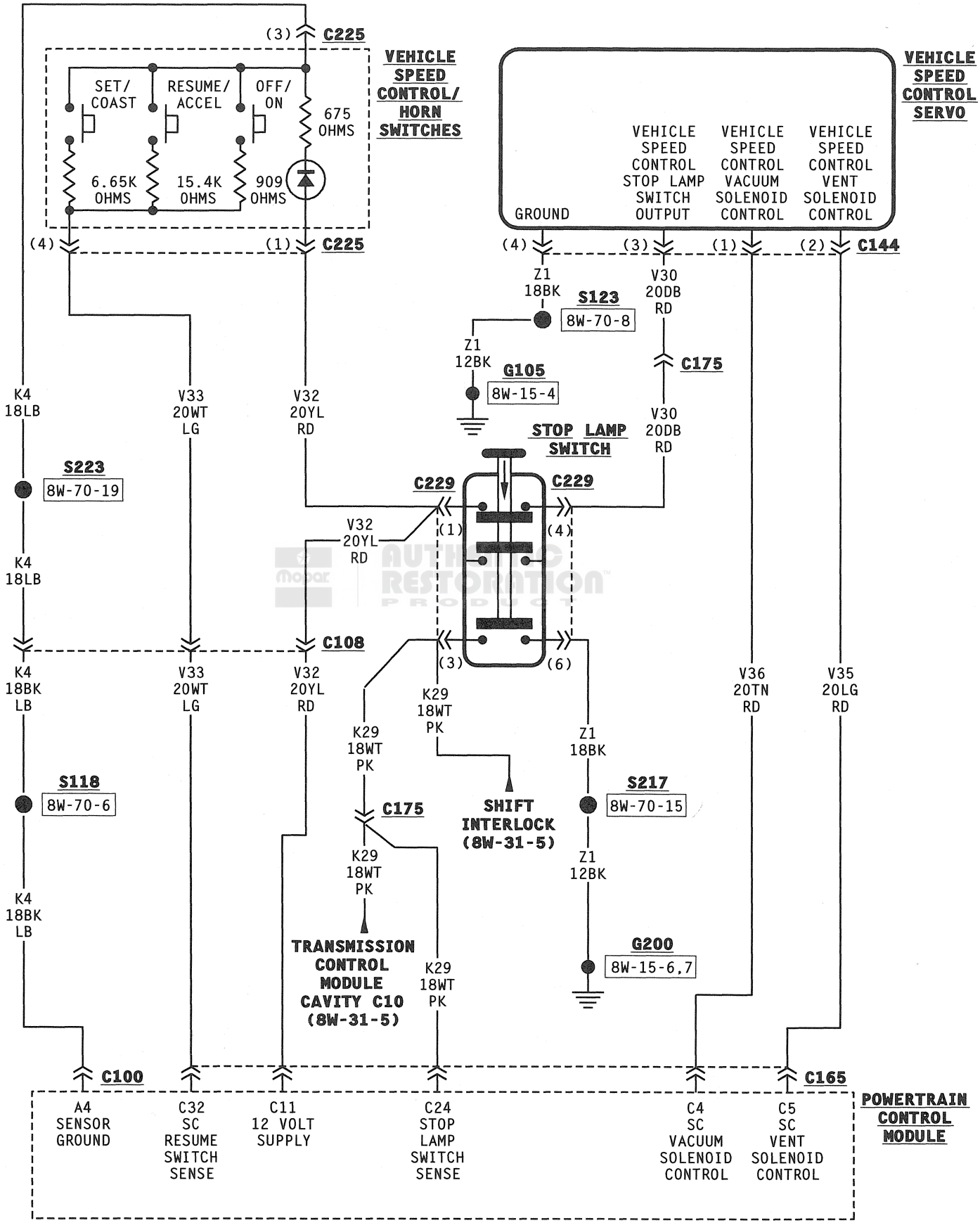
WIRING DIAGRAM INDEX

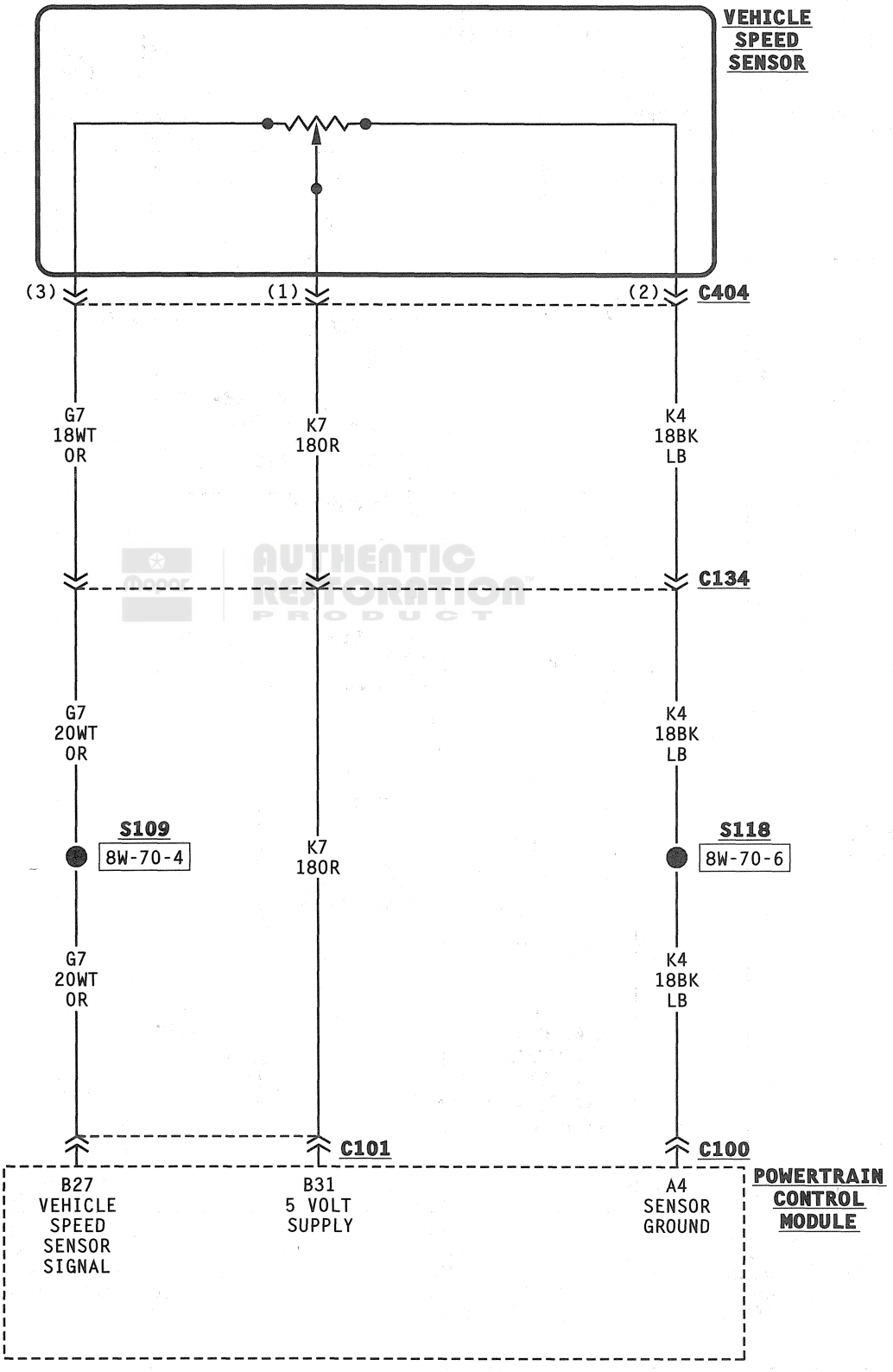
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Powertrain Control Module	8W-33-3, 4
Stop Lamp Switch	8W-33-3
Transmission Control Module	8W-33-3
Vehicle Speed Control And Horn Switches	8W-33-3
Vehicle Speed Control Servo	8W-33-3
Vehicle Speed Sensor	8W-33-4

Mopar AUTHENTIC RESTORATION PRODUCT


(3) C225
VEHICLE SPEED CONTROL/ HORN SWITCHES
SET/ COAST
RESUME/ ACCEL
OFF/ ON
675 OHMS
6.65K OHMS
15.4K OHMS
909 OHMS
(4)
(1) C225
VEHICLE SPEED CONTROL SERVO
GROUND
VEHICLE SPEED CONTROL STOP LAMP SWITCH OUTPUT
VEHICLE SPEED CONTROL VACUUM SOLENOID CONTROL
VEHICLE SPEED CONTROL VENT SOLENOID CONTROL
(4) (3) (1) (2) C144
Z1 18BK
S123
8W-70-8
V30 20DB RD
Z1 12BK
G105
8W-15-4
C175
V30 20DB RD
STOP LAMP SWITCH
K4 18LB
V33 20WT LG
V32 20YL RD
S223
8W-70-19
C229
C229
V32 20YL RD
(1)
(4)
K4 18LB
C108
(3)
(6)
K4 18BK LB
V33 20WT LG
V32 20YL RD
K29 18WT PK
V36 20TN RD
V35 20LG RD
K29 18WT PK
Z1 18BK
S118
8W-70-6
C175
SHIFT INTERLOCK (8W-31-5)
S217
8W-70-15
K29 18WT PK
Z1 12BK
K4 18BK LB
TRANSMISSION CONTROL MODULE CAVITY C10 (8W-31-5)
K29 18WT PK
G200
8W-15-6,7
C100
C165
A4 SENSOR GROUND
C32 SC RESUME SWITCH SENSE
C11 12 VOLT SUPPLY
C24 STOP LAMP SWITCH SENSE
C4 SC VACUUM SOLENOID CONTROL
C5 SC VENT SOLENOID CONTROL
POWERTRAIN CONTROL MODULE


VEHICLE SPEED SENSOR
(3)
(1)
(2)
C404
G7 18WT OR
K7 18OR
K4 18BK LB
C134
G7 20WT OR
K4 18BK LB
S109
8W-70-4
K7 18OR
S118
8W-70-6
G7 20WT OR
K4 18BK LB
C101
C100
B27 VEHICLE SPEED SENSOR SIGNAL
B31 5 VOLT SUPPLY
A4 SENSOR GROUND
POWERTRAIN CONTROL MODULE

8W-35 ALL-WHEEL ANTI-LOCK BRAKES

INDEX

page

DESCRIPTION AND OPERATION
ABS MAIN RELAY 1
ABS PUMP MOTOR RELAY 1
ABS WARNING LAMP 2
DATA LINK CONNECTOR 2
G-SWITCH 1
HYDRAULIC CONTROL UNIT 2
INTRODUCTION 1
STOP LAMP SWITCH INPUT 2
WHEEL SPEED SENSORS 1
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

INTRODUCTION

Four fuses supply power for the Anti-Lock Brake System (ABS); fuses 5, 8 and 14 in the Power Distribution Center (PDC) and fuse 18 in the fuse block. Fuses 5, 8 and 14 in the PDC are connected directly to battery voltage and are HOT all times. Fuse 18 in the fuse block is HOT when the ignition switch is the RUN Position.

In the RUN position, the ignition switch connects circuit A1 from fuse 8 in the PDC with circuit A38. Circuit A38 connects to a bus bar in the fuse block. The bus bar feeds circuit B236 through fuse 18. Fuse 18 is a 2 amp fuse.

Circuit B236 connects to the coil side of the ABS main relay and the Controller, Anti-Lock Brakes (CAB).

Circuit Z1 provides ground for the CAB. Circuit Z1 connects to cavities B14 and B13 of the CAB.

Refer to group 5, Brakes for operational descriptions of ABS system components.

WHEEL SPEED SENSORS

The all wheel anti-lock system uses four wheel speed sensors; one for each wheel. Each sensor converts wheel speed into an electrical signal that it transmits to the Controller, Anti-Lock Brakes (CAB). A pair of twisted wires connect to each sensor to provide signals to the CAB.

Circuits B6 and B7 provide signals to the CAB from the right front wheel speed sensor. Circuit B6 which provides the LOW signal connects to cavity B2 of the CAB. Circuit B7 connects to cavity B1 of the CAB and provides the HIGH signal.

Circuits B8 and B9 provide signals to the CAB from the left front wheel speed sensor. Circuit B8, which provides the LOW signal, connects to cavity B10 of the CAB. Circuit B9 connects to cavity B9 of the CAB and provides the HIGH signal.

Circuits B1 and B2 provide signals to the CAB from right rear wheel speed sensor. Circuit B1 which provides the LOW signal connects to cavity A12 of the CAB. Circuit B2 connects to cavity A11 and provides the HIGH signal.

Circuits B4 and B3 provide signals to the CAB from the left rear wheel speed sensor. Circuit B3, which provides the LOW signal, connects to cavity A9 of the CAB. Circuit B4 connects to cavity A10 and provides the HIGH signal.

G-SWITCH

During four-wheel drive operation, the G-switch provides deceleration data to the Controller, Anti-Lock Brakes (CAB). Refer to Group 5, Brakes for additional information.

Circuits B515, B516, and B517 connect the acceleration switch to the CAB. Circuits B515 and B516 provide switch states while circuit B517 provides ground. At the CAB, circuit B515 connects to cavity A6, circuit B516 connects to cavity A7 and circuit B517 connects to cavity A2.

ABS MAIN RELAY

The ABS main relay is located in the Power Distribution Center (PDC). When the Controller, Anti-Lock Brakes (CAB) grounds the ABS main relay on circuit B207, the relay switches to connect circuit A20 from PDC fuse 14 to circuit B235. Circuit B236 from fuse 18 in the fuse block splices to feed the coil side of the ABS main relay. Circuit B207 connects to cavity B11 of the CAB.

Circuit B235 is double crimped at the ABS main relay. One branch of circuit B235 supplies power to the coil side of the ABS pump motor relay. The other branch of circuit B235 splices to the ABS diode, cavity B5 of the CAB and to the hydraulic control unit.

ABS PUMP MOTOR RELAY

The ABS pump motor relay in the power distribution center (PDC) supplies voltage to the ABS pump motor. When the ABS main relay energizes, circuit B235 supplies battery voltage to the coil side of the ABS pump motor relay. The Controller, Anti-Lock

DESCRIPTION AND OPERATION (Continued)

Brakes (CAB) provides ground for the relay on circuit B116. Circuit B116 connects to cavity B7 of the CAB.

When the ABS pump motor energizes, it connects circuit A10 from PDC fuse 5 to circuit B233. Circuit B233 supplies battery voltage to the pump motor. Circuit Z12 provides ground for the pump motor.

HYDRAULIC CONTROL UNIT

When the ABS main relay energizes, two branches of circuit B235 splice to supply voltage to the isolation and dump solenoids in the hydraulic control unit. The hydraulic control unit contains three separate isolation solenoids and three separate dump solenoids. The Controller, Anti-Lock Brakes (CAB) activates the dump and isolation solenoids by providing separate ground paths for each.

The CAB provides a ground path for the rear isolation solenoid on circuit B251. Circuit B251 connects to cavity B4 of the CAB.

For the right front isolation solenoid, the CAB provides a ground path on circuit B249. Circuit B249 connects to cavity B15 of the CAB.

On circuit B245, the CAB provides ground for the left front isolation solenoid. Circuit B245 connects to cavity B18 of the CAB.

The CAB provides a ground path for the rear dump solenoid on circuit B254. Circuit B254 connects to cavity B12 of the CAB.

For the right front dump solenoid, the CAB provides a ground path on circuit B248. Circuit B248 connects to cavity B6 of the CAB.

On circuit B243, the CAB provides ground for the left dump solenoid. Circuit B243 connects to cavity B8 of the CAB.

ABS WARNING LAMP

Circuit F87 provides power for the ABS warning lamp at the instrument cluster. Ground for the ABS warning lamp is provided by either the Controller, Anti-Lock Brakes (CAB) or by the ABS main relay when the relay is not energized. The CAB illuminates the lamp by providing ground on circuit B205.

Circuit B205 splices to connect to circuit B235 through a diode. When the ABS main relay is not energized, it connects circuit B235 to circuit Z12. The ground path for the warning lamp is through the diode to circuit B235, through the ABS main relay to ground on circuit Z12.

The diode between circuit B205 and B235 prevents voltage from flowing to the CAB when the ABS main relay switches to supply power on circuit B235.

STOP LAMP SWITCH INPUT

Circuit L50 from the stop lamp switch provides the brake switch input to the Controller, Anti-Lock Brakes (CAB). When the brake pedal is depressed, the stop lamp switch closes to supply battery voltage from circuit L9 to circuit L50. Circuit L50 connects to cavity A8 of the CAB. Circuit L9 originates at fuse 2 in the Power Distribution Center (PDC).

DATA LINK CONNECTOR

Circuit D21 from cavity A3 of the Controller, Anti-Lock Brakes (CAB) transmits data to the DRB scan tool through the data link connector. Circuit D21 is double crimped at the data link connector and connects to cavity C27 of the Powertrain Control Module (PCM).

Through the data link connector, circuits Z11 and Z12 provide ground for the DRB scan tool.

Circuit F39 from fuse 17 in the Power Distribution Center (PDC) powers supplies battery voltage to the scan tool through the diagnostic connector.

SCHEMATICS AND DIAGRAMS

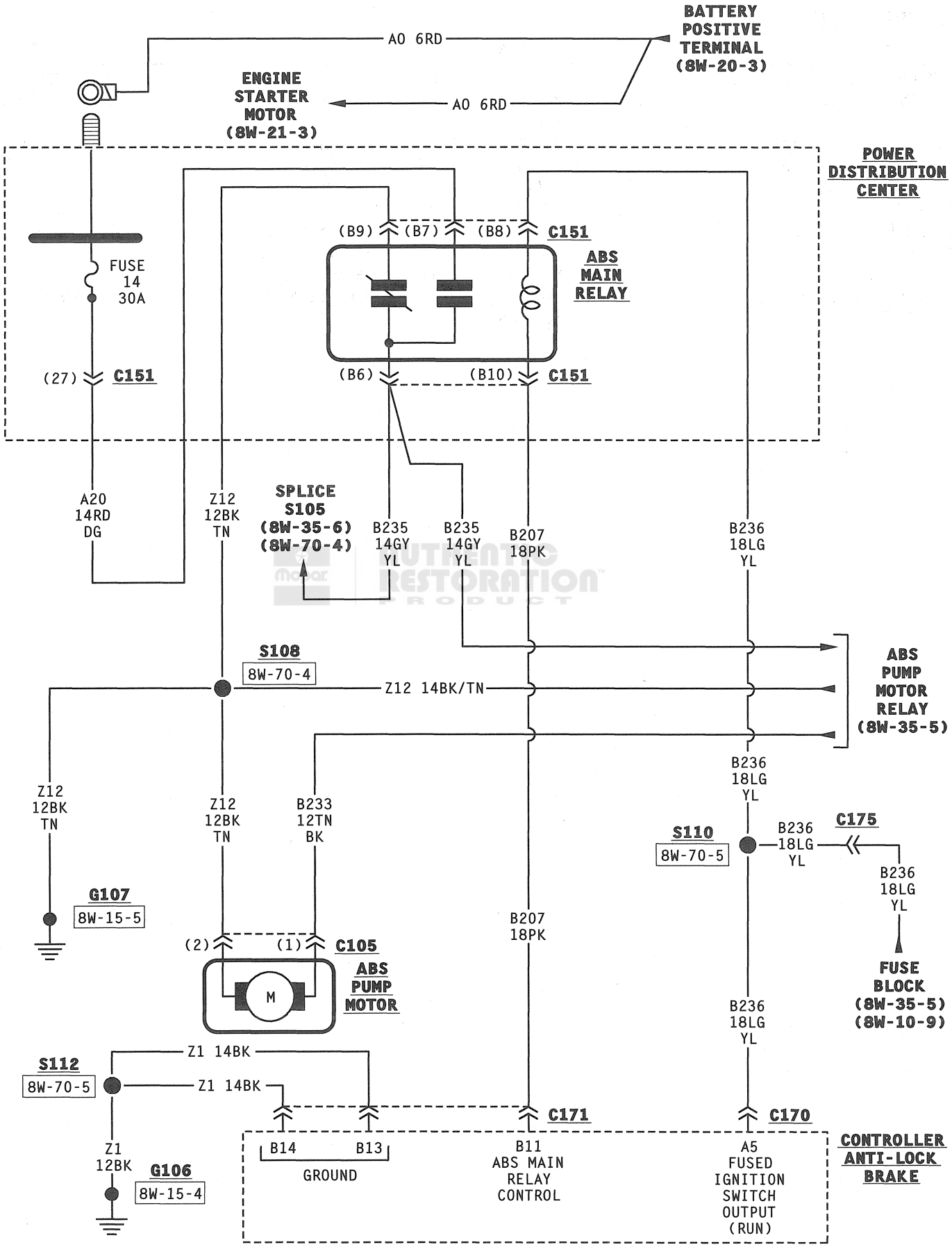
WIRING DIAGRAM INDEX

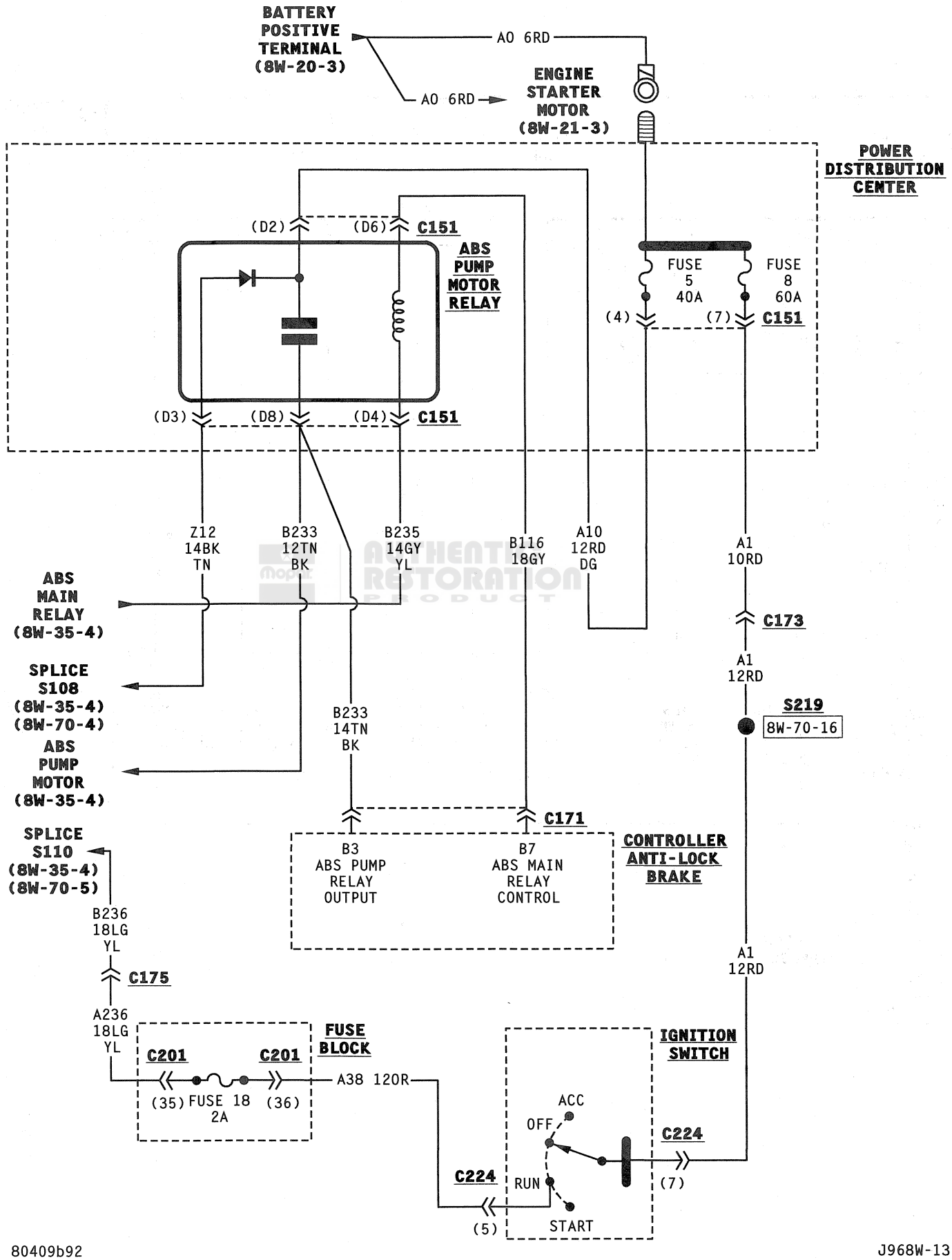
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

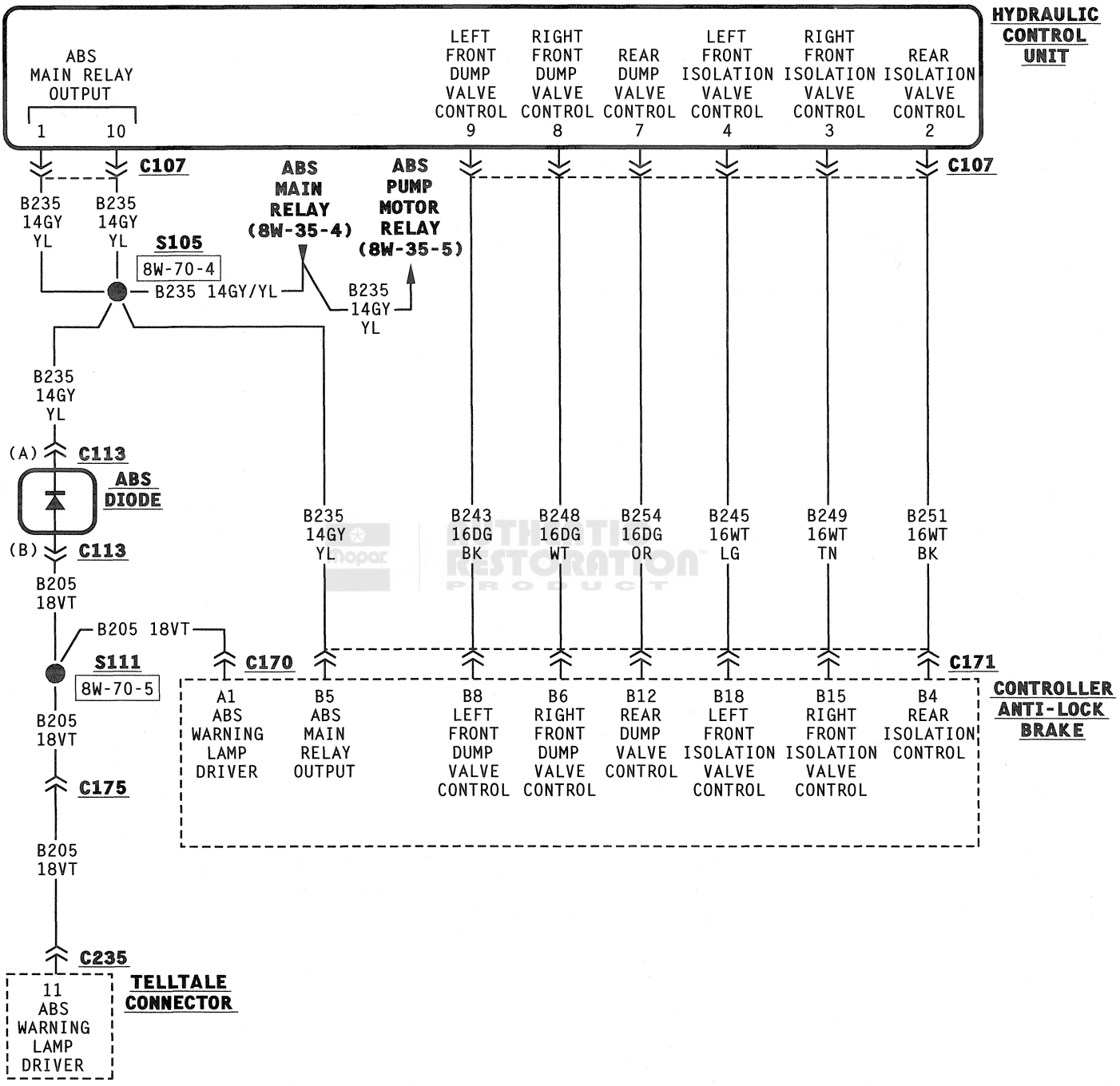
DIAGRAM INDEX

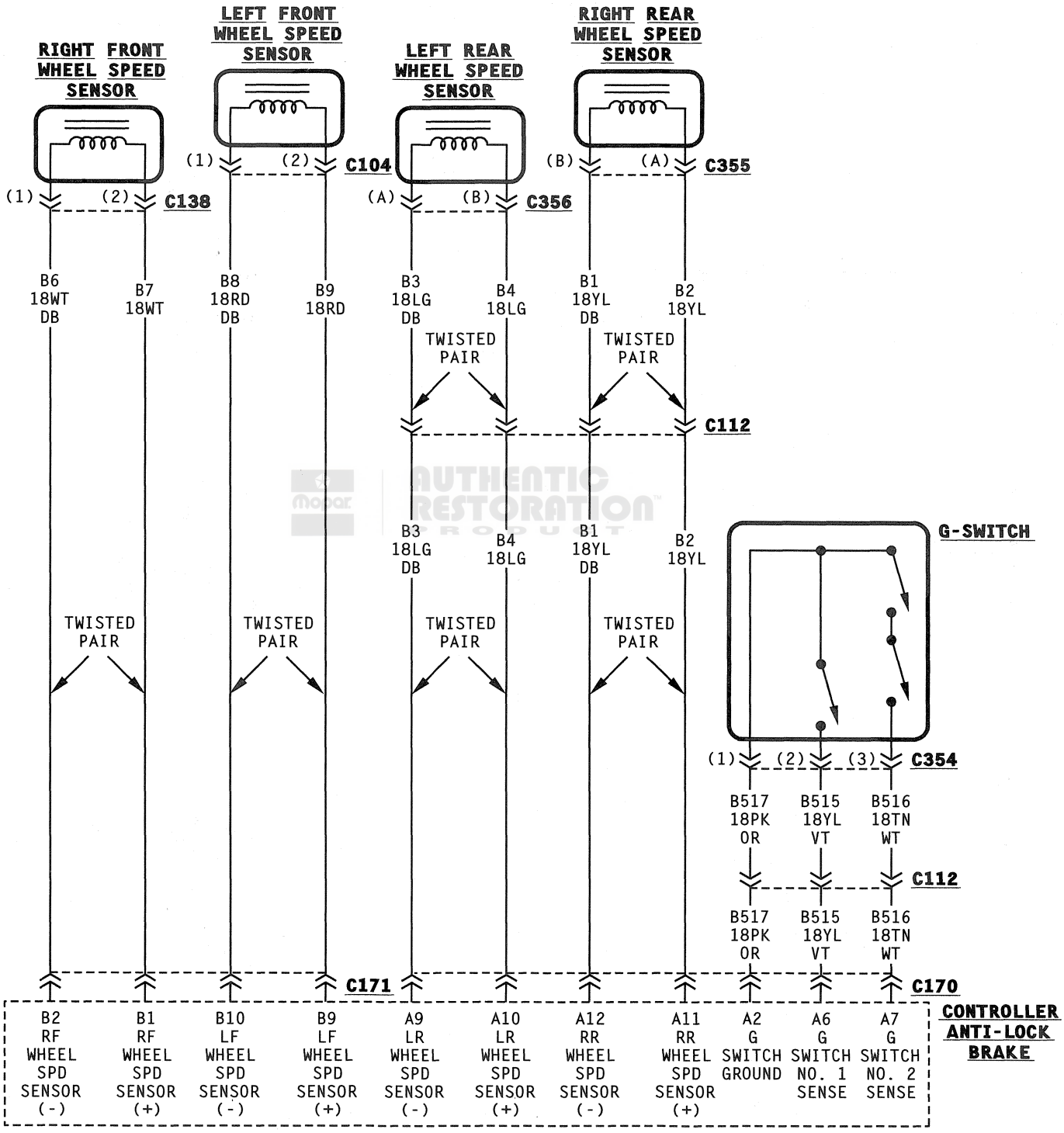
Component	Page
ABS Diode	8W-35-6
ABS Main Relay (PDC)	8W-35-4
ABS Pump Motor	8W-35-4
ABS Pump Motor Relay (PDC)	8W-35-5
Controller Anti-Lock Brake	8W-35-4, 5, 6, 7, 8, 9
Data Link Connector	8W-35-8
Fuse 18	8W-35-5
Fuse 2 (PDC)	8W-35-9
Fuse 5 (PDC)	8W-35-5
Fuse 8 (PDC)	8W-35-5
Fuse 14 (PDC)	8W-35-4
Fuse 17 (PDC)	8W-35-8
G-Switch	8W-35-7
Hydraulic Control Unit	8W-35-6
Ignition Switch	8W-35-5
Left Front Wheel Speed Sensor	8W-35-7
Left Rear Wheel Speed Sensor	8W-35-7
Powertrain Control Module	8W-35-8, 9
Right Front Wheel Speed Sensor	8W-35-7
Right Rear Wheel Speed Sensor	8W-35-7
Stop Lamp Switch	8W-35-9
Telltale Connector	8W-35-6
Transmission Control Module	8W-35-8, 9

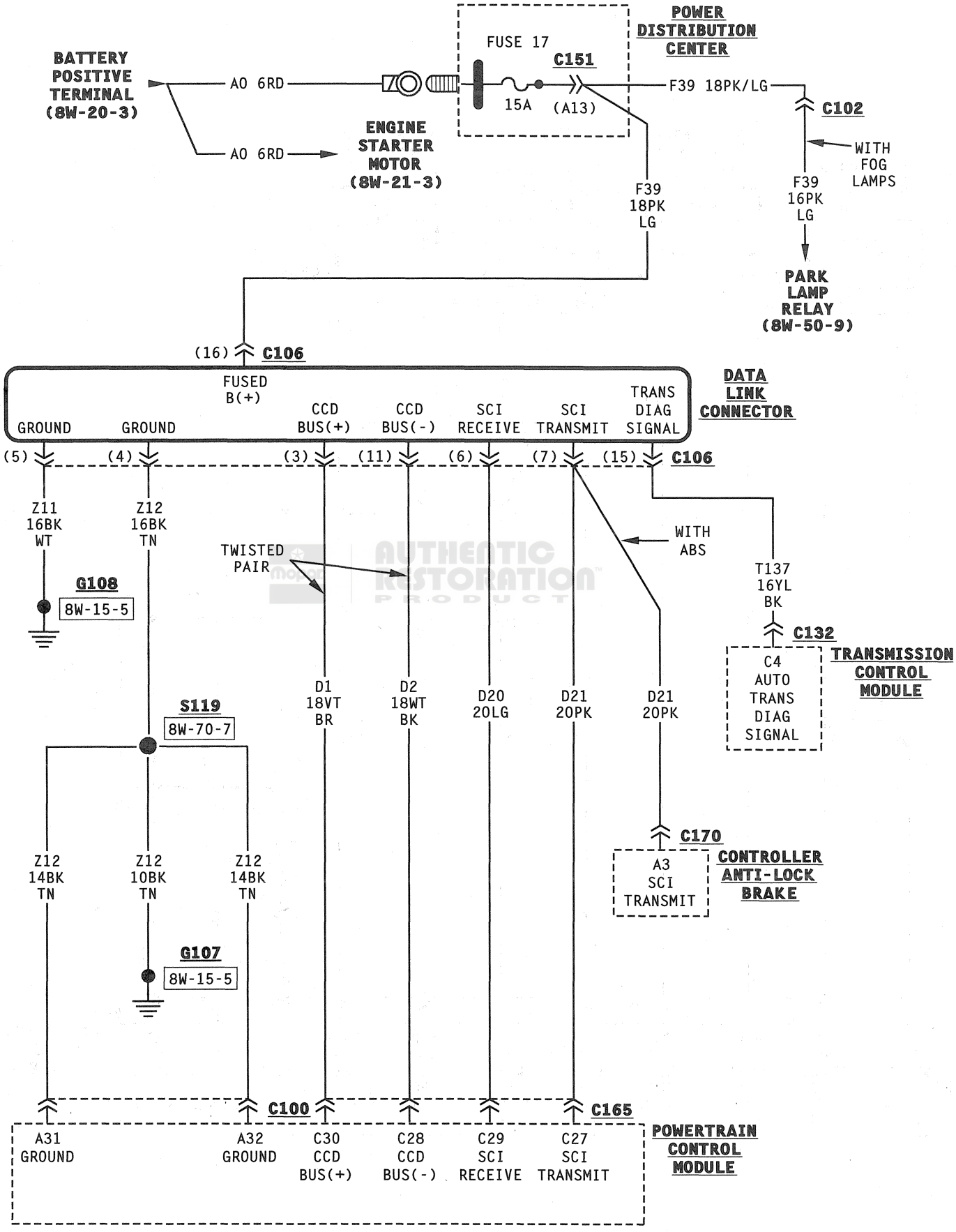
Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
(B9) (B7) (B8) C151
ABS MAIN RELAY
FUSE 14 30A
(27) C151
(B6) (B10) C151
A20 14RD DG
Z12 12BK TN
SPLICE S105 (8W-35-6) (8W-70-4)
B235 14GY YL
B235 14GY YL
B207 18PK
B236 18LG YL
S108 8W-70-4
Z12 14BK/TN
ABS PUMP MOTOR RELAY (8W-35-5)
Z12 12BK TN
Z12 12BK TN
B233 12TN BK
B236 18LG YL
S110 8W-70-5
B236 18LG YL
C175
B236 18LG YL
G107 8W-15-5
(2) (1) C105
ABS PUMP MOTOR
M
B207 18PK
FUSE BLOCK (8W-35-5) (8W-10-9)
B236 18LG YL
Z1 14BK
S112 8W-70-5
Z1 14BK
C171
C170
CONTROLLER ANTI-LOCK BRAKE
Z1 12BK
G106 8W-15-4
B14 B13
GROUND
B11 ABS MAIN RELAY CONTROL
A5 FUSED IGNITION SWITCH OUTPUT (RUN)

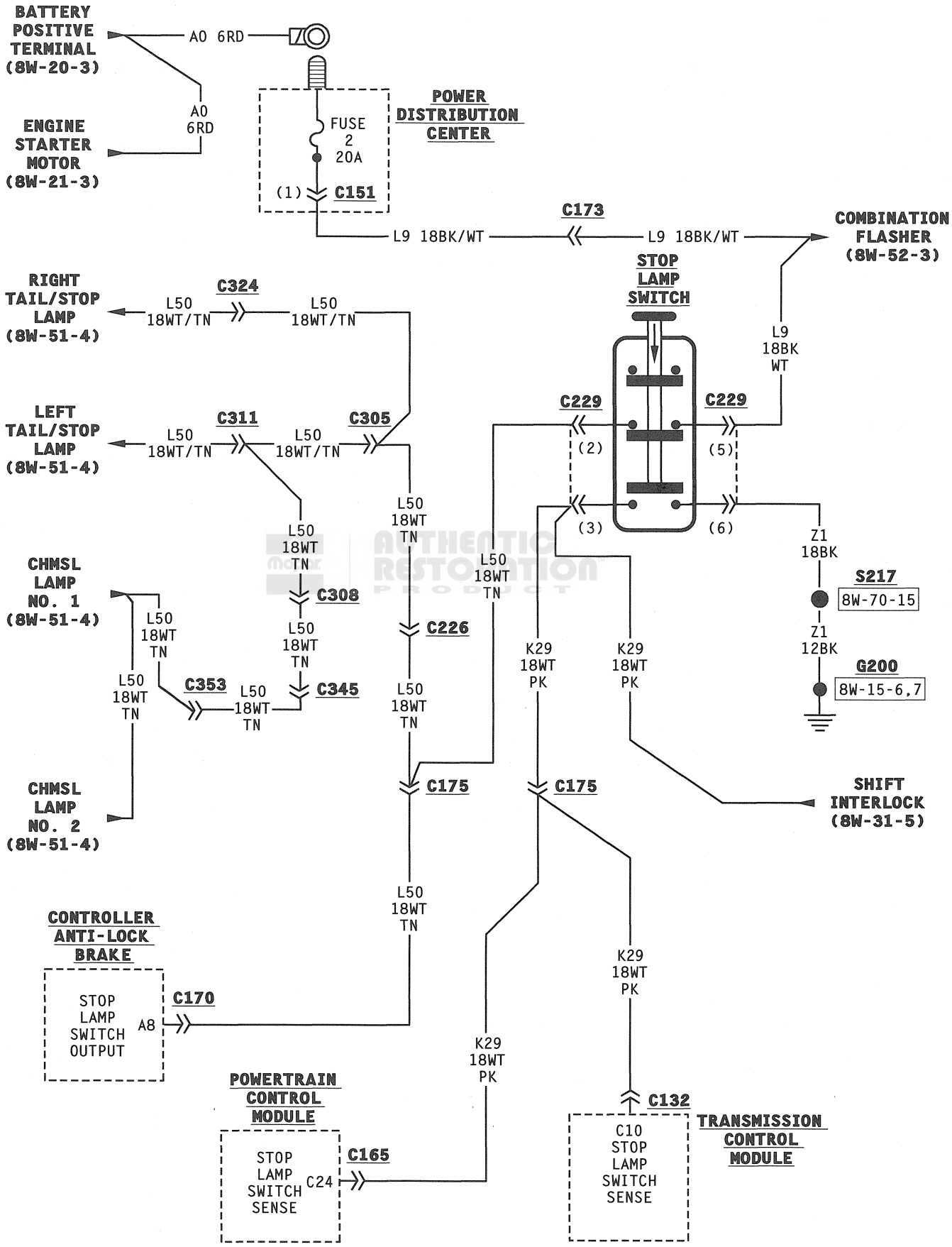

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
(D2)
(D6)
C151
ABS PUMP MOTOR RELAY
FUSE 5 40A
FUSE 8 60A
(4)
(7)
C151
(D3)
(D8)
(D4)
C151
Z12 14BK TN
B233 12TN BK
B235 14GY YL
B116 18GY
A10 12RD DG
A1 10RD
ABS MAIN RELAY (8W-35-4)
C173
A1 12RD
SPLICE S108 (8W-35-4) (8W-70-4)
S219
8W-70-16
ABS PUMP MOTOR (8W-35-4)
B233 14TN BK
C171
SPLICE S110 (8W-35-4) (8W-70-5)
B3 ABS PUMP RELAY OUTPUT
B7 ABS MAIN RELAY CONTROL
CONTROLLER ANTI-LOCK BRAKE
B236 18LG YL
C175
A1 12RD
A236 18LG YL
C201
C201
FUSE BLOCK
(35) FUSE 18 2A (36)
A38 12OR
IGNITION SWITCH
ACC
OFF
C224
C224
RUN
(7)
(5)
START


HYDRAULIC CONTROL UNIT
ABS MAIN RELAY OUTPUT
1
10
LEFT FRONT DUMP VALVE CONTROL 9
RIGHT FRONT DUMP VALVE CONTROL 8
REAR DUMP VALVE CONTROL 7
LEFT FRONT ISOLATION VALVE CONTROL 4
RIGHT FRONT ISOLATION VALVE CONTROL 3
REAR ISOLATION VALVE CONTROL 2
C107
B235 14GY YL
B235 14GY YL
S105
8W-70-4
ABS MAIN RELAY (8W-35-4)
ABS PUMP MOTOR RELAY (8W-35-5)
B235 14GY/YL
B235 14GY YL
B235 14GY YL
(A) C113
ABS DIODE
(B) C113
B205 18VT
B205 18VT
S111
8W-70-5
B205 18VT
C175
B205 18VT
C235
11 ABS WARNING LAMP DRIVER
TELLTALE CONNECTOR
B235 14GY YL
B243 16DG BK
B248 16DG WT
B254 16DG OR
B245 16WT LG
B249 16WT TN
B251 16WT BK
C170
C171
A1 ABS WARNING LAMP DRIVER
B5 ABS MAIN RELAY OUTPUT
B8 LEFT FRONT DUMP VALVE CONTROL
B6 RIGHT FRONT DUMP VALVE CONTROL
B12 REAR DUMP VALVE CONTROL
B18 LEFT FRONT ISOLATION VALVE CONTROL
B15 RIGHT FRONT ISOLATION VALVE CONTROL
B4 REAR ISOLATION CONTROL
CONTROLLER ANTI-LOCK BRAKE


RIGHT FRONT WHEEL SPEED SENSOR
LEFT FRONT WHEEL SPEED SENSOR
LEFT REAR WHEEL SPEED SENSOR
RIGHT REAR WHEEL SPEED SENSOR
(1) (2) C138
(1) (2) C104
(A) (B) C356
(B) (A) C355
B6 18WT DB
B7 18WT
B8 18RD DB
B9 18RD
B3 18LG DB
B4 18LG
B1 18YL DB
B2 18YL
TWISTED PAIR
C112
G-SWITCH
(1) (2) (3) C354
B517 18PK OR
B515 18YL VT
B516 18TN WT
C171
C170
B2 RF WHEEL SPD SENSOR (-)
B1 RF WHEEL SPD SENSOR (+)
B10 LF WHEEL SPD SENSOR (-)
B9 LF WHEEL SPD SENSOR (+)
A9 LR WHEEL SPD SENSOR (-)
A10 LR WHEEL SPD SENSOR (+)
A12 RR WHEEL SPD SENSOR (-)
A11 RR WHEEL SPD SENSOR (+)
A2 G SWITCH GROUND
A6 G SWITCH NO. 1 SENSE
A7 G SWITCH NO. 2 SENSE
CONTROLLER ANTI-LOCK BRAKE



AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
FUSE 2 20A
(1)
C151
POWER DISTRIBUTION CENTER
C173
L9 18BK/WT
L9 18BK/WT
COMBINATION FLASHER (8W-52-3)
STOP LAMP SWITCH
L9 18BK WT
RIGHT TAIL/STOP LAMP (8W-51-4)
C324
L50 18WT/TN
L50 18WT/TN
LEFT TAIL/STOP LAMP (8W-51-4)
C311
C305
L50 18WT/TN
L50 18WT/TN
C229
C229
(2)
(5)
(3)
(6)
L50 18WT TN
L50 18WT TN
L50 18WT TN
C308
L50 18WT TN
C226
L50 18WT TN
Z1 18BK
S217
8W-70-15
Z1 12BK
G200
8W-15-6,7
CHMSL LAMP NO. 1 (8W-51-4)
L50 18WT TN
L50 18WT TN
C353
L50 18WT TN
C345
K29 18WT PK
K29 18WT PK
SHIFT INTERLOCK (8W-31-5)
CHMSL LAMP NO. 2 (8W-51-4)
C175
C175
L50 18WT TN
CONTROLLER ANTI-LOCK BRAKE
STOP LAMP SWITCH OUTPUT
A8
C170
K29 18WT PK
K29 18WT PK
POWERTRAIN CONTROL MODULE
STOP LAMP SWITCH SENSE
C24
C165
C132
C10 STOP LAMP SWITCH SENSE
TRANSMISSION CONTROL MODULE

8W-40 INSTRUMENT CLUSTER

INDEX

page

DESCRIPTION AND OPERATION
ABS WARNING LAMP 2
BRAKE WARNING LAMP 3
CHARGING SYSTEM WARNING LAMP 2
ENGINE COOLANT TEMPERATURE WARNING LAMP 2
FOUR-WHEEL DRIVE (4WD) SWITCH 3
FUEL GAUGE 1
HELPFUL INFORMATION 4
HIGH-BEAM INDICATOR LAMP 3
INSTRUMENT CLUSTER 1
LOW FUEL WARNING LAMP 2
LOW WASHER FLUID WARNING LAMP 3
MALFUNCTION INDICATOR LAMP (MIL) 2
OIL PRESSURE WARNING LAMP 2
SEAT BELT INDICATOR WARNING LAMP 3
SPEEDOMETER 1
TACHOMETER 1
TURN SIGNAL INDICATOR LAMPS 3
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 4

DESCRIPTION AND OPERATION

INSTRUMENT CLUSTER

The instrument cluster contains the gauges and warning lamps. All gauges have magnetic movements.

When the ignition switch is in the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 feeds circuit F87 through fuse 17 in the fuse block. Circuit A1 is HOT at all times.

Circuit F87 connects to the cluster connector to power the gauges and to the telltale connector to power the warning lamps.

Circuit E2 from fuse 25 in the fuse block feeds the illumination lamps. Circuit E2 originates at the headlamp switch and continues through fuse 25. The headlamp switch powers circuit E2 when the parking lamps or headlamp are ON.

Circuit Z1 provides ground for the indicator lamps and illumination lamps.

SPEEDOMETER

The speedometer and odometer receive a signal from the vehicle speed sensor on circuit G7. Circuit G7 also connects to the Powertrain Control Module (PCM) at cavity B27.

TACHOMETER

The tachometer module in the instrument cluster operates the tachometer. The Powertrain Control Module (PCM) supplies the signal for the tachometer on circuit G21. Circuit G21 connects to cavity C31 of the PCM.

FUEL GAUGE

The fuel level sensor is a variable resistor. Circuit G4 connects the fuel level sensor to the fuel gauge in the instrument cluster. Circuit F87 from fuse 17 in the fuse block supplies voltage to the fuel gauge. The fuel level sensor draws voltage from circuit F87 through the fuel gauge on circuit G4. Circuit G4 connects to the fuel level sensor. Circuit Z1 provides the ground path for the fuel level sensor.

As current flows through the coils in the fuel gauge, it creates a magnetic field. One of the coils in the gauge receives fixed current. The other coil is connected to the level sensor. The magnetic field controls the position of the fuel gauge pointer.

The fuel level sensor contains a variable resistor. As the position of the float arm on the fuel level sensor changes, the resistor changes the current flow through second coil in the fuel gauge. A change in current flow alters the magnetic field in the fuel gauge, which changes the pointer position.

DESCRIPTION AND OPERATION (Continued)

HELPFUL INFORMATION

A separate branch of circuit G4 from the fuel level sensor connects to cavity C26 of the Powertrain Control Module (PCM).

LOW FUEL WARNING LAMP

Circuit G4 connects the fuel level sensor to the fuel gauge. The low fuel level module at the rear of the gauge monitors resistance in circuit G4. The low fuel level module powers an light emitting diode (LED) when the resistance in circuit G4 reaches a calibrated level. The LED illuminates the Low Fuel indicator. Refer to Group 8E for additional information.

ENGINE COOLANT TEMPERATURE WARNING LAMP

Circuit G20 connects the engine coolant temperature warning lamp to the engine coolant temperature switch. When the switch closes, battery voltage from circuit F87 flows through the lamp to ground through the switch on circuit G20. The engine coolant temperature switch is case grounded to the engine. Circuit F87 connects to the instrument cluster connector and supplies voltage for the lamp.

MALFUNCTION INDICATOR LAMP (MIL)

The Powertrain Control Module (PCM) provides ground for the instrument cluster malfunction indicator lamp on circuit G3. Circuit G3 connects to cavity C17 of the PCM. Circuit F87 provides voltage for the lamp. The MIL displays the message CHECK ENGINE when illuminated.

For information regarding diagnostic trouble code access using the MIL lamp, refer to Group 14, Fuel Systems.

ABS WARNING LAMP

Circuit F87 provides power for the ABS warning lamp at the instrument cluster. Ground for the ABS warning lamp is provided by either the Controller, Anti-Lock Brakes (CAB) or by the ABS main relay when the relay is not energized. The CAB illuminates the lamp by providing ground on circuit B205.

Circuit B205 splices to connect to circuit B235 through a diode. When the ABS main relay is not energized, it connects circuit B235 to circuit Z12. The ground path for the warning lamp is through the diode to circuit B235, through the ABS main relay to ground on circuit Z12.

The diode between circuit B205 and B235 prevents voltage from flowing to the CAB when the ABS main relay switches to supply power on circuit B235.

CHARGING SYSTEM WARNING LAMP

The Powertrain Control Module (PCM) provides ground for the generator lamp in the instrument cluster on circuit G14. Circuit G14 connects to cavity C16 of the PCM.

OIL PRESSURE WARNING LAMP

The case grounded oil pressure switch connects to circuit G6. Circuit G6 connects to the oil pressure warning lamp. Circuit F87 connects to the instrument cluster connector and supplies battery voltage to oil pressure lamp.

When the oil pressure switch closes, battery voltage flows through the warning lamp to ground through the switch, illuminating the lamp.

DESCRIPTION AND OPERATION (Continued)

LOW WASHER FLUID WARNING LAMP

Circuit G29 connects the low washer fluid switch to the warning lamp in the instrument cluster. Circuit F12 supplies battery voltage to the switch.

When the low washer fluid switch closes, it connects circuits G29 and F12. Battery voltage from circuit F12 powers the low washer fluid lamp. Circuit Z1 at the instrument cluster provides ground to illuminate the warning lamp.

SEAT BELT INDICATOR WARNING LAMP

The seat belt indicator warning lamp is activated by the buzzer module on circuit G11. Circuit G11 supplies power to instrument cluster for the lamp. Circuit Z1 provides ground for the lamp at the cluster.

The buzzer module powers circuit G11 after it receives an input on circuit G10 indicating the seat belt switch is open.

HIGH-BEAM INDICATOR LAMP

Circuit L3 supplies power for the high beam indicator lamp. The ground path for the lamp is through circuit Z1. Circuit Z1 provides ground for the indicator lamp at the cluster.

TURN SIGNAL INDICATOR LAMPS

Circuits L61 and L60 power for the turn signal indicator lamps. Circuit L61 powers the left indicator lamp. Circuit L60 powers the right indicator lamp. Circuit Z1 provides ground for the lamps.

BRAKE WARNING LAMP

Circuit F87 supplies power to the park brake lamp. Ground for the park brake lamp is supplied through the case grounded park brake switch or brake warning switch on circuit G9. Circuit G9 connects to the brake warning lamp at the instrument cluster.

FOUR-WHEEL DRIVE (4WD) SWITCH

When the 4WD switch CLOSES, circuit Z1 provides ground for the 4WD indicator lamp in the instrument cluster. Circuit F87 connects to the instrument cluster and supplies battery voltage to the 4WD indicator lamp. Circuit G107 connects the indicator lamp to the 4WD switch.

On vehicles equipped with the 4.0L engine and an automatic transmission, circuit G107 connects to the solenoid assembly in the transmission. Circuit G106 from the solenoid assembly provides ground during 4WD Full Time operation.

DESCRIPTION AND OPERATION (Continued)

HELPFUL INFORMATION

- If the warning lamps don't operate, check fuse 17 in the fuse block.
- If the illumination lamps don't operate, check fuses 9 and 19 in the fuse block.

SCHEMATICS AND DIAGRAMS

WIRING DIAGRAM INDEX

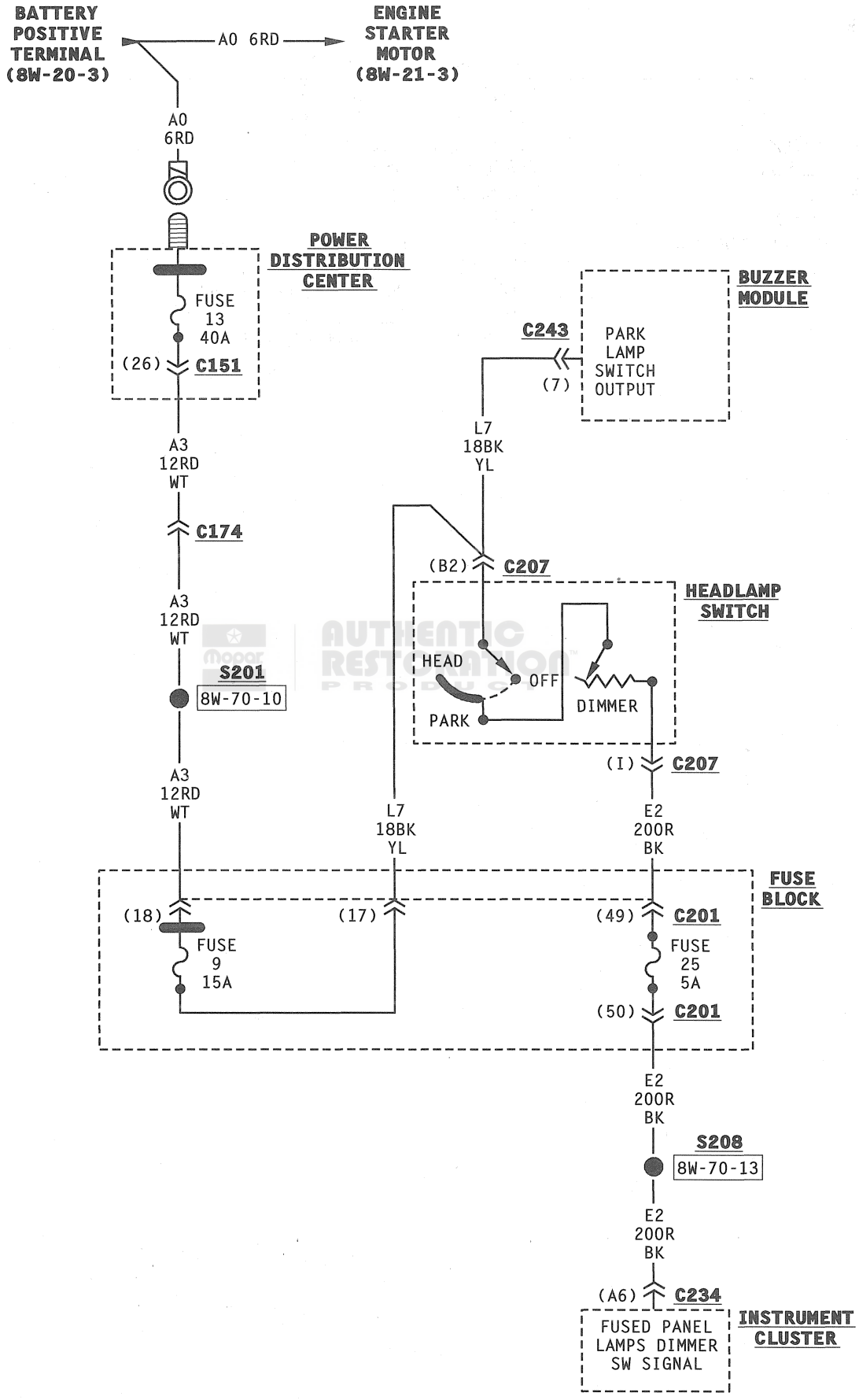
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

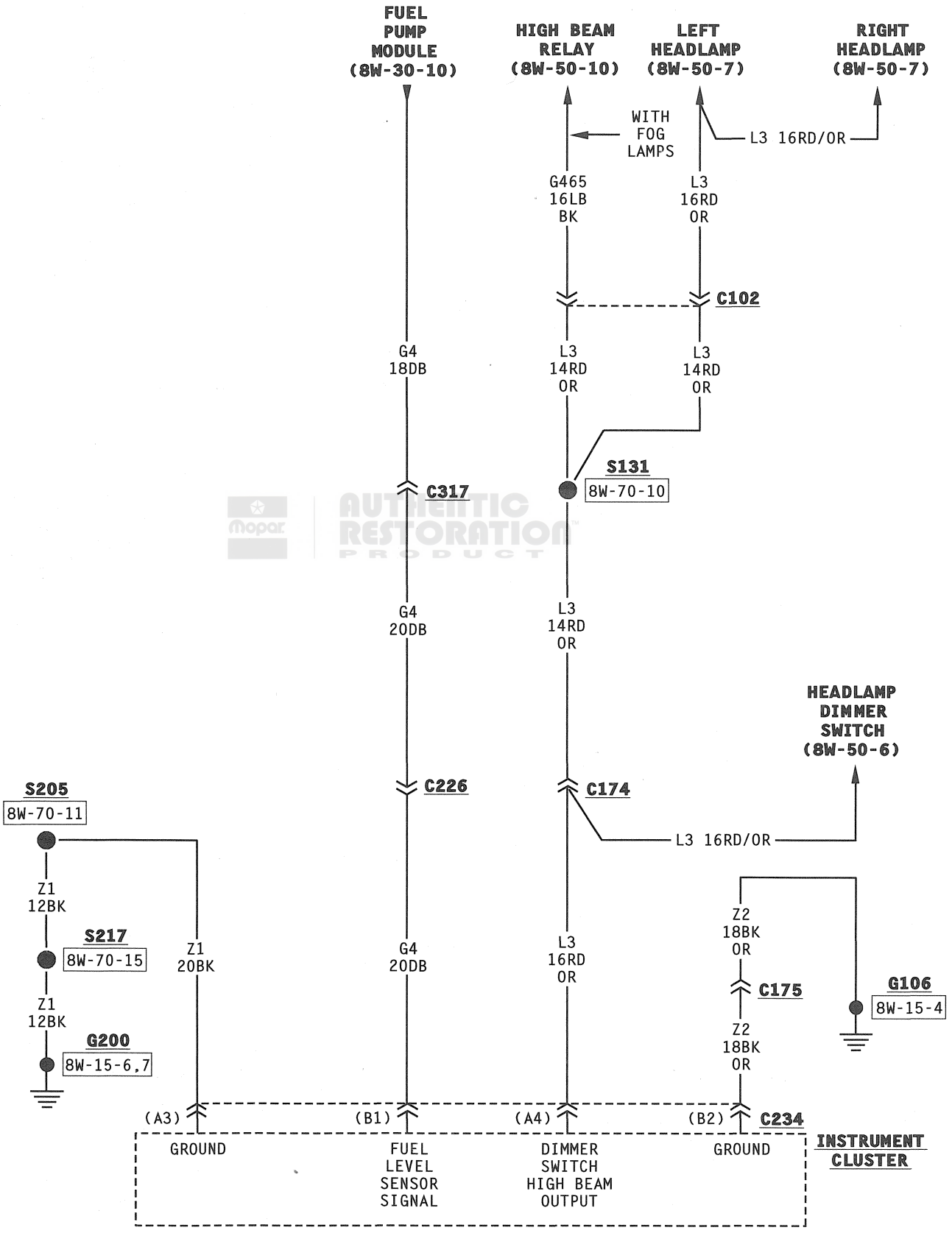
AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

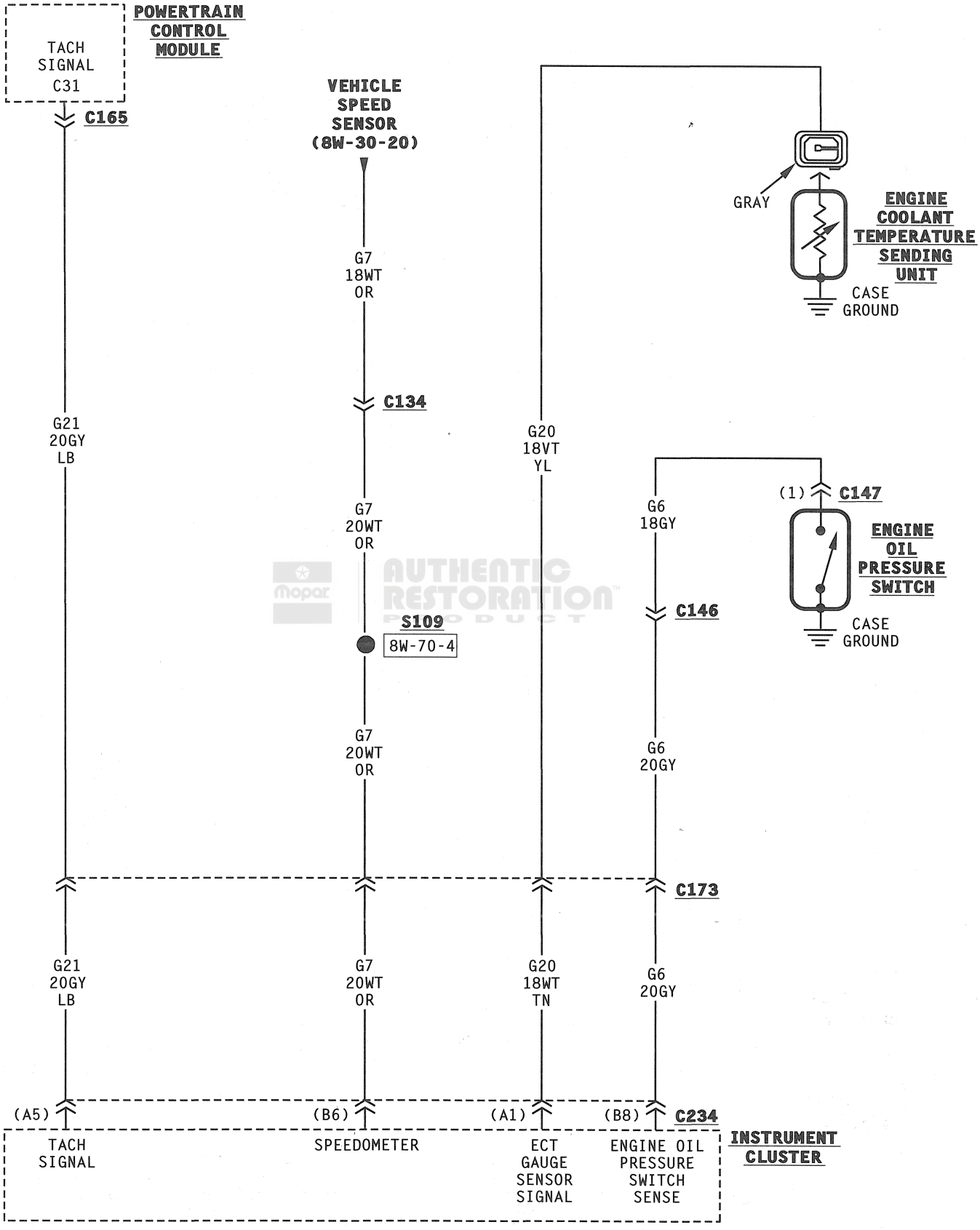
Component	Page
4WD Switch	8W-40-11
ABS Diode	8W-40-11
ABS Main Relay (PDC)	8W-40-11
Brake Warning Lamp Switch	8W-40-12
Buzzer Module	8W-40-6, 12
Controller Anti-Lock Brake	8W-40-11
Engine Coolant Temperature Sending Unit	8W-40-8
Engine Oil Pressure Switch	8W-40-8
Fuse 9	8W-40-6
Fuse 25	8W-40-6
Fuse 26	8W-40-13
Fuse 8 (PDC)	8W-40-10, 13
Fuse 13 (PDC)	8W-40-6
Fuse 18 (PDC)	8W-40-10
Headlamp Switch	8W-40-6
Ignition Switch	8W-40-10, 12, 13
Instrument Cluster	8W-40-6, 7, 8, 9, 13
Low Washer Fluid Level Switch	8W-40-10
Park Brake Switch	8W-40-12
Powertrain Control Module	8W-40-8, 12
Telltale Connector	8W-40-10, 11, 12, 13
Valve Body Solenoids	8W-40-11

Mopar AUTHENTIC RESTORATION PRODUCT

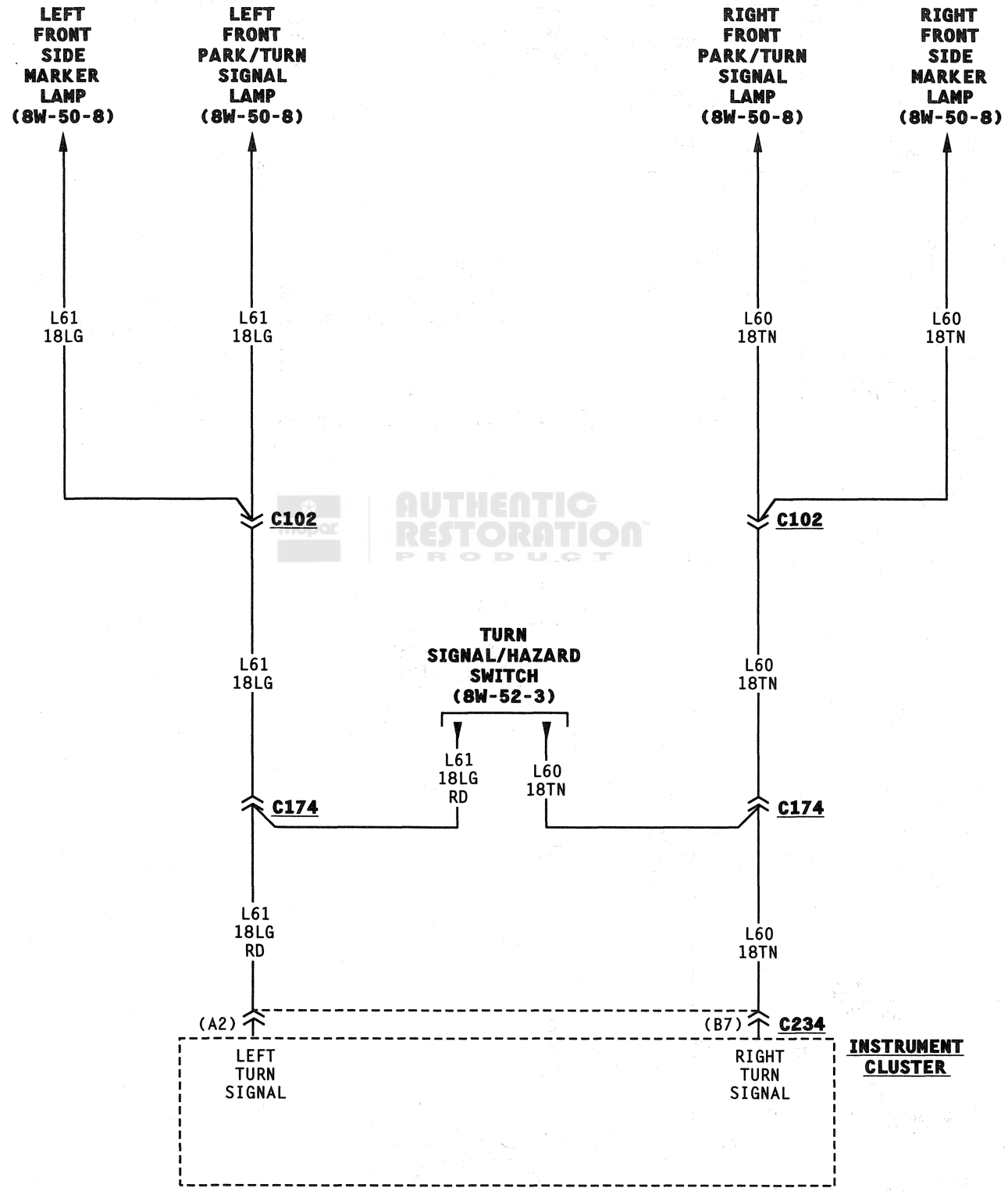

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
A3 12RD WT
C174
A3 12RD WT
S201
8W-70-10
A3 12RD WT
BUZZER MODULE
C243
PARK LAMP SWITCH OUTPUT
(7)
L7 18BK YL
(B2) C207
HEADLAMP SWITCH
HEAD
OFF
DIMMER
PARK
(I) C207
L7 18BK YL
E2 200R BK
FUSE BLOCK
(18)
FUSE 9 15A
(17)
(49) C201
FUSE 25 5A
(50) C201
E2 200R BK
S208
8W-70-13
E2 200R BK
(A6) C234
FUSED PANEL LAMPS DIMMER SW SIGNAL
INSTRUMENT CLUSTER

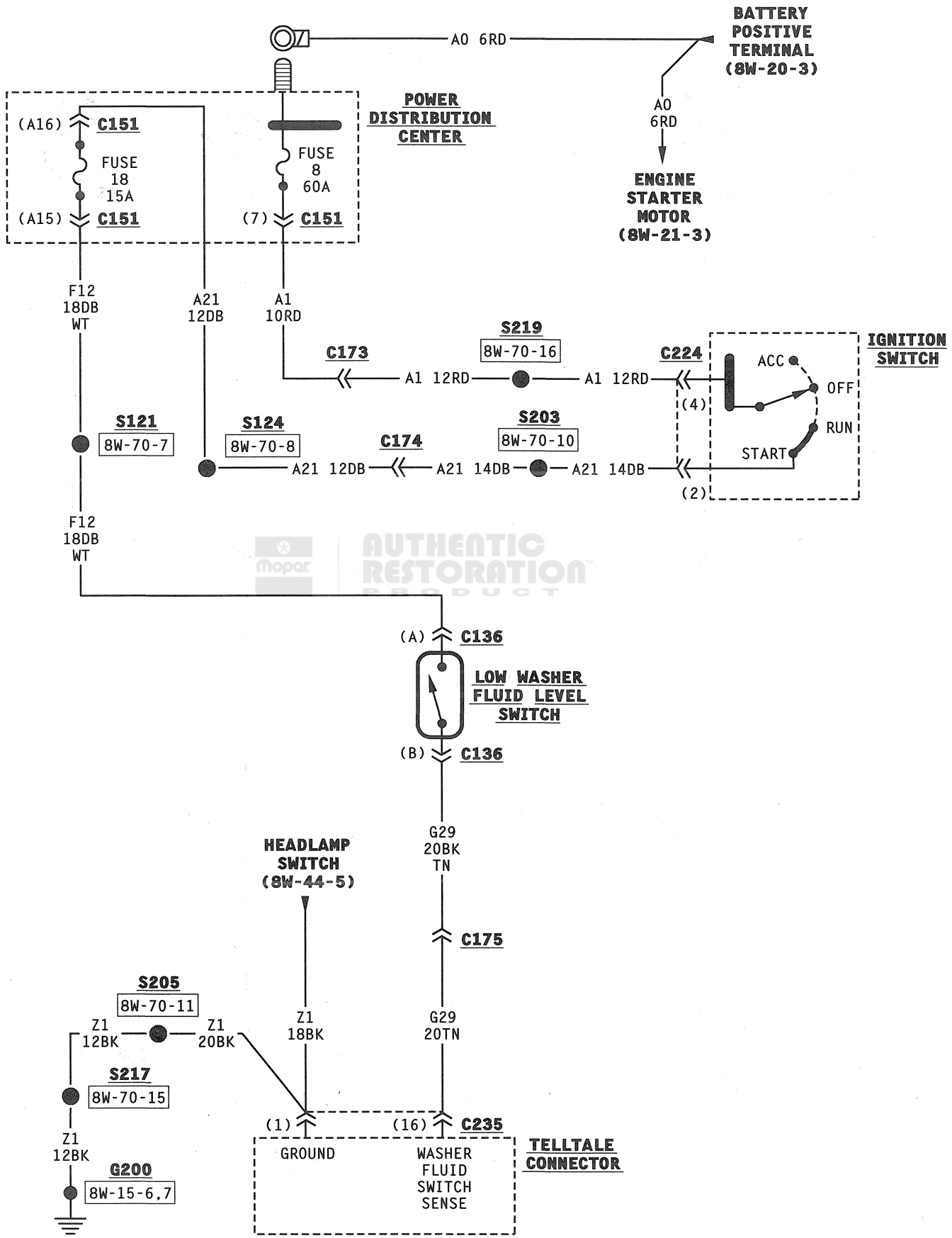


Mopar AUTHENTIC RESTORATION PRODUCT

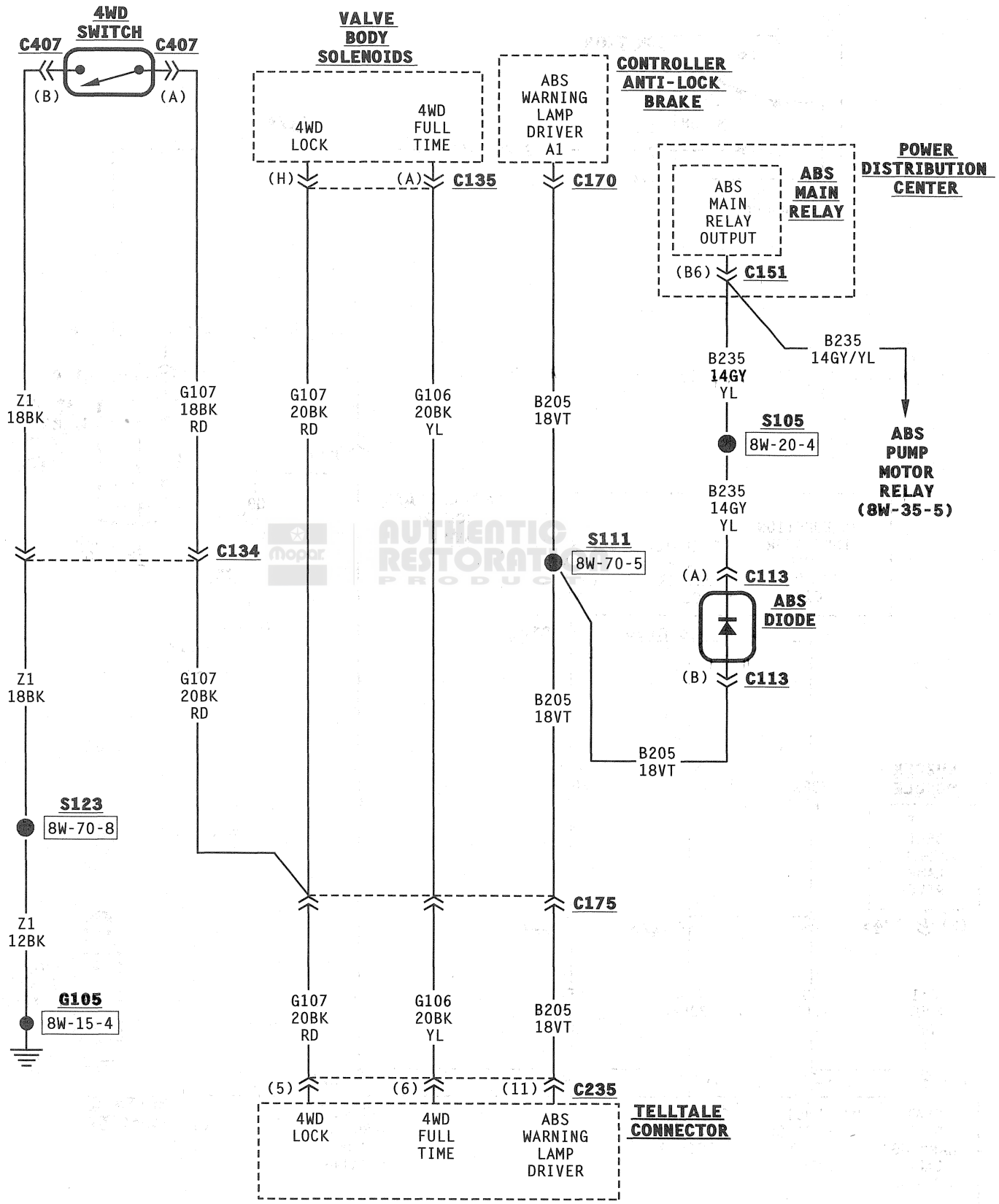


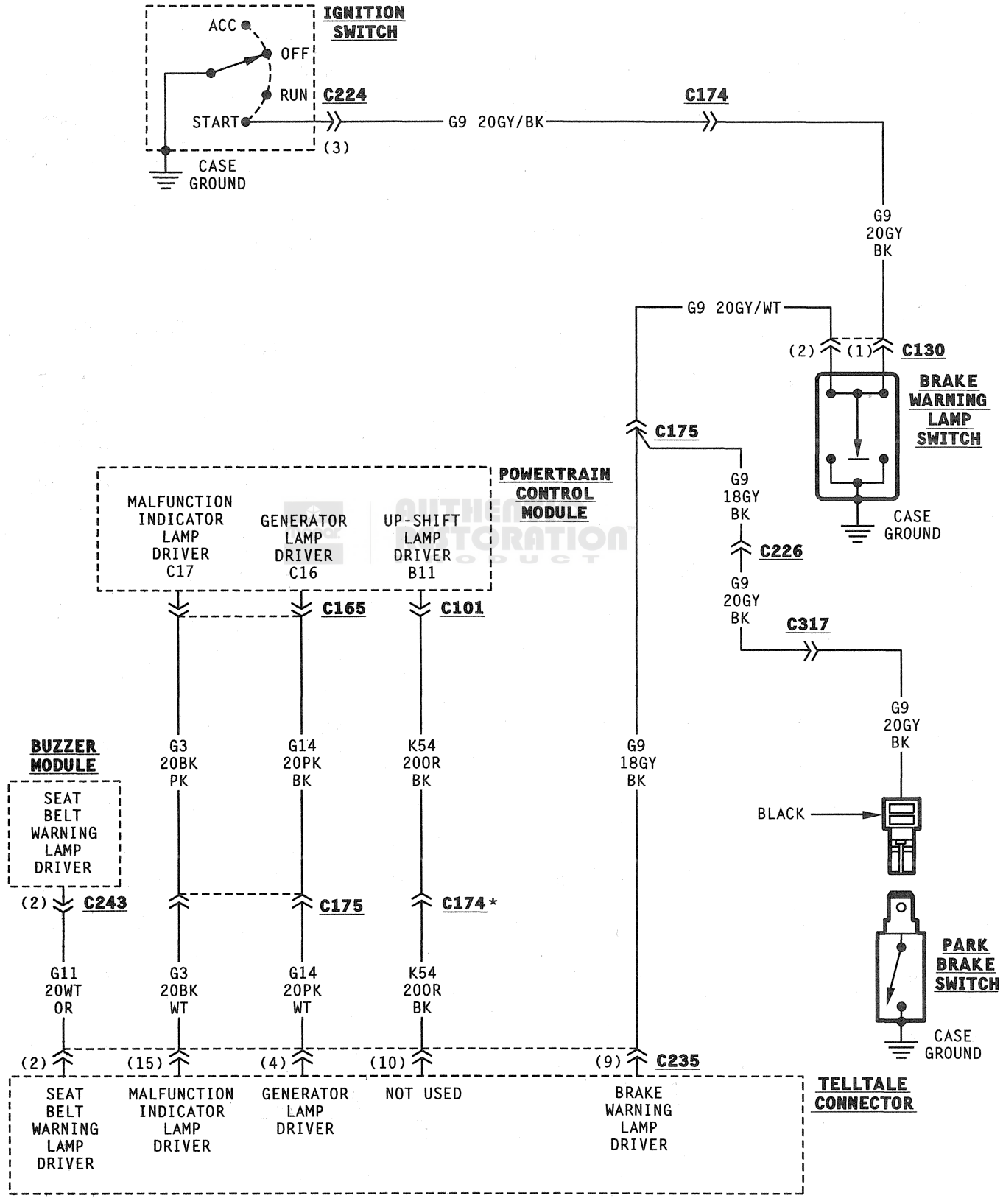
Mopar AUTHENTIC RESTORATION PRODUCT


LEFT FRONT SIDE MARKER LAMP (8W-50-8)
LEFT FRONT PARK/TURN SIGNAL LAMP (8W-50-8)
RIGHT FRONT PARK/TURN SIGNAL LAMP (8W-50-8)
RIGHT FRONT SIDE MARKER LAMP (8W-50-8)
L61 18LG
L61 18LG
L60 18TN
L60 18TN
C102
C102
L61 18LG
TURN SIGNAL/HAZARD SWITCH (8W-52-3)
L60 18TN
L61 18LG RD
C174
C174
L61 18LG RD
L60 18TN
(A2)
(B7)
C234
INSTRUMENT CLUSTER
LEFT TURN SIGNAL
RIGHT TURN SIGNAL

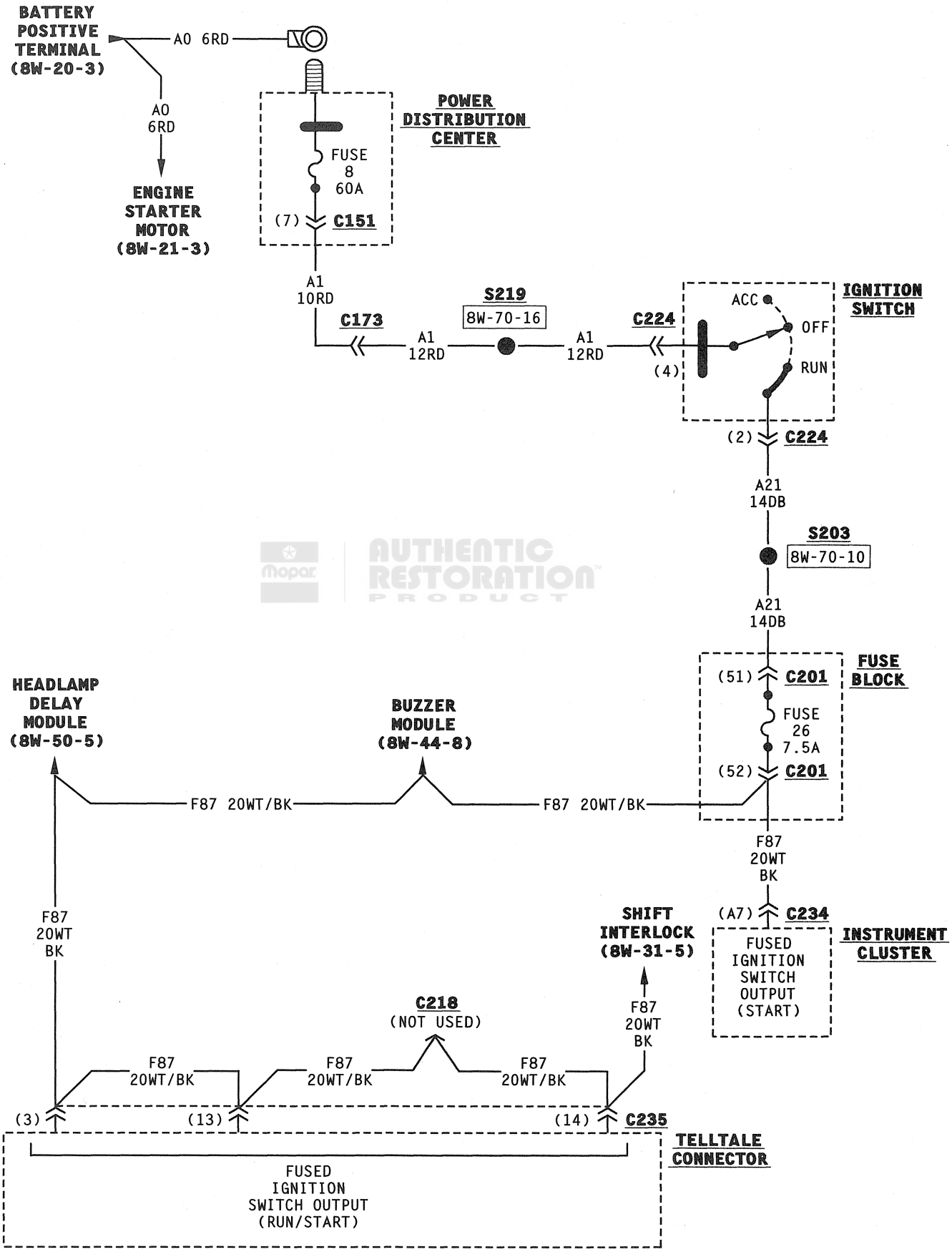


Mopar AUTHENTIC RESTORATION PRODUCT


4WD SWITCH
C407
C407
(B)
(A)
VALVE BODY SOLENOIDS
4WD LOCK
4WD FULL TIME
(H)
(A)
C135
ABS WARNING LAMP DRIVER A1
C170
CONTROLLER ANTI-LOCK BRAKE
ABS MAIN RELAY OUTPUT
(B6)
C151
ABS MAIN RELAY
POWER DISTRIBUTION CENTER
B235 14GY/YL
B235 14GY YL
S105
8W-20-4
ABS PUMP MOTOR RELAY (8W-35-5)
Z1 18BK
G107 18BK RD
G107 20BK RD
G106 20BK YL
B205 18VT
S111
8W-70-5
C134
(A)
C113
ABS DIODE
(B)
C113
B205 18VT
Z1 18BK
G107 20BK RD
B205 18VT
S123
8W-70-8
C175
Z1 12BK
G105
8W-15-4
G107 20BK RD
G106 20BK YL
B205 18VT
(5)
(6)
(11)
C235
4WD LOCK
4WD FULL TIME
ABS WARNING LAMP DRIVER
TELLTALE CONNECTOR


IGNITION SWITCH
ACC
OFF
RUN
START
C224
(3)
CASE GROUND
G9 20GY/BK
C174
G9 20GY BK
G9 20GY/WT
(2)
(1)
C130
BRAKE WARNING LAMP SWITCH
CASE GROUND
C175
G9 18GY BK
C226
G9 20GY BK
C317
G9 20GY BK
BLACK
PARK BRAKE SWITCH
CASE GROUND
POWERTRAIN CONTROL MODULE
MALFUNCTION INDICATOR LAMP DRIVER C17
GENERATOR LAMP DRIVER C16
UP-SHIFT LAMP DRIVER B11
C165
C101
BUZZER MODULE
SEAT BELT WARNING LAMP DRIVER
G3 20BK PK
G14 20PK BK
K54 200R BK
G9 18GY BK
(2)
C243
C175
C174*
G11 20WT OR
G3 20BK WT
G14 20PK WT
K54 200R BK
(2)
(15)
(4)
(10)
(9)
C235
SEAT BELT WARNING LAMP DRIVER
MALFUNCTION INDICATOR LAMP DRIVER
GENERATOR LAMP DRIVER
NOT USED
BRAKE WARNING LAMP DRIVER
TELLTALE CONNECTOR

* NOT USED



Mopar AUTHENTIC RESTORATION PRODUCT

8W-41 HORN/CIGAR LIGHTER

DESCRIPTION AND OPERATION

HORN

The horn system uses two switches and horn relay. The horn switches are on the steering wheel.

Circuit A7 from fuse 4 in the Power Distribution Center (PDC) feeds a fuse block bus bar that powers circuit X4 through fuse 5 in the fuse block. Circuit X4 is HOT at all times and powers the coil and contact sides of the horn relay.

When the case grounded horn switch is depressed, circuit X3 provides ground for the coil side of the relay and the contacts CLOSE. When the contacts CLOSE, circuit X2 supplies voltage to the case grounded horns.

HELPFUL INFORMATION

- The horn switches are grounded to the steering wheel.
- Circuit X4 is double crimped at the coil side of the horn relay.
- Check fuse 4 in the PDC and fuse 5 in the fuse block.

CIGAR LIGHTER

In the ACCESSORY or RUN position, the ignition switch supplies voltage to fuse 13 in the fuse block on circuit A48. Fuse 13 feeds circuit F85 which connects to the cigar lighter. When the lighter is depressed, the contacts inside of the lighter element close and voltage flows to ground on circuit Z1.

HELPFUL INFORMATION

- In the ACCESSORY or RUN position, the ignition switch connects circuit A1 from fuse 8 in the PDC with circuit A48.
- Circuit F85 also powers the radio and LCD relay.

SCHEMATICS AND DIAGRAMS

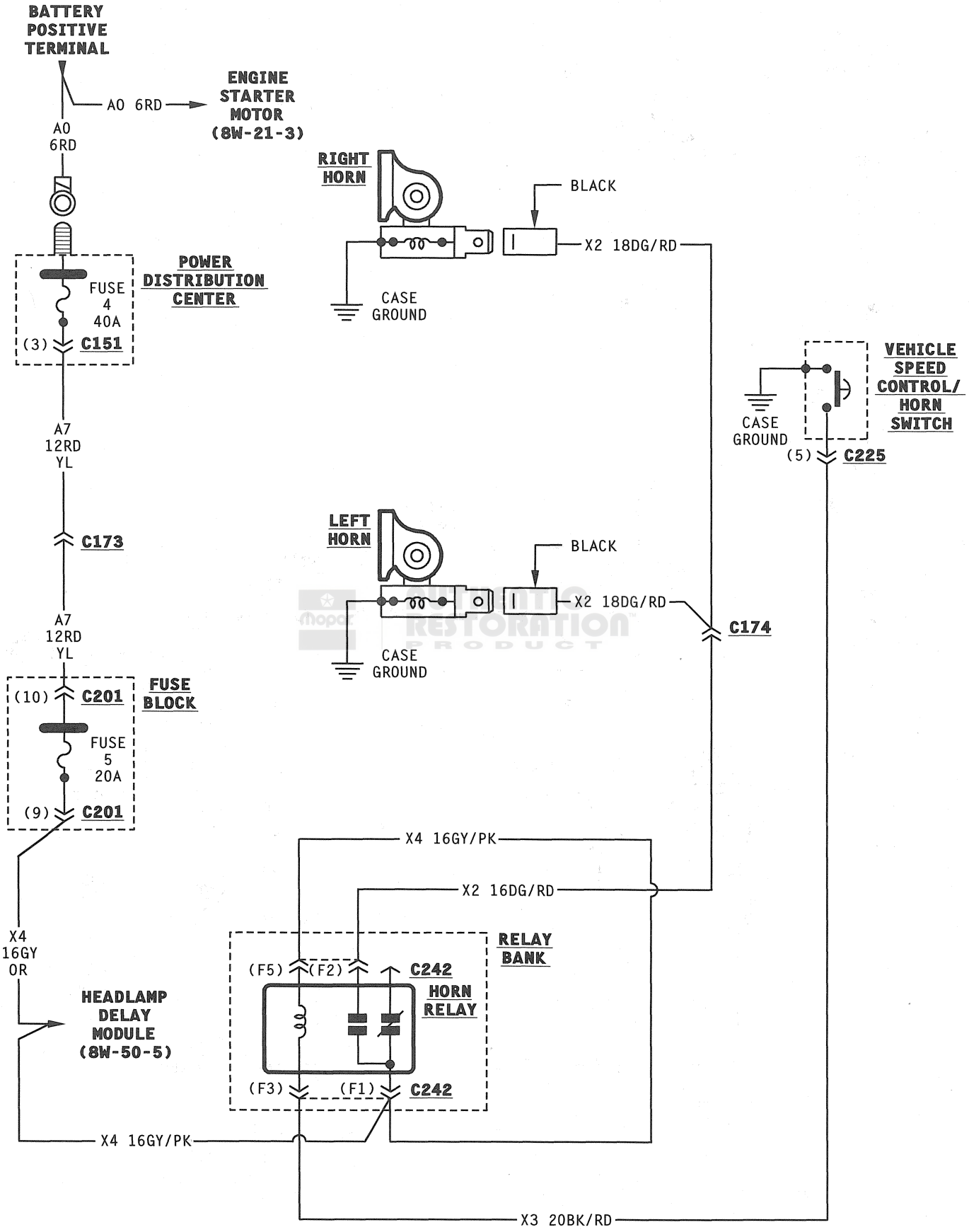
WIRING DIAGRAM INDEX

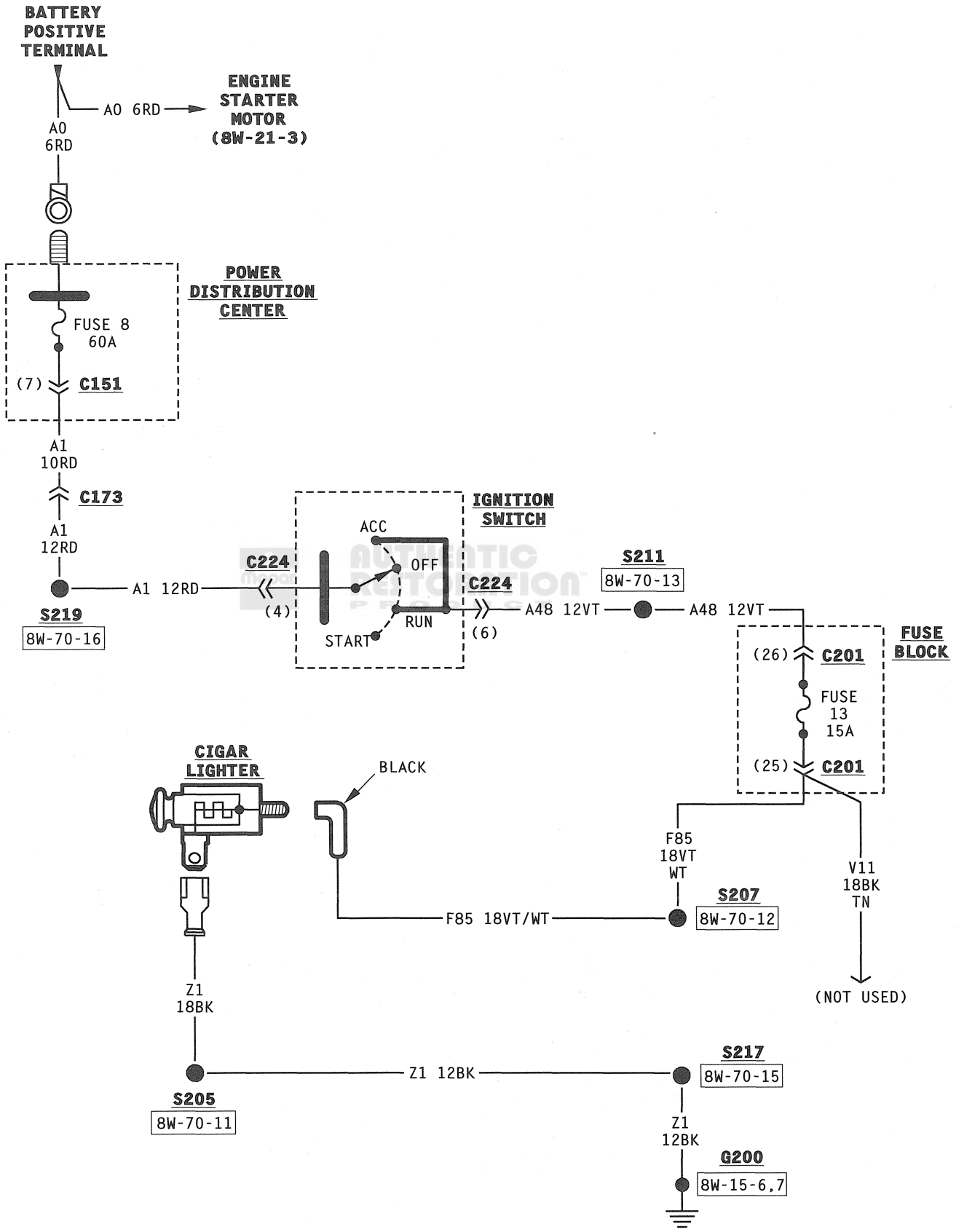
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Cigar Lighter	8W-41-4
Fuse 5	8W-41-3
Fuse 13	8W-41-4
Fuse 4 (PDC)	8W-41-3
Fuse 8 (PDC)	8W-41-4
Horn Relay (Relay Bank)	8W-41-3
Horn Switch	8W-41-3
Ignition Switch	8W-41-4
Left Horn	8W-41-3
Right Horn	8W-41-3

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3) C151
A7 12RD YL
C173
A7 12RD YL
FUSE BLOCK
(10) C201
FUSE 5 20A
(9) C201
X4 16GY OR
HEADLAMP DELAY MODULE (8W-50-5)
RIGHT HORN
BLACK
X2 18DG/RD
CASE GROUND
LEFT HORN
BLACK
X2 18DG/RD
CASE GROUND
C174
VEHICLE SPEED CONTROL/ HORN SWITCH
CASE GROUND
(5) C225
X4 16GY/PK
X2 16DG/RD
RELAY BANK
(F5) (F2) C242
HORN RELAY
(F3) (F1) C242
X4 16GY/PK
X3 20BK/RD


BATTERY POSITIVE TERMINAL
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8 60A
(7) C151
A1 10RD
C173
A1 12RD
S219
8W-70-16
A1 12RD
C224
(4)
IGNITION SWITCH
ACC
OFF
RUN
START
C224
(6)
A48 12VT
S211
8W-70-13
A48 12VT
FUSE BLOCK
(26) C201
FUSE 13 15A
(25) C201
CIGAR LIGHTER
BLACK
F85 18VT/WT
S207
8W-70-12
F85 18VT WT
V11 18BK TN
(NOT USED)
Z1 18BK
S205
8W-70-11
Z1 12BK
S217
8W-70-15
Z1 12BK
G200
8W-15-6,7

8W-42 AIR CONDITIONING/HEATER

INDEX

page

GENERAL INFORMATION
INTRODUCTION 1
DESCRIPTION AND OPERATION
A/C COMPRESSOR 1
BLOWER MOTOR—A/C-HEATER 1
BLOWER MOTOR—HEATER ONLY 1
RADIATOR FAN RELAY AND MOTOR 2
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

GENERAL INFORMATION

INTRODUCTION

The wiring diagrams in this section are divided into two sub-sections; Heater only, and A/C and Heater. When referring to the wiring diagrams, ensure that you use the correct sub-section.

DESCRIPTION AND OPERATION

BLOWER MOTOR—HEATER ONLY

In the RUN or ACCESSORY position, the ignition switch connects circuit A1 from fuse 8 in the PDC to circuit A48. Circuit A48 supplies battery voltage to fuse 4 in the fuse block. Fuse 4 supplies power to the heater control switch on circuit C7.

Circuit C43 from the heater control switch splices to supply voltage to the blower motor switch and the blower motor resistor block. The blower motor switch has four positions; HIGH, M1, M2, or LOW.

When the blower motor switch is in the LOW position, circuit C43 from the heater control switch supplies voltage to the resistor block. Voltage does not pass through the blower motor switch in the LOW position.

In the M1 position, the blower motor switch supplies voltage to the resistor block on circuit C4. From circuit C4, voltage passes through three resistors in the resistor block to the blower motor on circuit C1.

In the M2 position, the blower motor supplies voltage to the resistor block on circuit C6. From circuit C6 voltage flows through two resistors to the blower motor on circuit C1.

In the HIGH position, the blower motor switch connects directly to the blower motor on circuit C1. Voltage does not pass through the resistor block.

Circuit Z1 provides ground for the blower motor.

BLOWER MOTOR—A/C-HEATER

In the RUN or ACCESSORY position, the ignition switch connects circuit A1 from fuse 8 in the PDC to circuit A48. Circuit A48 supplies battery voltage to fuse 4 in the fuse block. Fuse 4 supplies power to the A/C-Heater control switch on circuit C7.

Circuit C43 from the A/C-heater switch splices to supply voltage to the blower motor switch and the blower motor resistor block. The blower motor switch has four positions; HIGH, M1, M2, or LOW.

When the blower motor switch is in the LOW position, circuit C43 from the A/C-Heater switch supplies voltage to the resistor block. Voltage does not pass through the blower motor switch in the LOW position

In the M1 position, the blower motor switch supplies voltage to the resistor block on circuit C4. From circuit C4, voltage passes through three resistors in the resistor block to the blower motor on circuit C1.

In the M2 position, the blower motor supplies voltage to the resistor block on circuit C6. From circuit C6 voltage flows through two resistors to the blower motor on circuit C1.

In the HIGH position, the blower motor switch connects directly to the blower motor on circuit C1. Voltage does not pass through the resistor block.

Circuit Z1 provides ground for the blower motor.

A/C COMPRESSOR

When the ignition switch is in the ACCESSORY or RUN position it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48. Circuit A48 powers circuit C7 through fuse 4 in the fuse block. When the A/C-heater control switch is moved to an A/C position or the defrost position, it connects circuit C7 to circuit C90. Circuit C90 provides the A/C select signal to cavity C23 of the Powertrain Control Module (PCM).

Circuit C90 also connects to the A/C cycling switch. Circuit C21 from the cycling switch connects to the low pressure switch. If the low pressure switch is closed, it completes a path from the cycling switch to the PCM on circuit C21. Circuit C21 provides the A/C request signal to cavity C22 of the PCM. Circuit Z1 provides ground for the cycling switch.

After receiving the A/C request signal, the PCM supplies ground for the A/C compressor clutch relay on circuit C13. Circuit C13 connects to cavity C1 of

DESCRIPTION AND OPERATION (Continued)

the PCM. Circuit F12 from the fuse 18 in the PDC supplies battery voltage to the coil side of the A/C compressor clutch relay when the ignition switch is in the START or RUN position. When the PCM grounds the relay, the contacts close and connect circuit A17 from fuse 10 in the PDC to circuit C3. Circuit C3 feeds the case grounded A/C compressor clutch.

Also, after receiving the A/C request signal, the PCM supplies ground for the coil side of the radiator fan relay on circuit C27 (4.0L engine). Circuit C27 connects to cavity C2 of the PCM. Circuit F12 supplies battery voltage to the coil side of the relay when the ignition switch is in the START or RUN position.

When the PCM grounds the coil side of the radiator fan relay, the contacts close and connect circuit F141 from fuse 15 in the PDC to circuit C25. Circuit C25 feeds the radiator fan motor. Circuit Z1 provides ground for the motor.

RADIATOR FAN RELAY AND MOTOR

In the START or RUN positions, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 powers a bus bar in the PDC that feeds circuit F12 through fuse 18. Circuit F12 feeds the coil side of the radiator fan relay (4.0L engine).

The Powertrain Control Module (PCM) supplies ground for the coil side of the radiator fan relay on circuit C27. Circuit C27 connects to cavity C2 of the PCM.

When the PCM grounds the coil side of the radiator fan relay, the contacts CLOSE and connect circuit F141 from fuse 15 in the PDC to circuit C25. Circuit C25 feeds the radiator fan motor. Circuit Z1 provides ground for the radiator fan motor.

SCHEMATICS AND DIAGRAMS

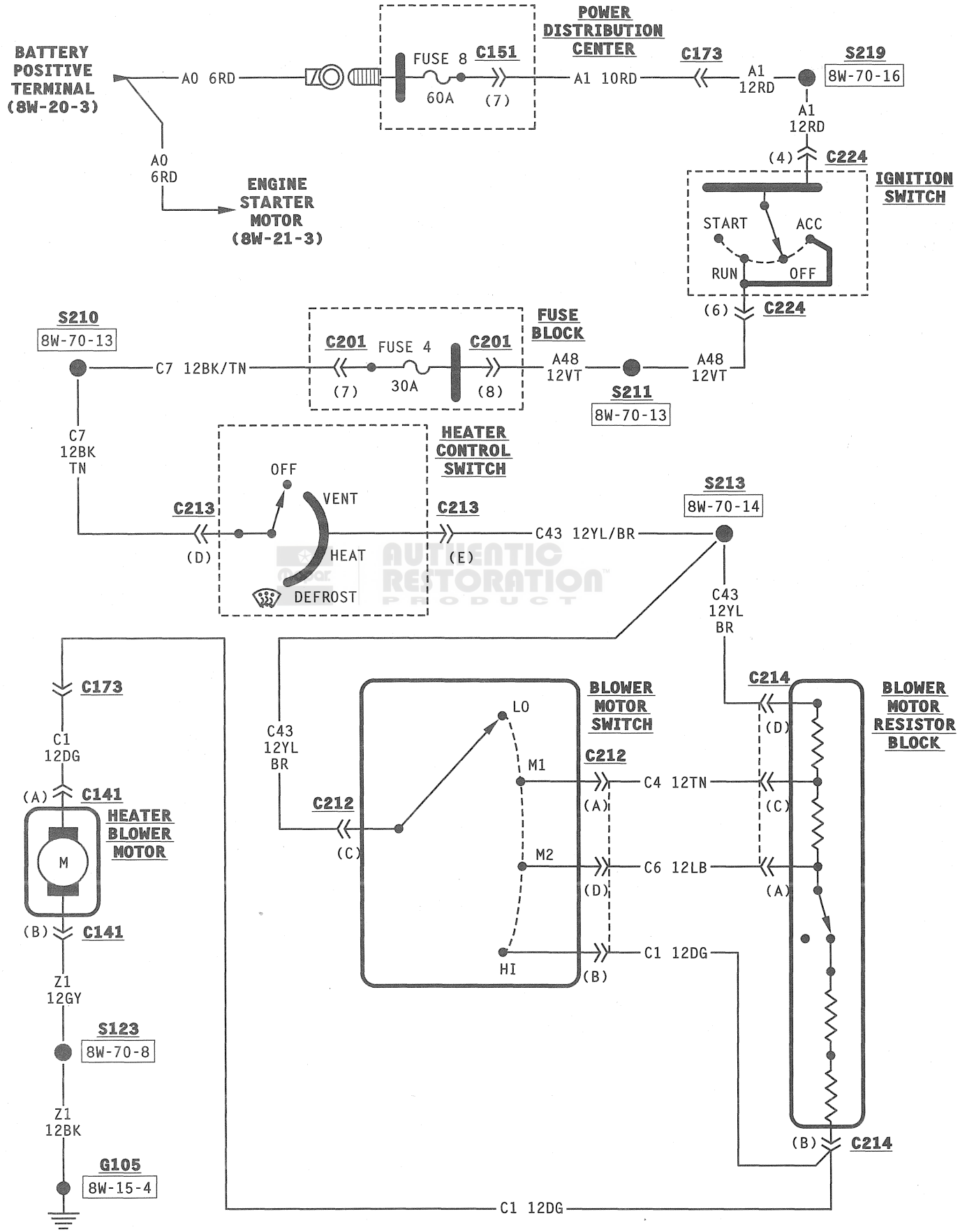
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

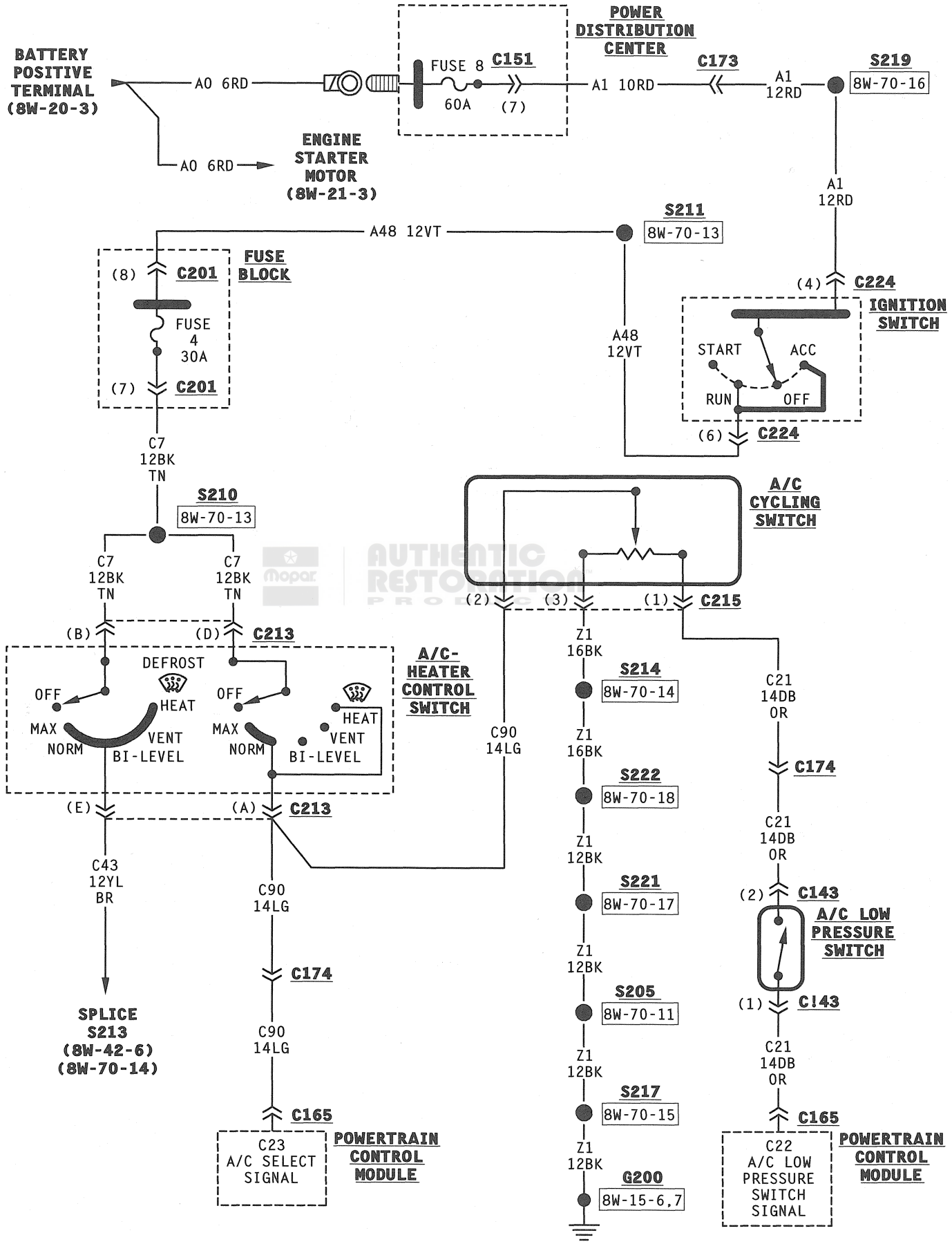
DIAGRAM INDEX

Component	Page
A/C Compressor Clutch	8W-42-7
A/C Compressor Clutch Relay (PDC)	8W-42-7
A/C Cycling Switch	8W-42-5
A/C Low Pressure Switch	8W-42-5
A/C-Heater Blower Motor	8W-42-6
A/C-Heater Control Switch	8W-42-5, 6
Blower Motor Resistor Block	8W-42-4, 6
Blower Motor Switch	8W-42-4, 6
Fuse 4	8W-42-4, 5, 6
Fuse 8 (PDC)	8W-42-4, 5, 6, 7, 8
Fuse 10 (PDC)	8W-42-7
Fuse 15 (PDC)	8W-42-8
Fuse 18 (PDC)	8W-42-7, 8
Heater Blower Motor	8W-42-4
Heater Control Switch	8W-42-4
Ignition Switch	8W-42-4, 5, 6, 7, 8
Powertrain Control Module	8W-42-5, 7, 8
Radiator Fan Motor	8W-42-8
Radiator Fan Relay (PDC)	8W-42-8

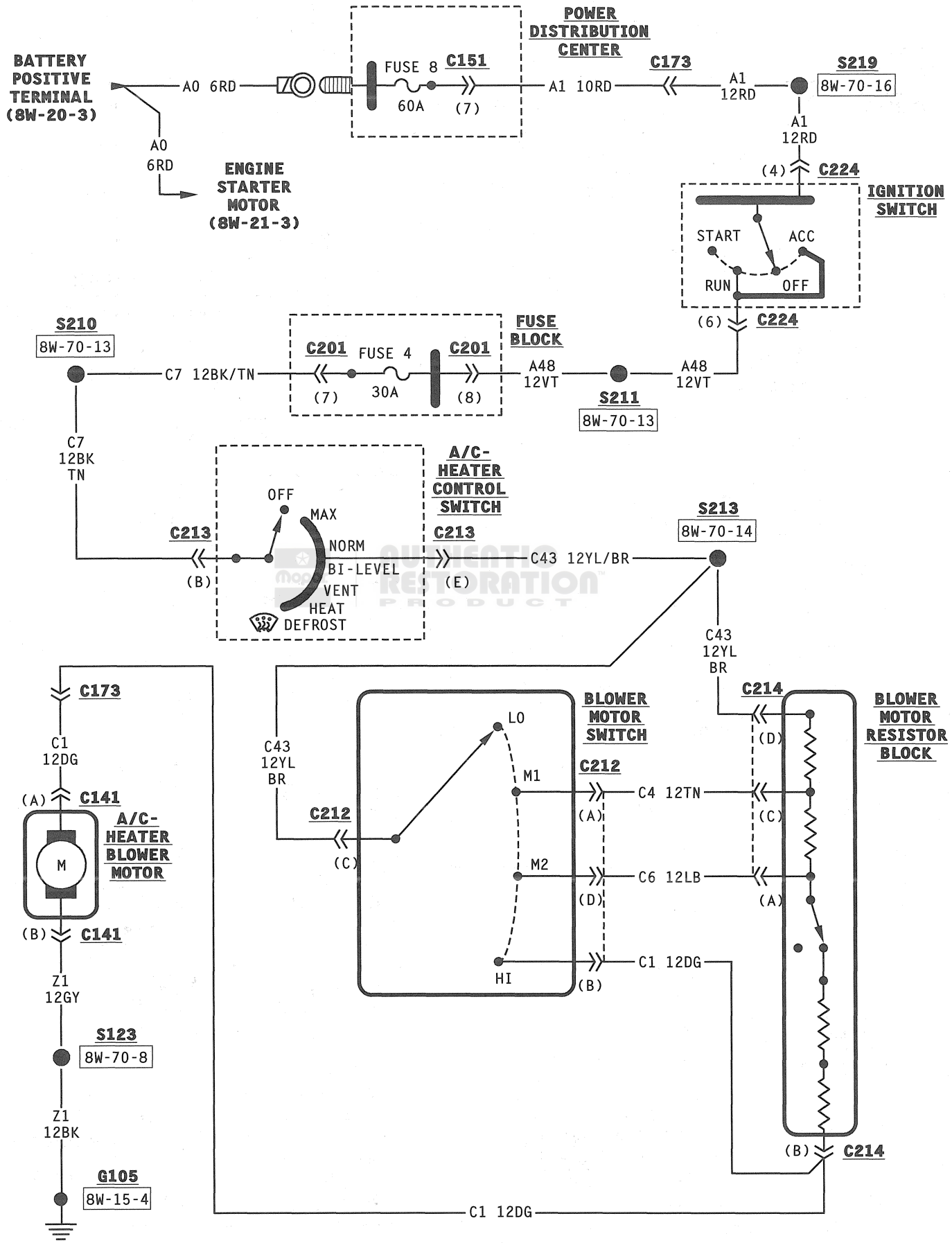
Mopar AUTHENTIC RESTORATION PRODUCT



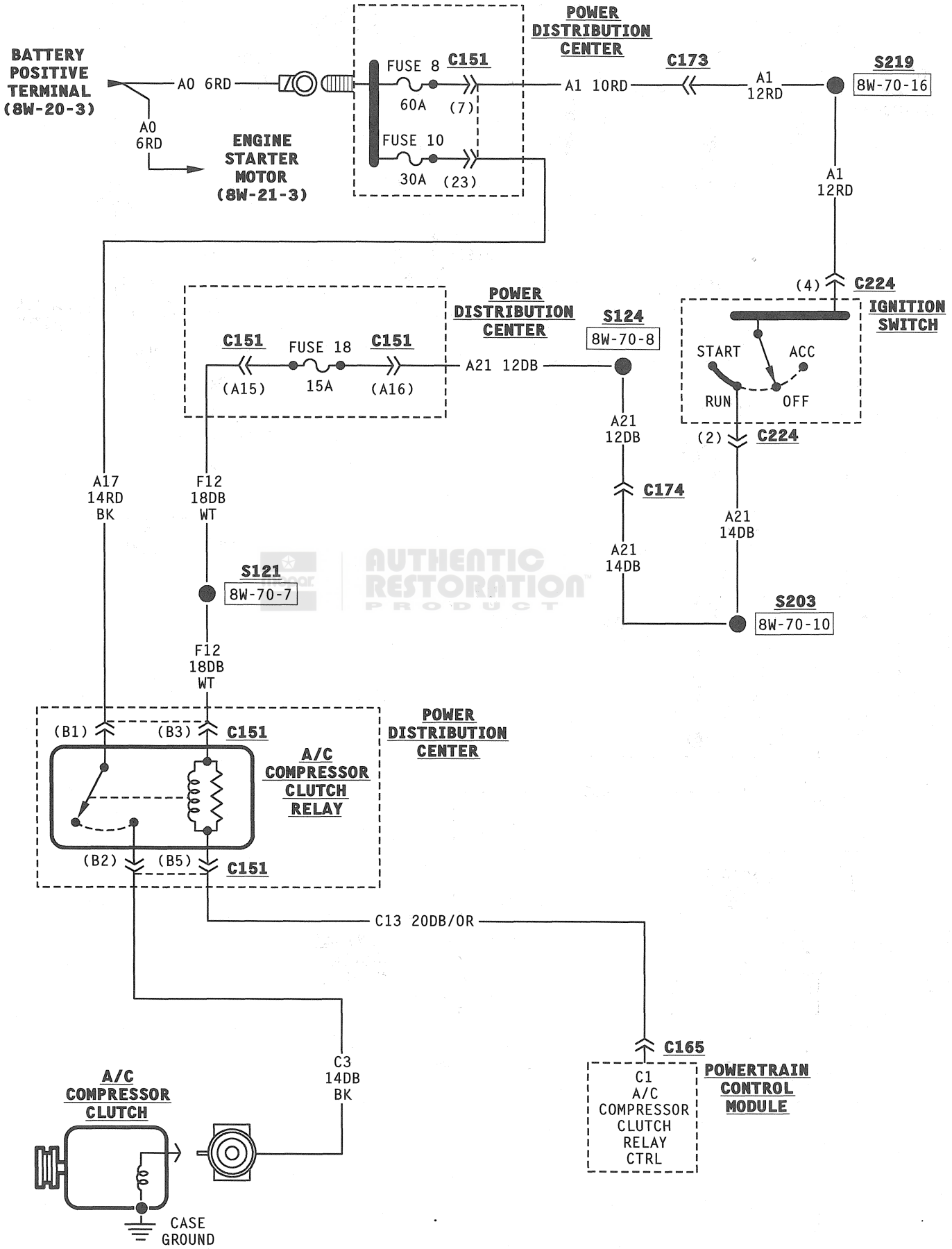
AUTHENTIC RESTORATION PRODUCT



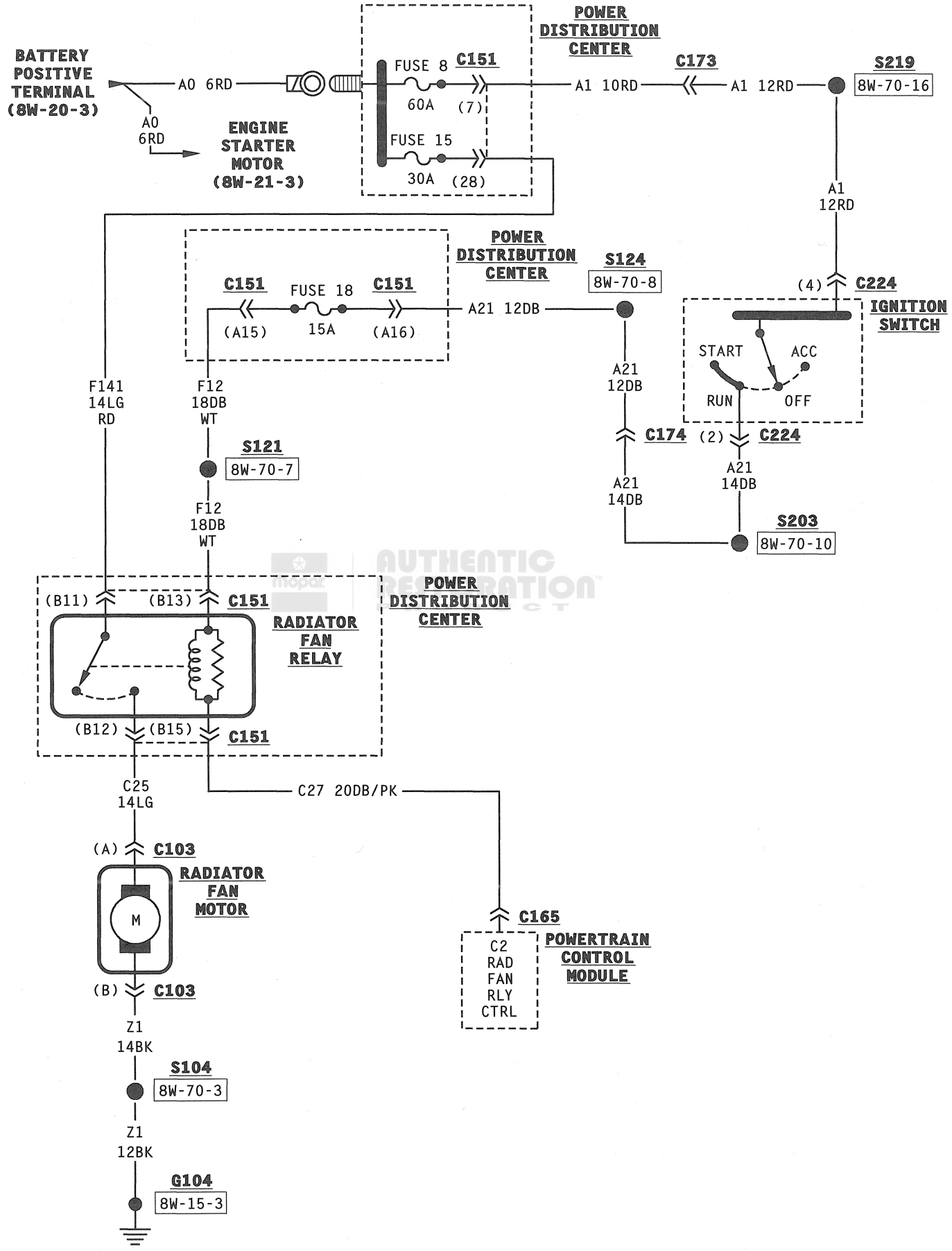
Mopar AUTHENTIC RESTORATION PRODUCTS



AUTOMATIC RESTORATION PRODUCT



AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
FUSE 15
30A
(28)
A1 10RD
C173
A1 12RD
S219
8W-70-16
A1 12RD
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
POWER DISTRIBUTION CENTER
C151
FUSE 18
C151
(A15)
15A
(A16)
A21 12DB
S124
8W-70-8
A21 12DB
C174
(2)
C224
A21 14DB
A21 14DB
S203
8W-70-10
F141 14LG RD
F12 18DB WT
S121
8W-70-7
F12 18DB WT
(B11)
(B13)
C151
RADIATOR FAN RELAY
POWER DISTRIBUTION CENTER
(B12)
(B15)
C151
C25 14LG
C27 20DB/PK
(A)
C103
RADIATOR FAN MOTOR
M
C165
C2 RAD FAN RLY CTRL
POWERTRAIN CONTROL MODULE
(B)
C103
Z1 14BK
S104
8W-70-3
Z1 12BK
G104
8W-15-3

8W-44 INTERIOR LIGHTING

INDEX

page

DESCRIPTION AND OPERATION
BUZZER MODULE 2
CARGO LAMP, COURTESY LAMPS, AND DOME LAMP 1
GLOVE BOX LAMP 1
IGNITION SWITCH KEY-IN HALO LAMP 1
INSTRUMENT PANEL ILLUMINATION LAMPS . . . 1
INTRODUCTION 1
READING LAMPS 2
UNDERHOOD LAMP 1
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

INTRODUCTION

Circuit M1 supplies power to the glove box lamp, dome lamp, courtesy lamps, reading lamps, cargo lamp and vanity lamps. Circuit A6 from 19 in the Power Distribution Center (PDC) powers circuit M1.

Circuit E2 supplies power for the instrument panel illumination lamps.

IGNITION SWITCH KEY-IN HALO LAMP

The time delay relay is used to allow a time-ON function for the ignition switch key-in halo lamp. Circuit A6 from fuse 19 in the Power Distribution Center (PDC) connects to circuit M1. Circuit M1 supplies power to the time delay relay.

Circuit M2 provides ground for the time delay relay through the right and left door jamb switches and the headlamp switch. When a door is opened, or the headlamp switch is moved to the dome lamp position, a ground path is provided for the relay on circuit M2. This energizes the relay, causing the contacts to close.

When the relay contacts close, power is provided through the relay to circuit M50. The M50 circuit supplies current to the ignition switch key-in halo lamp. Circuit Z1 provides ground for the lamp.

INSTRUMENT PANEL ILLUMINATION LAMPS

Circuit E2 from the headlamp switch splices to supply power to the following illumination lamps:

- Transmission range indicator lamp
- Transfer case range indicator lamp
- A/C-Heater switch lamp
- Rear window defogger switch lamp
- Rear wiper switch lamp
- Fog lamp switch lamp

Fuse 25 in the fuse block protects circuit E2. Circuit Z1 provides ground for all of the illumination lamps.

HELPFUL INFORMATION

Circuit E2 also supplies power to the radio, LCD relay and the illumination lamps in the instrument cluster.

GLOVE BOX LAMP

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) connects to circuit M1. Circuit M1 powers the glove box lamp. A case grounded switch, in series after the lamp, closes when the glove box door is opened. The switch completes a path to ground on circuit Z1.

UNDERHOOD LAMP

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) supplies battery voltage for the underhood lamp. A mercury switch, in series after the lamp, connects the lamp to ground on circuit Z1. When the hood is raised, mercury inside the switch moves to a position where it connects circuit M1 to ground circuit Z1, illuminating the lamp.

CARGO LAMP, COURTESY LAMPS, AND DOME LAMP

Circuit A6 from the fuse 19 in the Power Distribution Center (PDC) connects to circuit M1. Circuit M1 powers the cargo lamp, courtesy lamps and dome lamp. The M1 circuit is HOT at all times. The ground path for the lamps is provided in three different ways.

One way is through the door jamb switches. Circuit M2 connects to the door jamb switches to the dome lamp and cargo lamp. The switches are connected to ground circuit Z1. When a door is opened, the plunger in the switch closes, completing a path to ground.

The second way is through the liftgate switch. Circuit G71 connects to circuit M2 at the cargo lamp connector. Circuit G71 connects to the liftgate switch. The liftgate switch connects to ground circuit Z1. When the lift gate opens, the plunger in the switch closes, completing a path to ground.

DESCRIPTION AND OPERATION (Continued)

The third ground path is through the headlamp switch. Circuit M2 is spliced in with the headlamp switch. When the operator turns the headlamp switch to the dome lamp ON position, a ground path is provided through the switch.

READING LAMPS

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) connects to circuit M1. Circuit M1 powers the reading lamps. Circuit M1 is HOT at all times. When the operator depresses the reading lamp, the reading lamp switch closes and supplies ground on circuit Z1.

BUZZER MODULE

The buzzer module sounds an audible warning tone. The tone sounds for seat belt warning and when the ignition key is in the ignition switch while the drivers door is open. The tone also sounds when the ignition key is in the ON position while the drivers side seat belt is not buckled. Lastly, the tone sounds when the headlamps are ON when the ignition is OFF. Refer to Group 8U for system operation.

When the ignition switch is in the RUN or START position, circuit F87 from fuse 26 in the fuse block supplies power to the buzzer module. Circuit A21 from the ignition switch supplies power to fuse 26.

Circuit L7 from fuse 9 in the fuse block also supplies power to the buzzer module. Circuit A3 from fuse 13 in the Power Distribution Center (PDC) powers fuse 9.

When the parking lamps or headlamps are ON, the headlamp switch connects circuit G26 with circuit M11. Circuit M11 connects to the buzzer module. Circuit G26 can also connect to circuit M11 through the key-in switch.

If the headlamps are ON, and the drivers door opens, ground for the buzzer module is on circuit G26 from the headlamp switch through the door jamb switch to circuit Z1.

If the headlamps are OFF with the key in the ignition while the drivers side door is open, ground for the buzzer module is supplied through the key-in switch. The ground path is over circuit M11, through the closed key-in switch to circuit C26. From circuit C26, the ground path continues through the drivers door jamb switch to circuit Z1.

Circuit G11 from the buzzer module powers the seat belt warning lamp in the instrument cluster. Circuit Z1 at the instrument cluster provides ground for the lamp.

Circuit G10 from the buzzer connects to the seat belt switch. When the seat belt switch closes a path to ground is completed on circuit Z1 and the tone sounds momentarily.

Circuit Z1 also grounds the buzzer module.

HELPFUL INFORMATION

Circuit F87 also powers the instrument cluster and the headlamp delay module.

SCHEMATICS AND DIAGRAMS

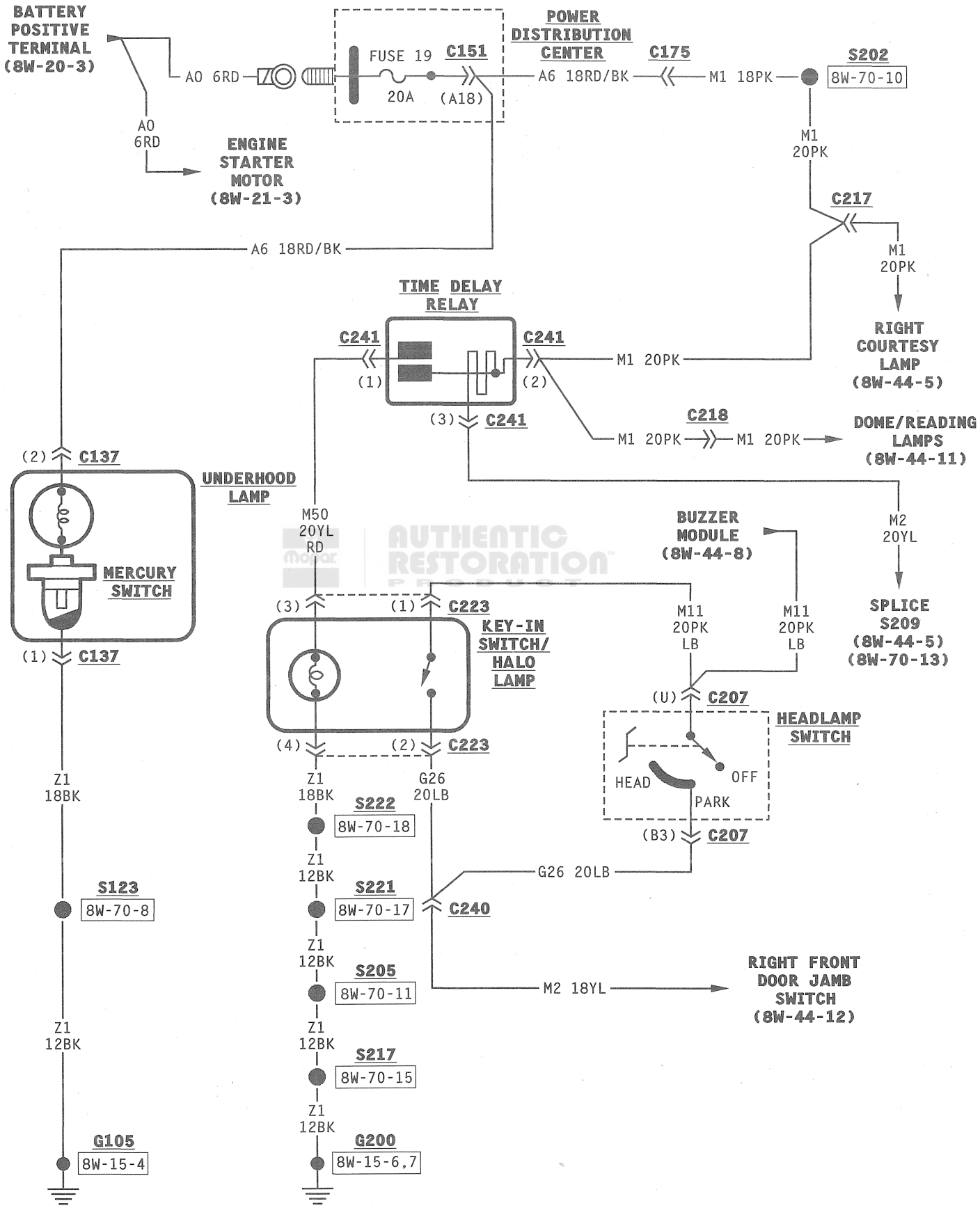
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

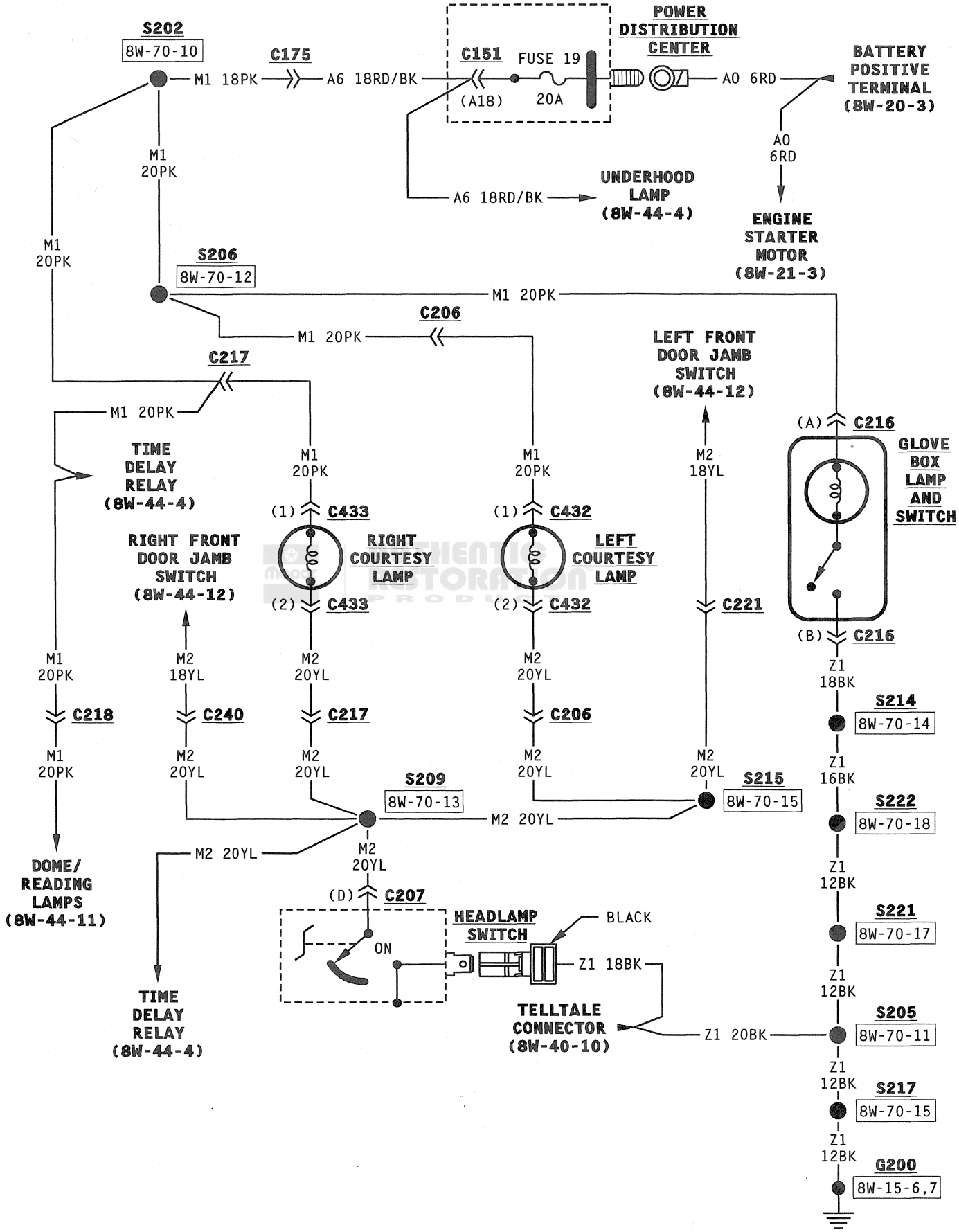
DIAGRAM INDEX

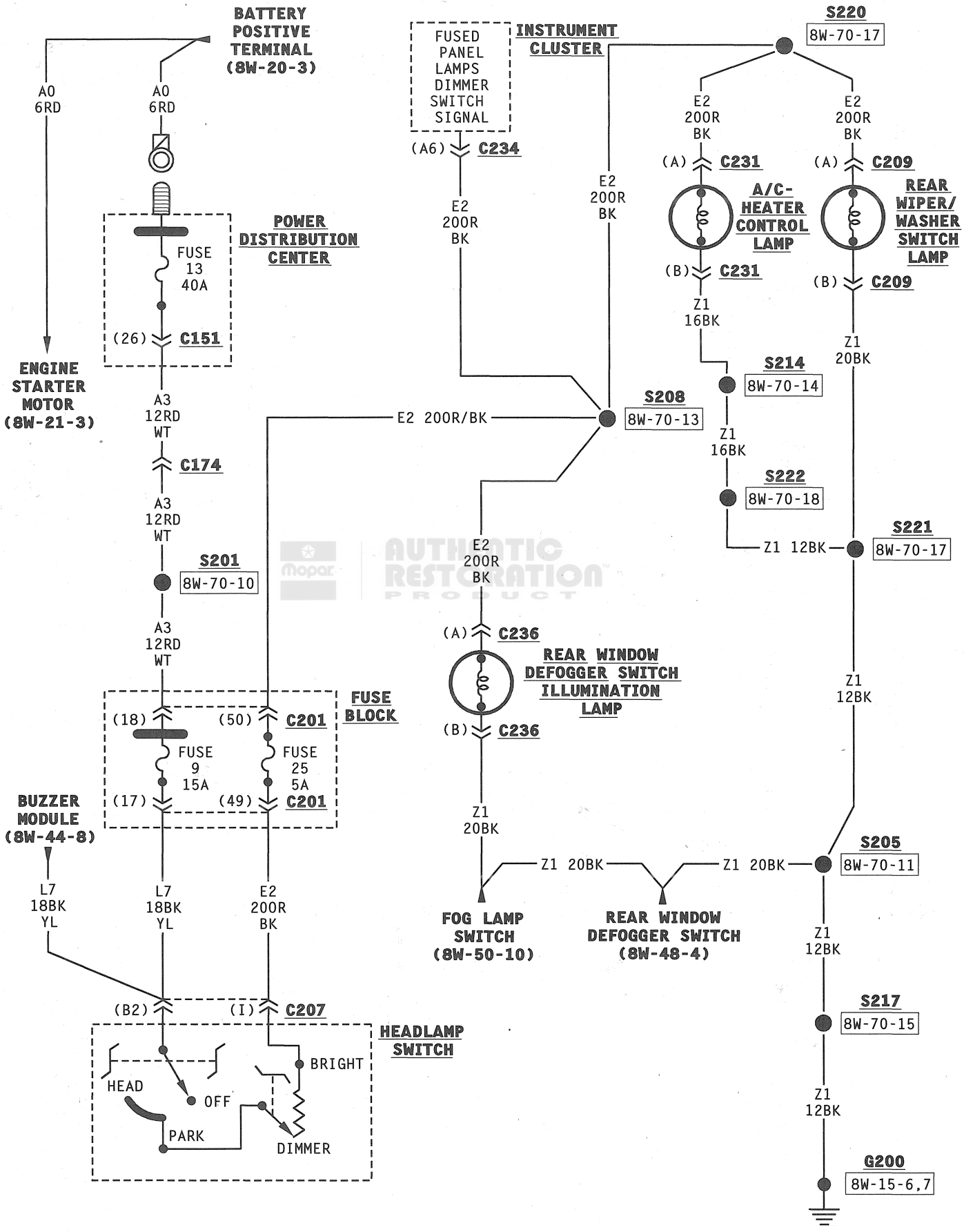
Component	Page
A/C-Heater Control Lamp	8W-44-6
Buzzer Module	8W-44-8
Cargo Lamp	8W-44-9
Courtesy Lamps	8W-44-5
Dome/Reading Lamps	8W-44-11
Fog Lamp Switch Illumination Lamp	8W-44-7
Fuse 9	8W-44-6, 7, 8, 10
Fuse 13	8W-44-10
Fuse 25	8W-44-6, 7, 10
Fuse 26	8W-44-8
Fuse 8 (PDC)	8W-44-8
Fuse 13 (PDC)	8W-44-6, 7, 8, 10
Fuse 19 (PDC)	8W-44-4, 5, 9, 11
Glove Box Lamp and Switch	8W-44-5
Halo Lamp	8W-44-4
Headlamp Switch	8W-44-4, 5, 6, 7, 8, 10, 12
Ignition Switch	8W-44-8
Instrument Cluster	8W-44-6, 7
Key-In Switch	8W-44-4, 12
LCD Illumination Relay	8W-44-10
Left Front Door Jamb Switch	8W-44-12
Left Rear Door Jamb Switch	8W-44-12
Liftgate Switch	8W-44-9
PRNDL Lamp	8W-44-7
Rear Window Defogger Switch Illumination Lamp	8W-44-6
Rear Wiper/Washer Switch Lamp	8W-44-6
Right Front Door Jamb Switch	8W-44-12
Right Rear Door Jamb Switch	8W-44-12
Seat Belt Switch	8W-44-8
Telltale Connector	8W-44-8
Time Delay Relay	8W-44-4
Transfer Case Lamp	8W-44-7
Underhood Lamp	8W-44-4

Mopar AUTHENTIC RESTORATION PRODUCT

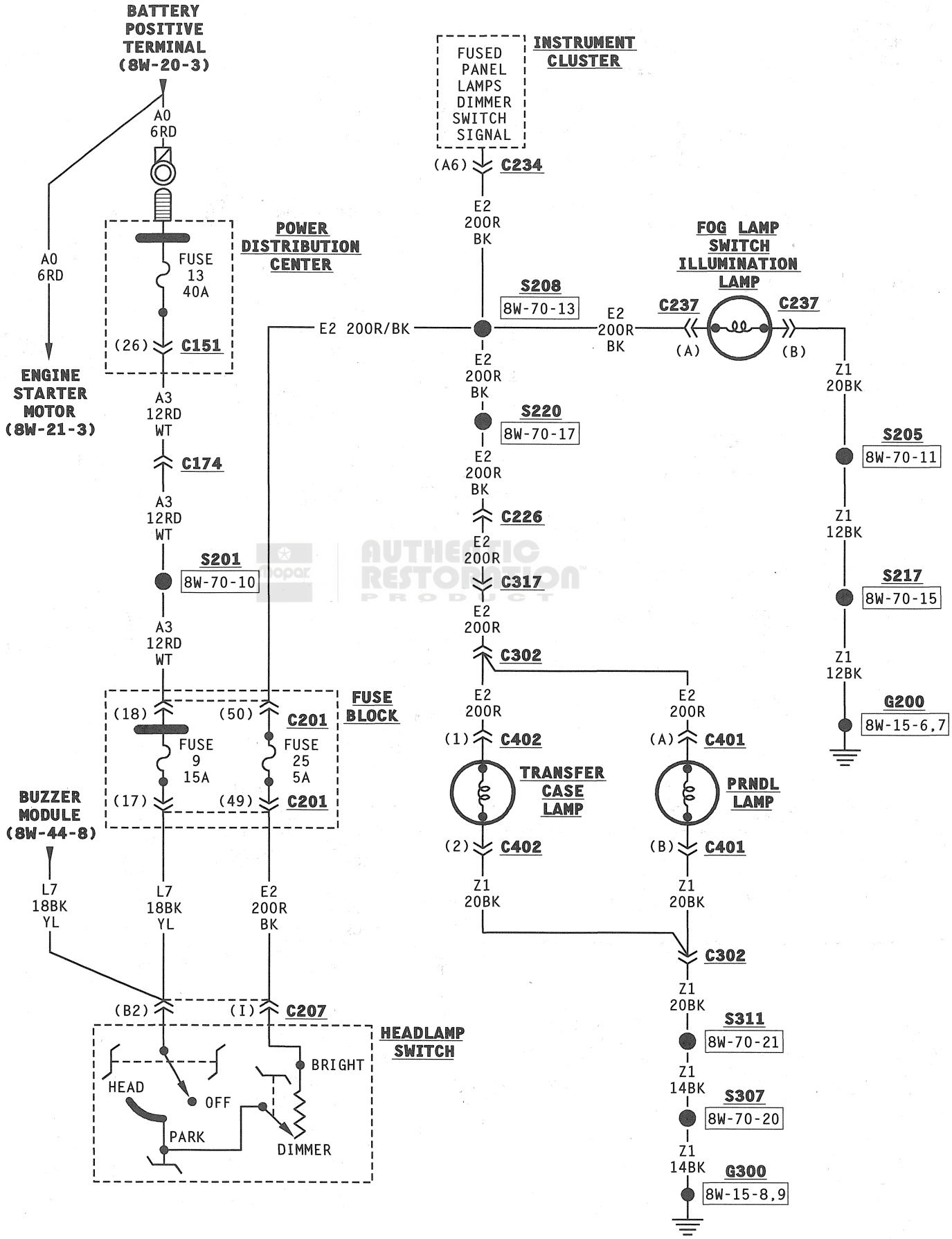


AUTHENTIC RESTORATION PARTS

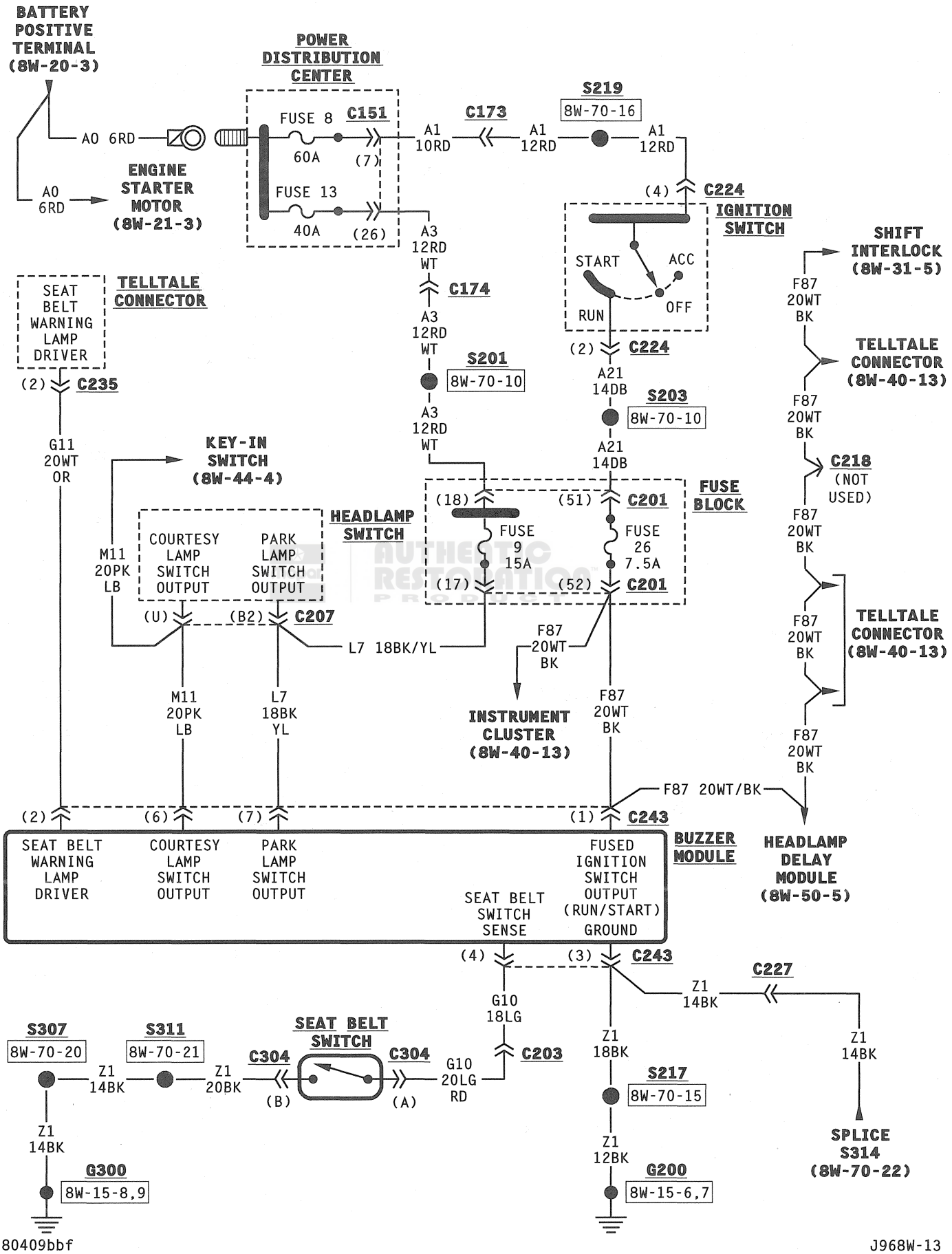

S202
8W-70-10
C175
M1 18PK
A6 18RD/BK
C151
FUSE 19
(A18)
20A
POWER DISTRIBUTION CENTER
A0 6RD
BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
M1 20PK
A6 18RD/BK
UNDERHOOD LAMP (8W-44-4)
ENGINE STARTER MOTOR (8W-21-3)
M1 20PK
S206
8W-70-12
M1 20PK
C206
M1 20PK
C217
M1 20PK
LEFT FRONT DOOR JAMB SWITCH (8W-44-12)
(A) C216
GLOVE BOX LAMP AND SWITCH
TIME DELAY RELAY (8W-44-4)
M1 20PK
(1) C433
RIGHT COURTESY LAMP
(2) C433
M1 20PK
(1) C432
LEFT COURTESY LAMP
(2) C432
M2 18YL
C221
(B) C216
RIGHT FRONT DOOR JAMB SWITCH (8W-44-12)
M1 20PK
C218
M1 20PK
M2 18YL
C240
M2 20YL
M2 20YL
C217
M2 20YL
M2 20YL
C206
M2 20YL
M2 20YL
S215
8W-70-15
Z1 18BK
S214
8W-70-14
Z1 16BK
S222
8W-70-18
Z1 12BK
S221
8W-70-17
Z1 12BK
S205
8W-70-11
Z1 12BK
S217
8W-70-15
Z1 12BK
G200
8W-15-6,7
S209
8W-70-13
M2 20YL
M2 20YL
M2 20YL
(D) C207
HEADLAMP SWITCH
BLACK
ON
Z1 18BK
TELLTALE CONNECTOR (8W-40-10)
Z1 20BK
DOME/ READING LAMPS (8W-44-11)
TIME DELAY RELAY (8W-44-4)

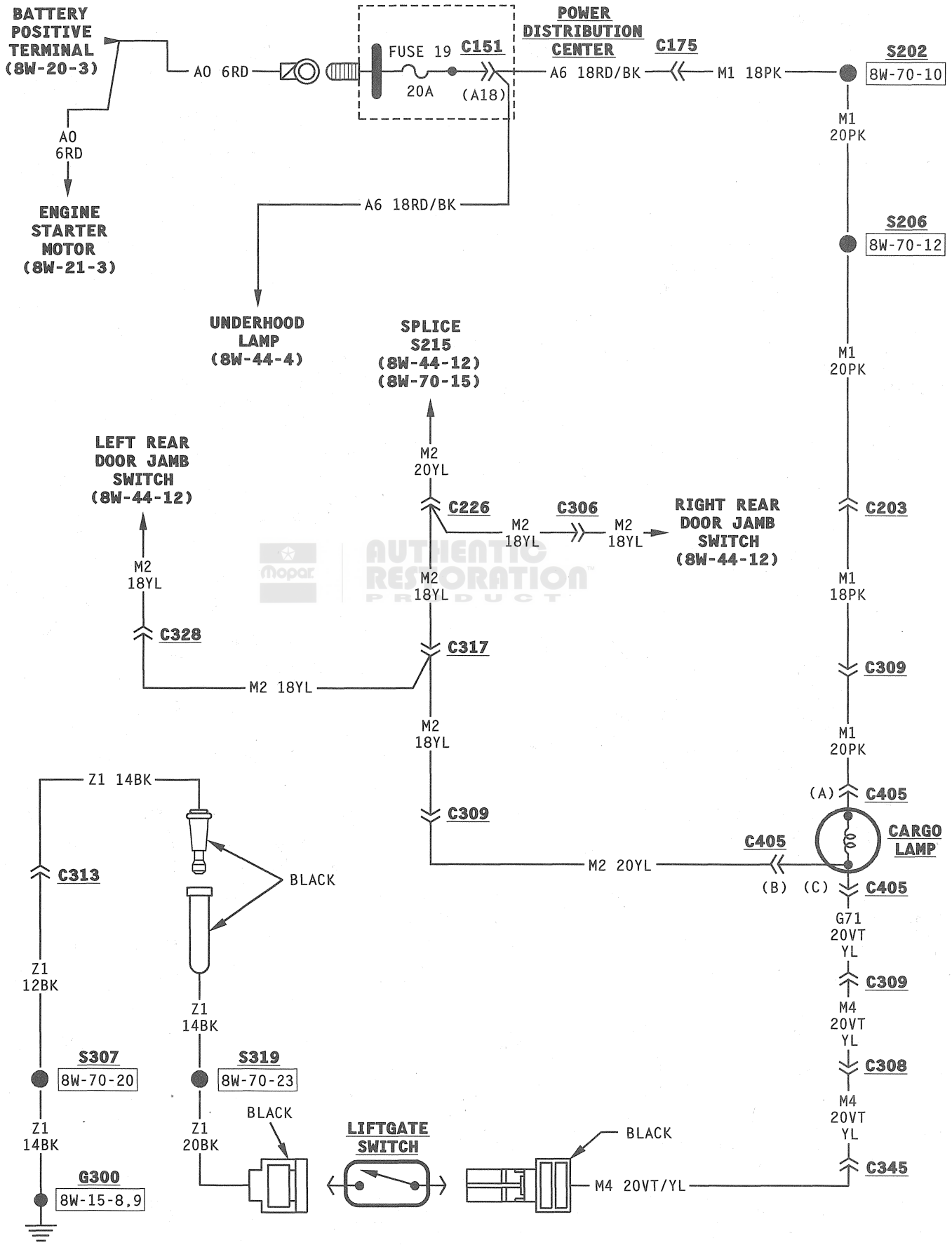


Mopar AUTHENTIC RESTORATION PRODUCT

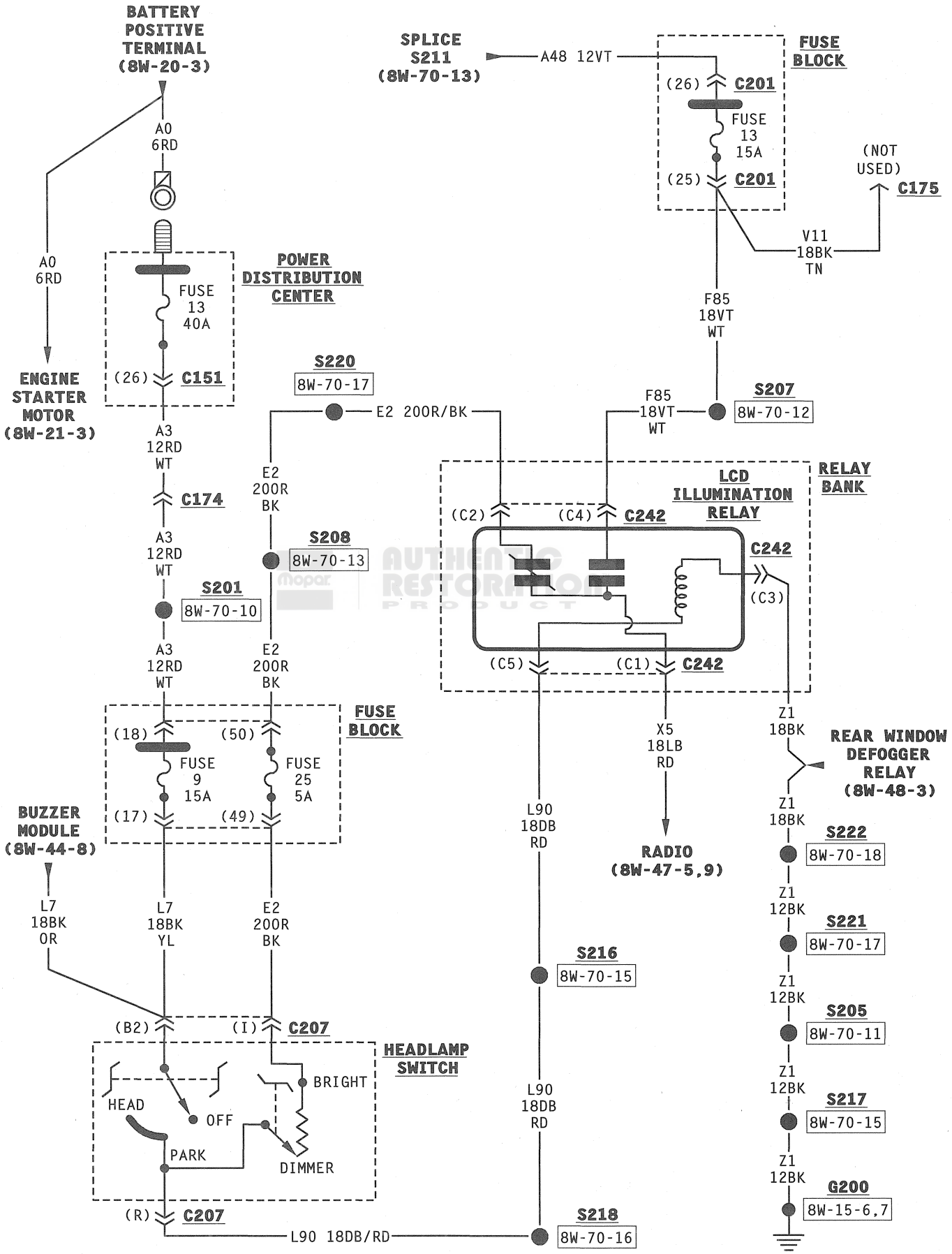


AUTHENTIC RESTORATION PRODUCT

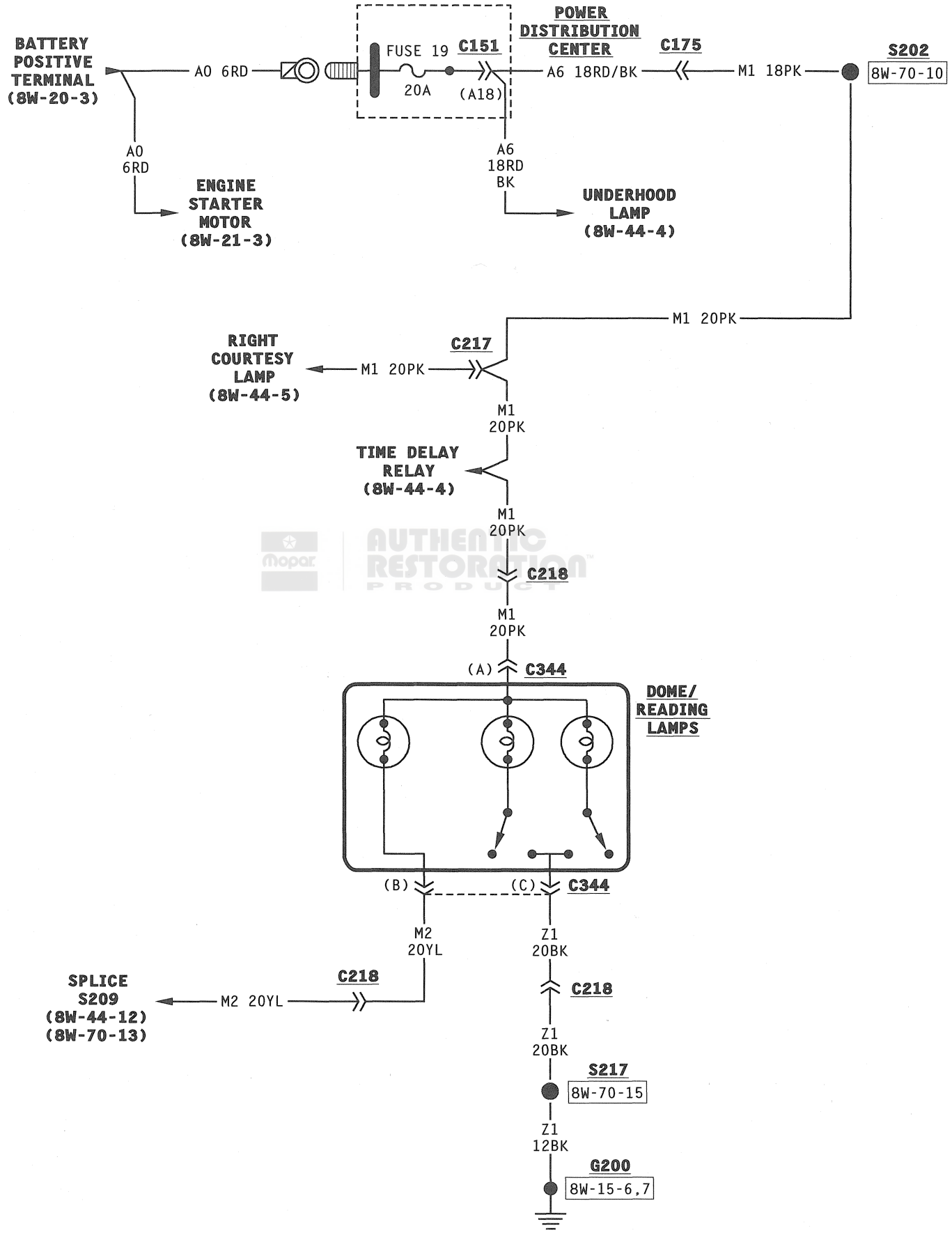

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 8
C151
60A
(7)
FUSE 13
40A
(26)
A1 10RD
C173
A1 12RD
S219
8W-70-16
A1 12RD
(4) C224
IGNITION SWITCH
START
ACC
RUN
OFF
(2) C224
A21 14DB
S203
8W-70-10
A21 14DB
A3 12RD WT
C174
A3 12RD WT
S201
8W-70-10
A3 12RD WT
SHIFT INTERLOCK (8W-31-5)
F87 20WT BK
TELLTALE CONNECTOR (8W-40-13)
F87 20WT BK
C218 (NOT USED)
F87 20WT BK
F87 20WT BK
TELLTALE CONNECTOR (8W-40-13)
F87 20WT BK
SEAT BELT WARNING LAMP DRIVER
TELLTALE CONNECTOR
(2) C235
G11 20WT OR
KEY-IN SWITCH (8W-44-4)
HEADLAMP SWITCH
COURTESY LAMP SWITCH OUTPUT
PARK LAMP SWITCH OUTPUT
M11 20PK LB
(U)
(B2) C207
L7 18BK/YL
(18)
(51) C201
FUSE 9 15A
FUSE 26 7.5A
(17)
(52) C201
FUSE BLOCK
F87 20WT BK
INSTRUMENT CLUSTER (8W-40-13)
F87 20WT BK
M11 20PK LB
L7 18BK YL
F87 20WT/BK
(2)
(6)
(7)
(1) C243
SEAT BELT WARNING LAMP DRIVER
COURTESY LAMP SWITCH OUTPUT
PARK LAMP SWITCH OUTPUT
FUSED IGNITION SWITCH OUTPUT (RUN/START)
GROUND
SEAT BELT SWITCH SENSE
BUZZER MODULE
HEADLAMP DELAY MODULE (8W-50-5)
(4)
(3) C243
C227
Z1 14BK
G10 18LG
C203
Z1 18BK
Z1 14BK
S307
8W-70-20
S311
8W-70-21
SEAT BELT SWITCH
C304
C304
Z1 14BK
Z1 20BK
(B)
(A)
G10 20LG RD
S217
8W-70-15
Z1 14BK
SPLICE S314 (8W-70-22)
Z1 14BK
G300
8W-15-8,9
Z1 12BK
G200
8W-15-6,7

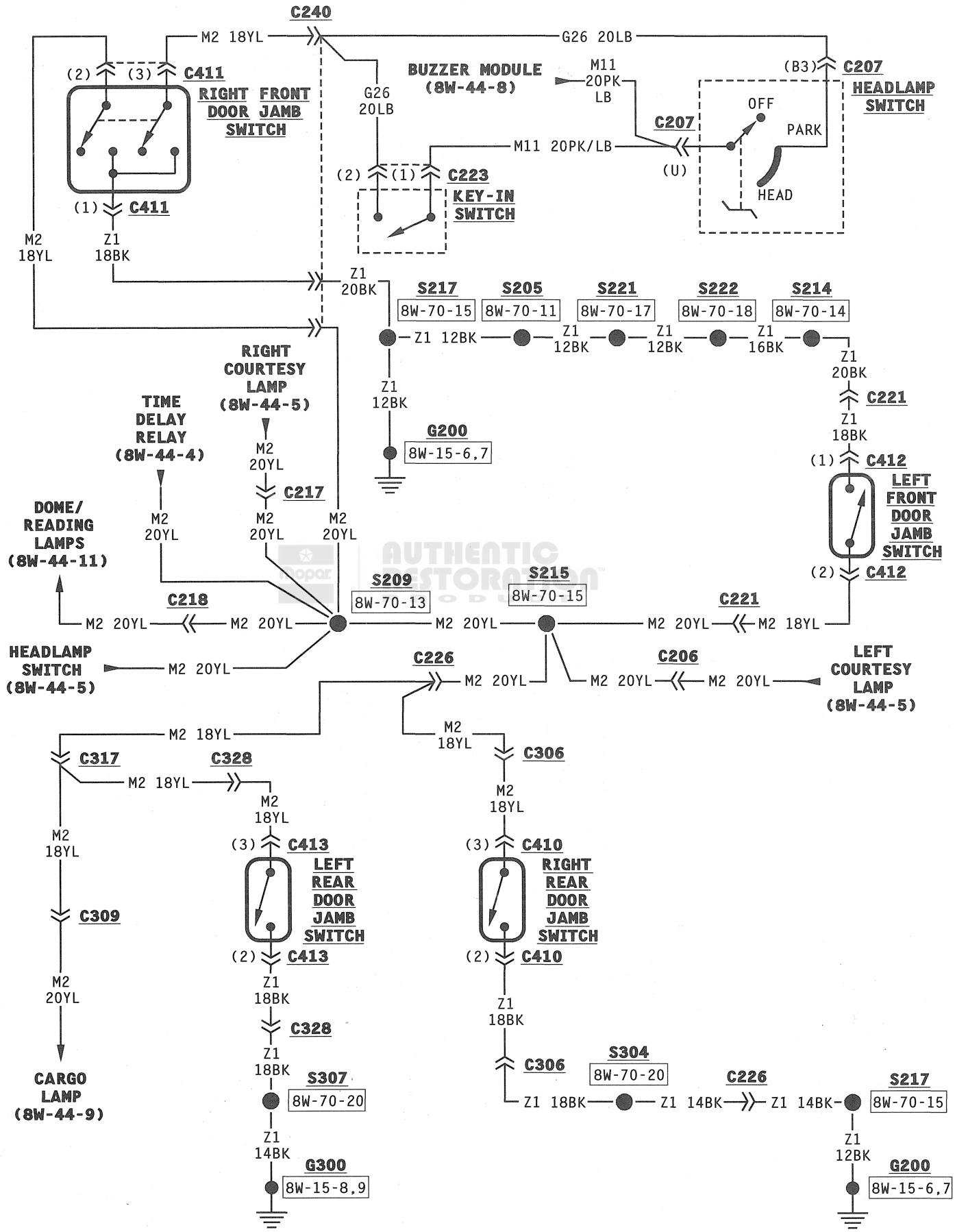


Mopar AUTHENTIC RESTORATION PRODUCT



AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
FUSE 19
20A
C151
(A18)
POWER DISTRIBUTION CENTER
A6 18RD/BK
C175
M1 18PK
S202
8W-70-10
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
A6 18RD BK
UNDERHOOD LAMP (8W-44-4)
M1 20PK
RIGHT COURTESY LAMP (8W-44-5)
C217
M1 20PK
M1 20PK
TIME DELAY RELAY (8W-44-4)
M1 20PK
C218
M1 20PK
(A)
C344
DOME/ READING LAMPS
(B)
(C)
C344
M2 20YL
Z1 20BK
SPLICE S209 (8W-44-12) (8W-70-13)
M2 20YL
C218
C218
Z1 20BK
S217
8W-70-15
Z1 12BK
G200
8W-15-6,7


C240
M2 18YL
G26 20LB
(2) (3) C411
RIGHT FRONT DOOR JAMB SWITCH
(1) C411
M2 18YL
Z1 18BK
G26 20LB
BUZZER MODULE (8W-44-8)
M11 20PK LB
(B3) C207
HEADLAMP SWITCH
OFF
PARK
HEAD
C207
(U)
M11 20PK/LB
(2) (1) C223
KEY-IN SWITCH
Z1 20BK
S217 8W-70-15
S205 8W-70-11
S221 8W-70-17
S222 8W-70-18
S214 8W-70-14
Z1 12BK
Z1 12BK
Z1 12BK
Z1 16BK
Z1 20BK
C221
Z1 18BK
(1) C412
LEFT FRONT DOOR JAMB SWITCH
(2) C412
Z1 12BK
G200 8W-15-6,7
RIGHT COURTESY LAMP (8W-44-5)
TIME DELAY RELAY (8W-44-4)
M2 20YL
C217
M2 20YL
M2 20YL
M2 20YL
DOME/ READING LAMPS (8W-44-11)
C218
S209 8W-70-13
S215 8W-70-15
C221
M2 20YL
M2 20YL
M2 20YL
M2 20YL
M2 18YL
HEADLAMP SWITCH (8W-44-5)
M2 20YL
C226
M2 20YL
C206
M2 20YL
M2 20YL
LEFT COURTESY LAMP (8W-44-5)
M2 18YL
C317
C328
M2 18YL
M2 18YL
M2 18YL
C306
M2 18YL
(3) C413
LEFT REAR DOOR JAMB SWITCH
(2) C413
(3) C410
RIGHT REAR DOOR JAMB SWITCH
(2) C410
C309
M2 20YL
Z1 18BK
Z1 18BK
C328
Z1 18BK
C306
S304 8W-70-20
C226
S217 8W-70-15
S307 8W-70-20
Z1 18BK
Z1 14BK
Z1 14BK
Z1 14BK
Z1 12BK
CARGO LAMP (8W-44-9)
Z1 14BK
G300 8W-15-8,9
G200 8W-15-6,7

8W-47 AUDIO SYSTEM

INDEX

page

DESCRIPTION AND OPERATION
RADIO ILLUMINATION 1
RADIO MEMORY 1
RADIO OPERATION 1
SPEAKERS 1
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

RADIO OPERATION

When the ignition switch is in the ACCESSORY or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48. Circuit A48 powers circuit F85 through fuse 13 in the fuse block. Circuit F85 powers the radio.

Circuit Z1 provides ground for the radio. The antenna connects to the rear of the radio.

RADIO MEMORY

Circuit A6 from fuse 19 in the Power Distribution Center (PDC) connects to circuit M1. Circuit M1 supplies power for the radio memory. Circuits A6 and M1 are HOT at all times.

RADIO ILLUMINATION

Circuit E2 supplies battery voltage to the radio illumination lamps when the headlamps or parking lamps are on and the dimmer switch is in the Low or On positions.

Circuit X5 supplies battery voltage for the radio clock and station frequency display. Circuit X5 originates at the radio illumination relay and is fed by either circuit F85 or circuit E2 depending on the switch position inside the relay.

When the headlamps and parking lamps are off, the radio illumination relay is in its normal At Rest position. In the At Rest position, the relay connects circuit F85 from fuse 13 in the fuse block to circuit X5.

When the headlamps or parking lamps are on, circuit L90 from the headlamp switch supplies battery voltage to the coil side of the radio illumination relay. Circuit Z1 provides ground for the coil side of the relay.

When voltage is present on circuit L90, the radio illumination relay switches from its At Rest position to connect circuit E2 to circuit X5.

HELPFUL INFORMATION

• Circuit A48 supplies voltage to fuse 13 in the fuse block for circuit F85 when the ignition switch is in the ACCESSORY or RUN positions. In these positions, the ignition switch connects circuit A1 from fuse 8 in the PDC to circuit A48.

• Circuit A3 from fuse 13 in the PDC supplies power to the fuse block for fuse 9. Fuse 9 protects circuit L7. When the headlamps or parking lamps are ON, the headlamp switch connects circuit L7 to circuit L90. When the adjustable dimmer switch is in the LOW to ON positions, it internally connects circuit L7 to circuit E2. Circuit E2 powers fuse 25 in the fuse block. Circuit E2 continues through fuse 25.

SPEAKERS

There are 3 different radio packages. The standard radio package includes 2 speakers; one in each front door. The four speaker system uses speakers in each front door plus two speakers in the instrument panel. The six speaker system has the front door speakers, sound bar speakers and two speakers in the instrument panel.

BASE RADIO

Vehicles with the base radio have a jumper between the radio and the instrument panel connectors. The jumper simulates rear speaker load.

Circuit X53 feeds the speaker in the left front door. Circuit X55 is the return from the speaker to the radio.

Circuit X54 feeds the right front door speaker. Circuit X56 is the return from the speaker to the radio.

FOUR SPEAKER SYSTEM

Circuit X53 feeds the speaker in the left front door and the speaker in the left side of the instrument panel. Circuit X55 is the return from the speakers to the radio. Circuits X53 and X55 are double crimped at the instrument panel speaker and connect to the door speaker.

Circuit X54 feeds the right front door speaker and the speaker in the right side of the instrument panel. Circuit X56 is the return from the speakers to the radio. Circuits X54 and X56 are double crimped at the instrument panel speaker and connect to the door speaker.

DESCRIPTION AND OPERATION (Continued)

SIX SPEAKER SYSTEM

Circuit X53 feeds the left speaker in the instrument panel. The X53 circuit is double crimped at the instrument panel left speaker and branches to the left front door speaker. Circuit X55 is the return to the radio from the instrument panel left speaker and left front door speaker. Circuit X55 is double crimped at the instrument panel left speaker.

Circuit X54 feeds the right speaker in the instrument panel. The X54 circuit is double crimped at the instrument panel right speaker and branches to the right front door speaker. Circuit X56 is the return to the radio from the instrument panel right speaker and right front door speaker. Circuit X56 is double crimped at the instrument panel right speaker.

Circuit X51 feeds the left rear speaker. Circuit X57 is the return from the speaker to the radio.

Circuit X52 feeds the right rear speaker. Circuit X58 is the return from the speaker to the radio.

SCHEMATICS AND DIAGRAMS

WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

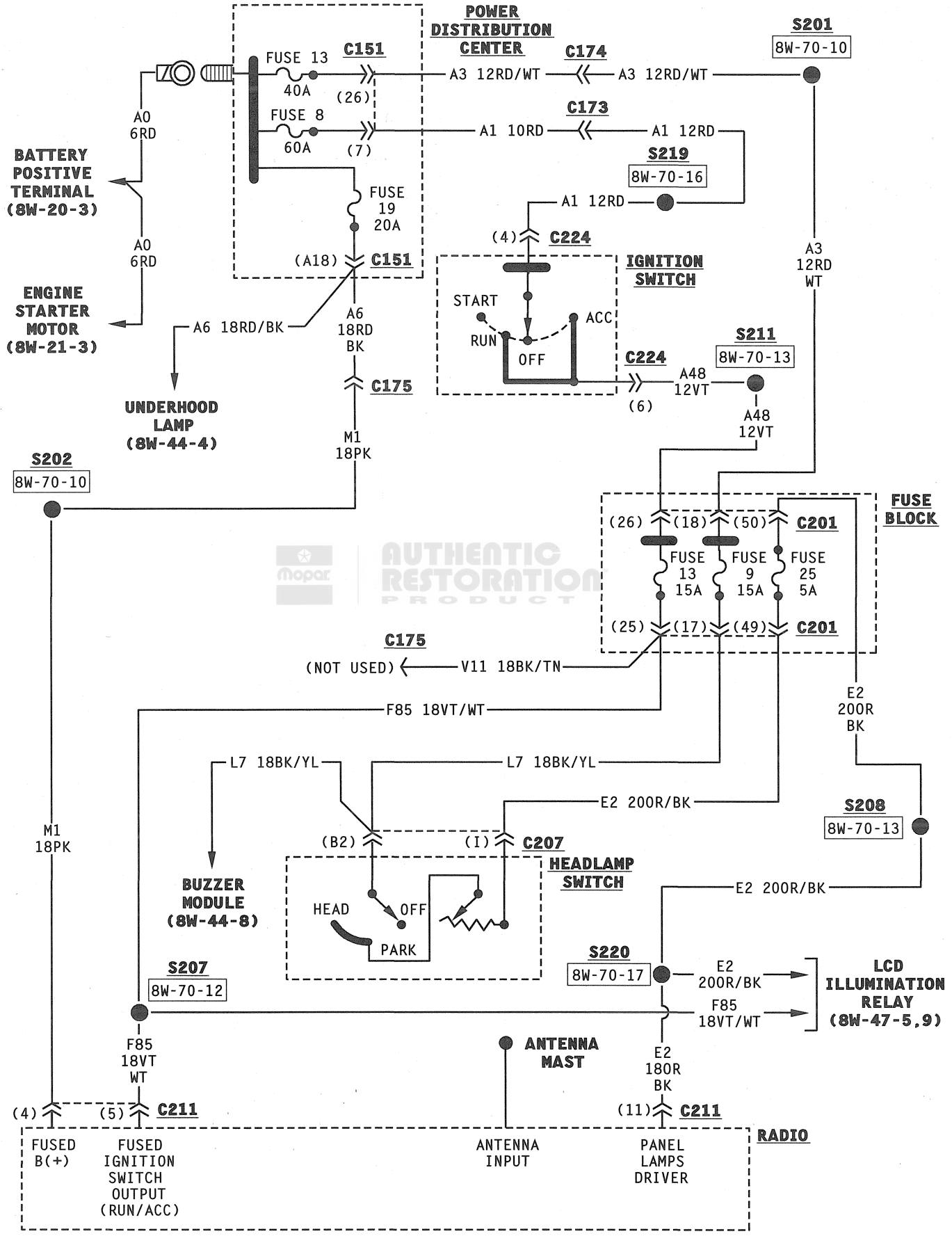
DIAGRAM INDEX

Component	Page
Fuse 9	8W-47-4, 5, 8, 9
Fuse 13	8W-47-4, 8
Fuse 25	8W-47-4, 8
Fuse 8 (PDC)	8W-47-4, 8
Fuse 13 (PDC)	8W-47-4, 5, 8, 9
Headlamp Switch	8W-47-4, 5, 8, 9
Ignition Switch	8W-47-4, 8
LCD Illumination Relay	8W-47-5, 9

Component	Page
Left Front Door Speaker	8W-47-6, 11
Left Instrument Panel Speaker	8W-47-6, 11
Left Soundbar Speaker	8W-47-6
Radio	8W-47-4 Thru 11
Right Front Door Speaker	8W-47-7, 10
Right Instrument Panel Speaker	8W-47-7, 10
Right Soundbar Speaker	8W-47-7

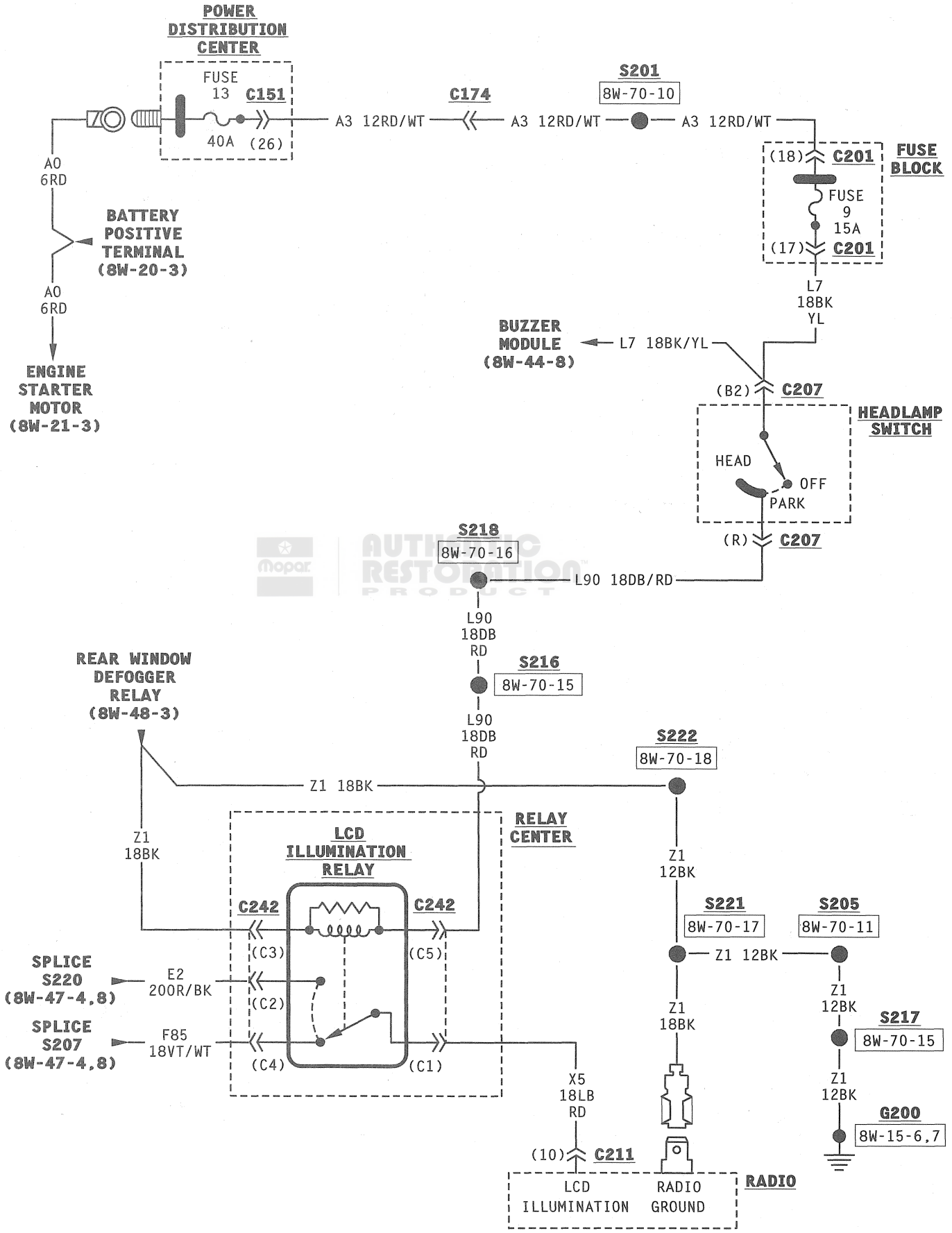
Mopar AUTHENTIC RESTORATION PRODUCT

6 SPEAKER SYSTEM

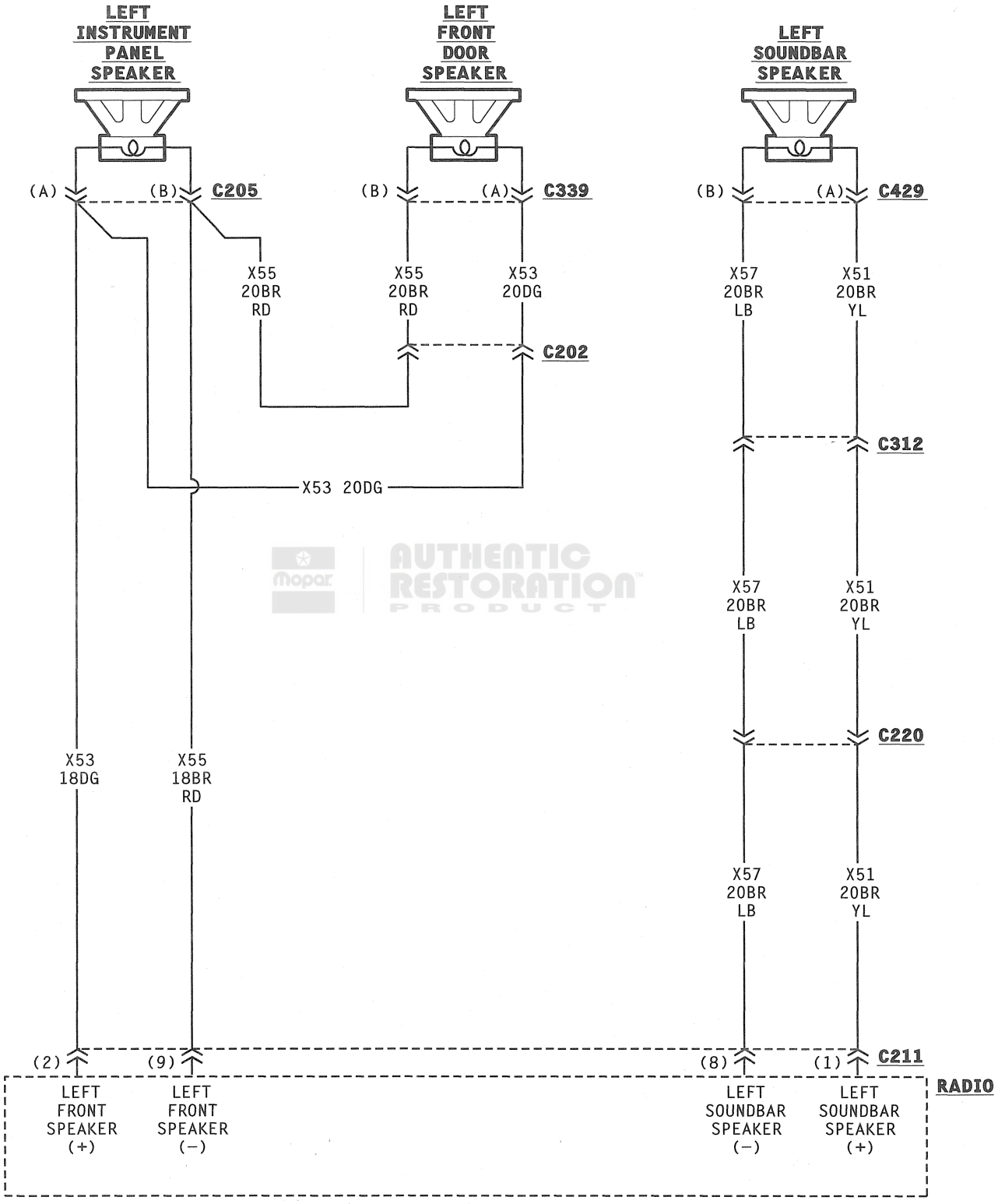


Mopar AUTHENTIC RESTORATION PRODUCT

6 SPEAKER SYSTEM

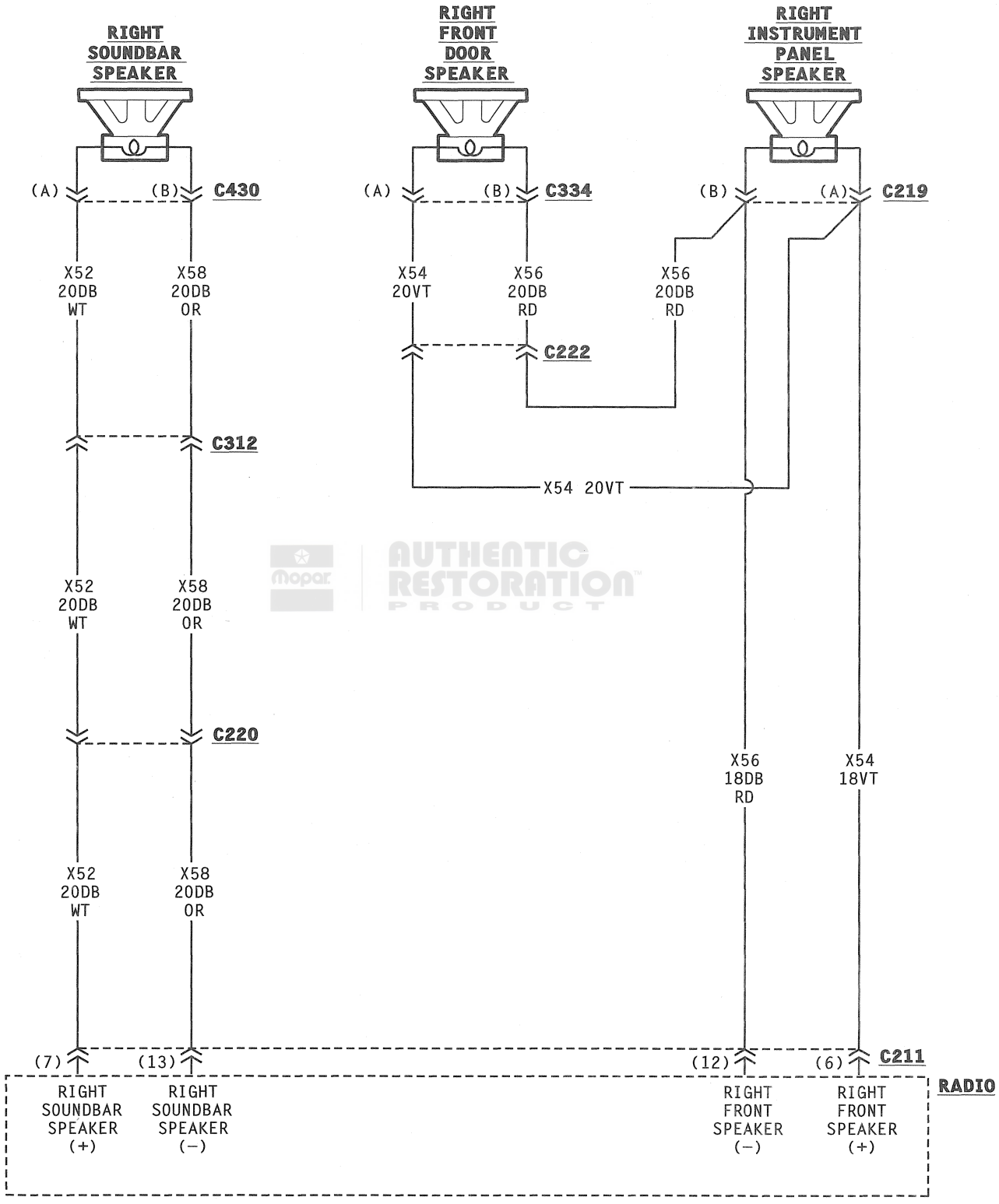


Mopar AUTHENTIC RESTORATION PRODUCT



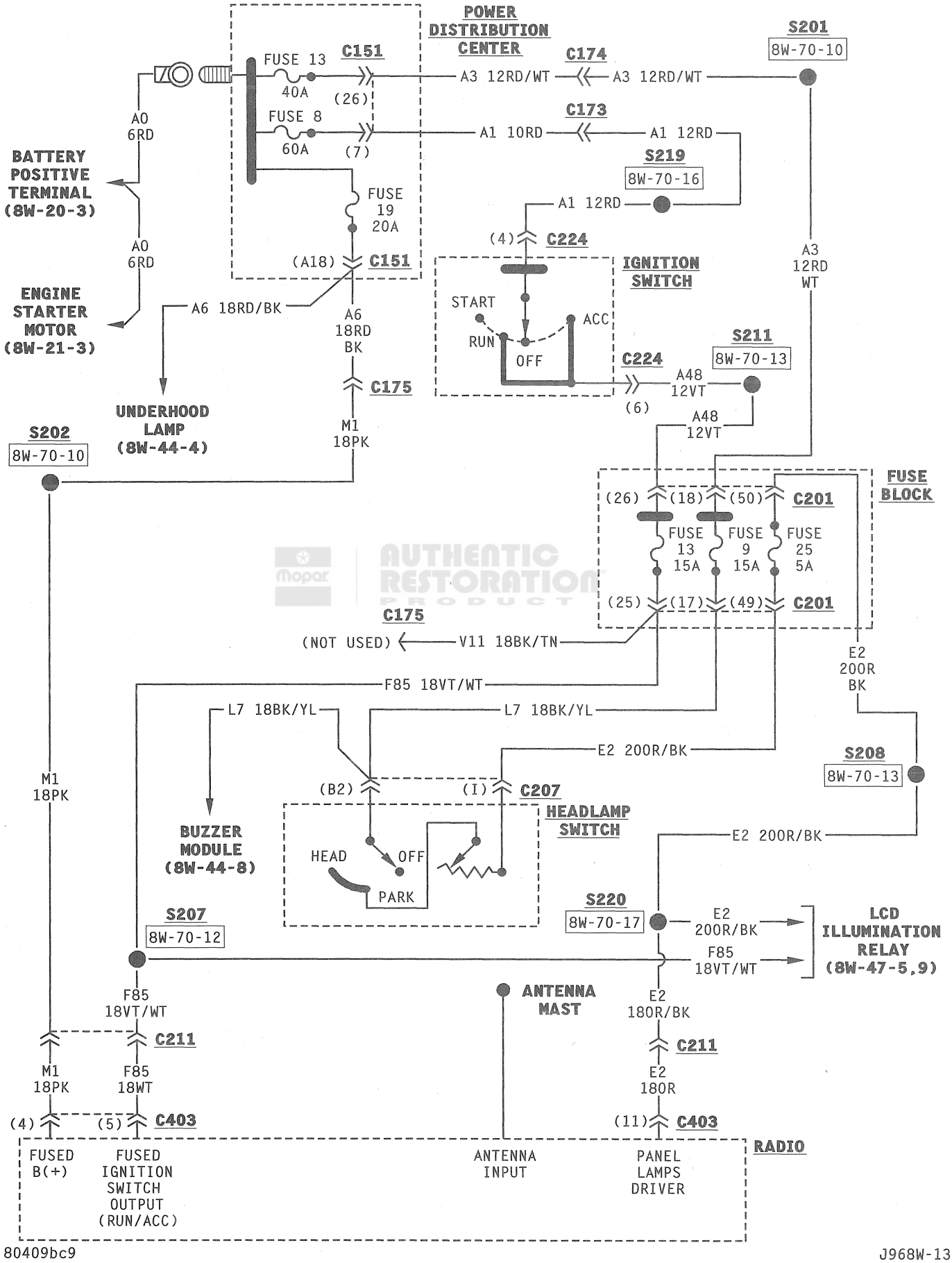
Mopar AUTHENTIC RESTORATION PRODUCT

6 SPEAKER SYSTEM



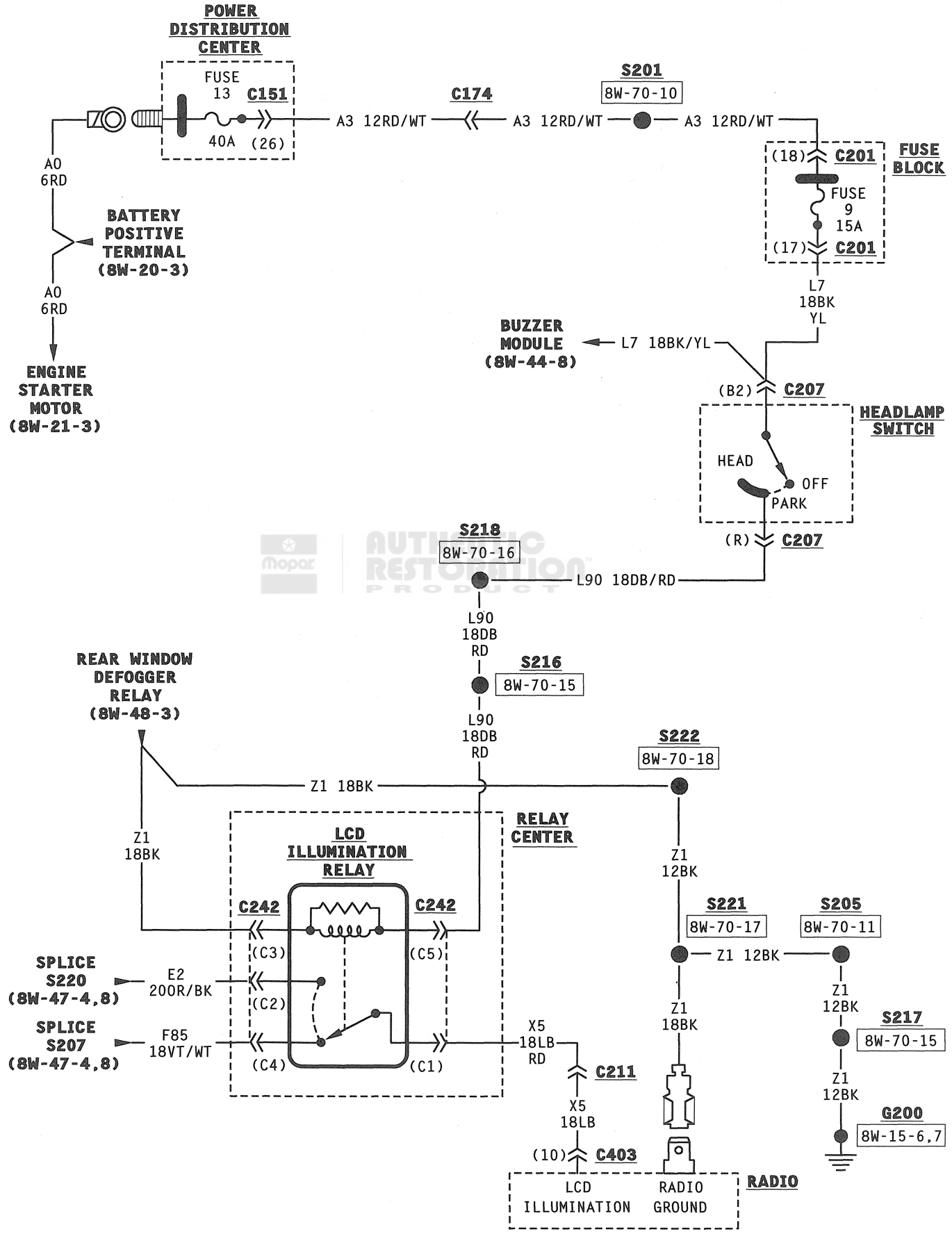
Mopar AUTHENTIC RESTORATION PRODUCT

2 AND 4 SPEAKER SYSTEM

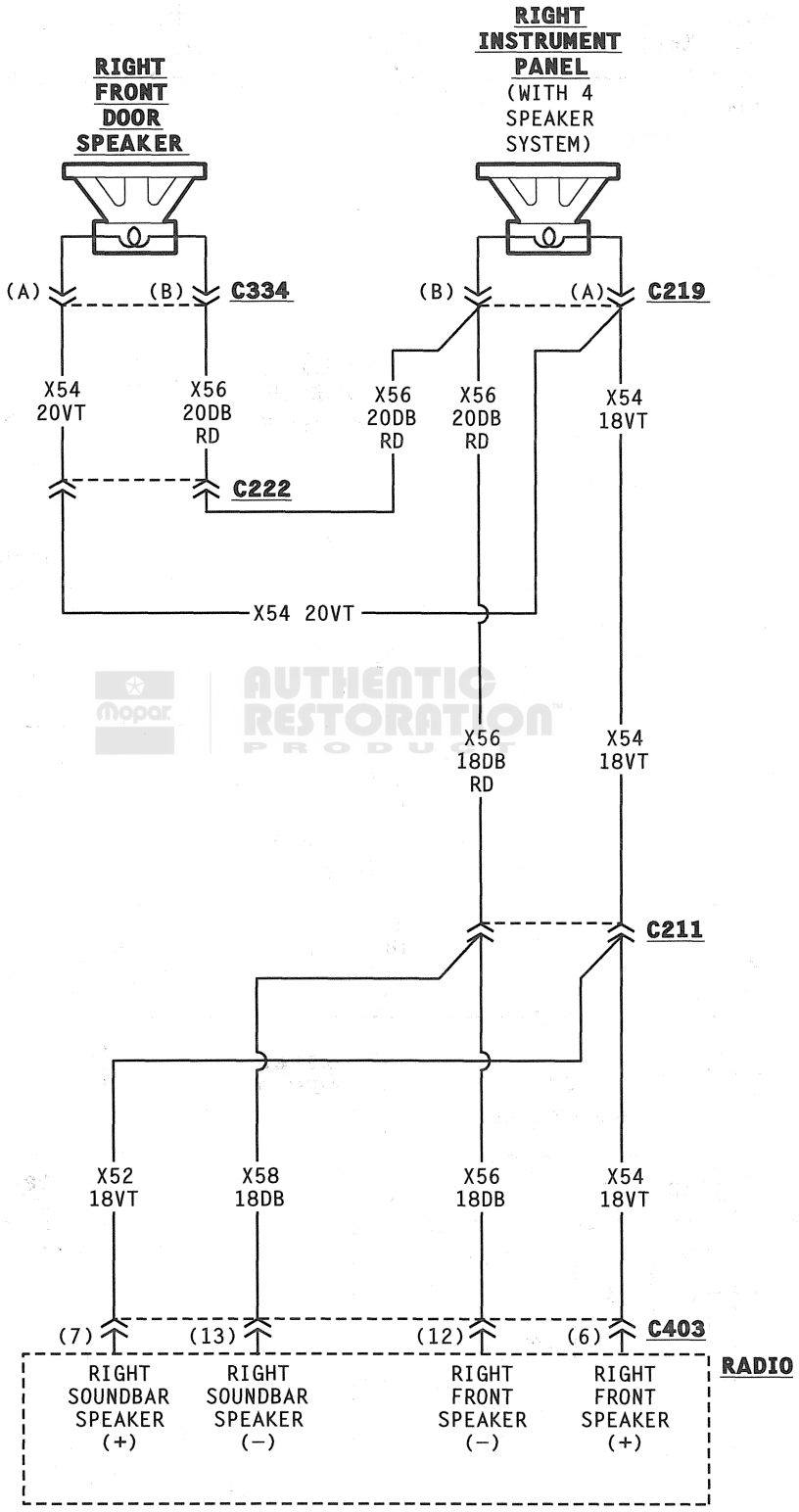


Mopar AUTHENTIC RESTORATION PRODUCT

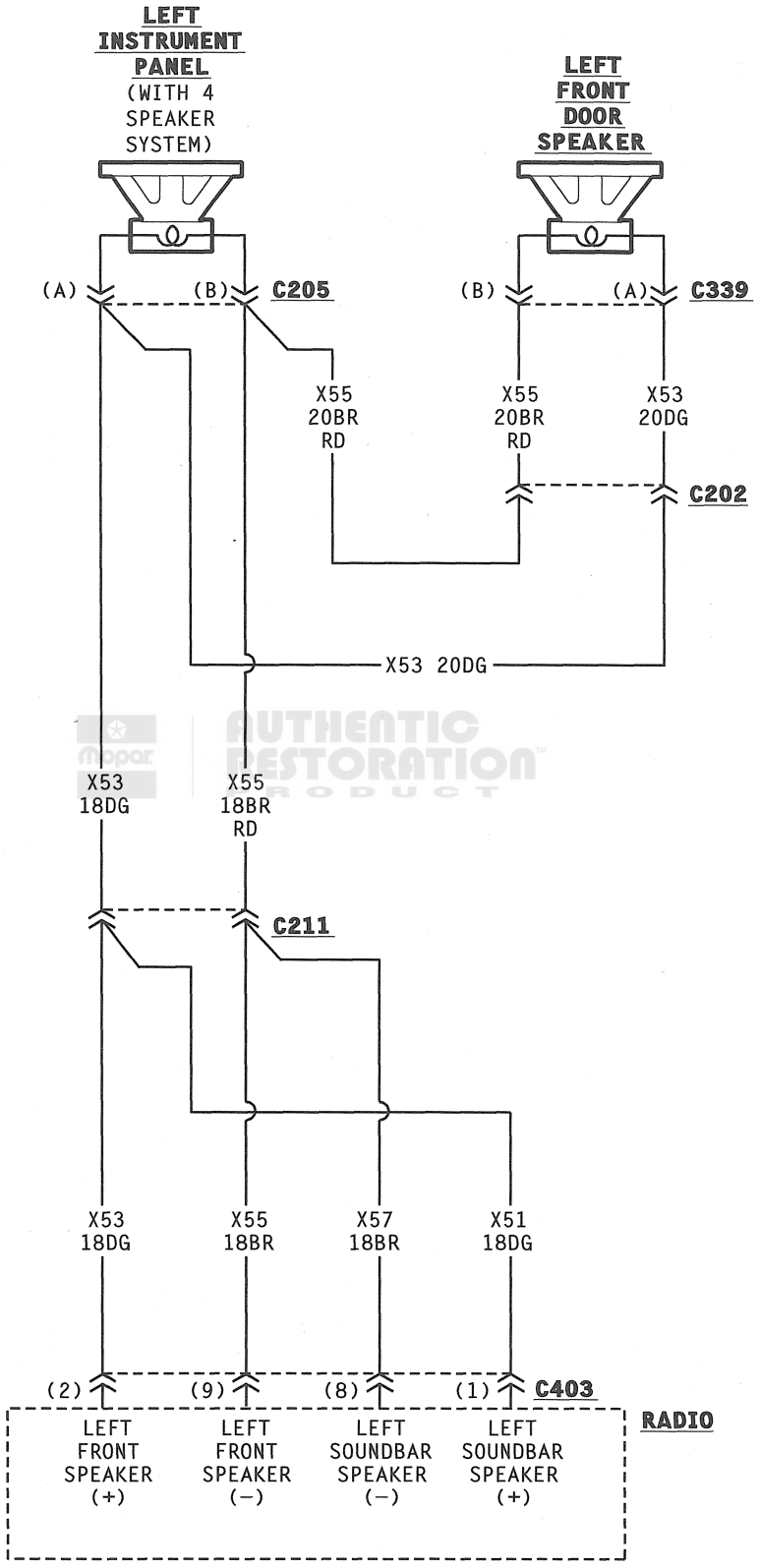
2 AND 4 SPEAKER SYSTEM



2 AND 4 SPEAKER SYSTEM



2 AND 4 SPEAKER SYSTEM



Mopar AUTHENTIC RESTORATION PRODUCT

8W-48 REAR WINDOW DEFOGGER

DESCRIPTION AND OPERATION

REAR WINDOW DEFOGGER

The rear window defogger relay supplies power to heated rear window grid. Circuit F83 from fuse 14 in the fuse block supplies power to the rear window defogger relay when the ignition switch is in the ACCESSORY or RUN position.

When the operator depresses the rear window defogger switch, the contacts inside the switch momentarily close and circuit C80 connects the switch to the relay. This causes the relay to change state and complete a circuit to energize the coil side of the relay and start the relay timer.

Circuit F82 from fuse 2 in the fuse block supplies voltage to the coil and contact sides of the relay. Circuit Z1 provides ground for the relay.

When the rear window defogger relay energizes, the contacts inside the relay close and connect circuit F82 to circuit C15. Circuit C15 splices to the power the rear window defogger grid and the indicator lamp in the rear window defogger switch. Circuit Z1 provides ground for the rear window defogger grid.

HELPFUL INFORMATION

- When the ignition switch is in the ACCESSORY or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48.
- Check for broken grid lines on the window.
- Check for a broken bus bar or disconnected leads at the rear window.
- Check for a good ground.

SCHEMATICS AND DIAGRAMS

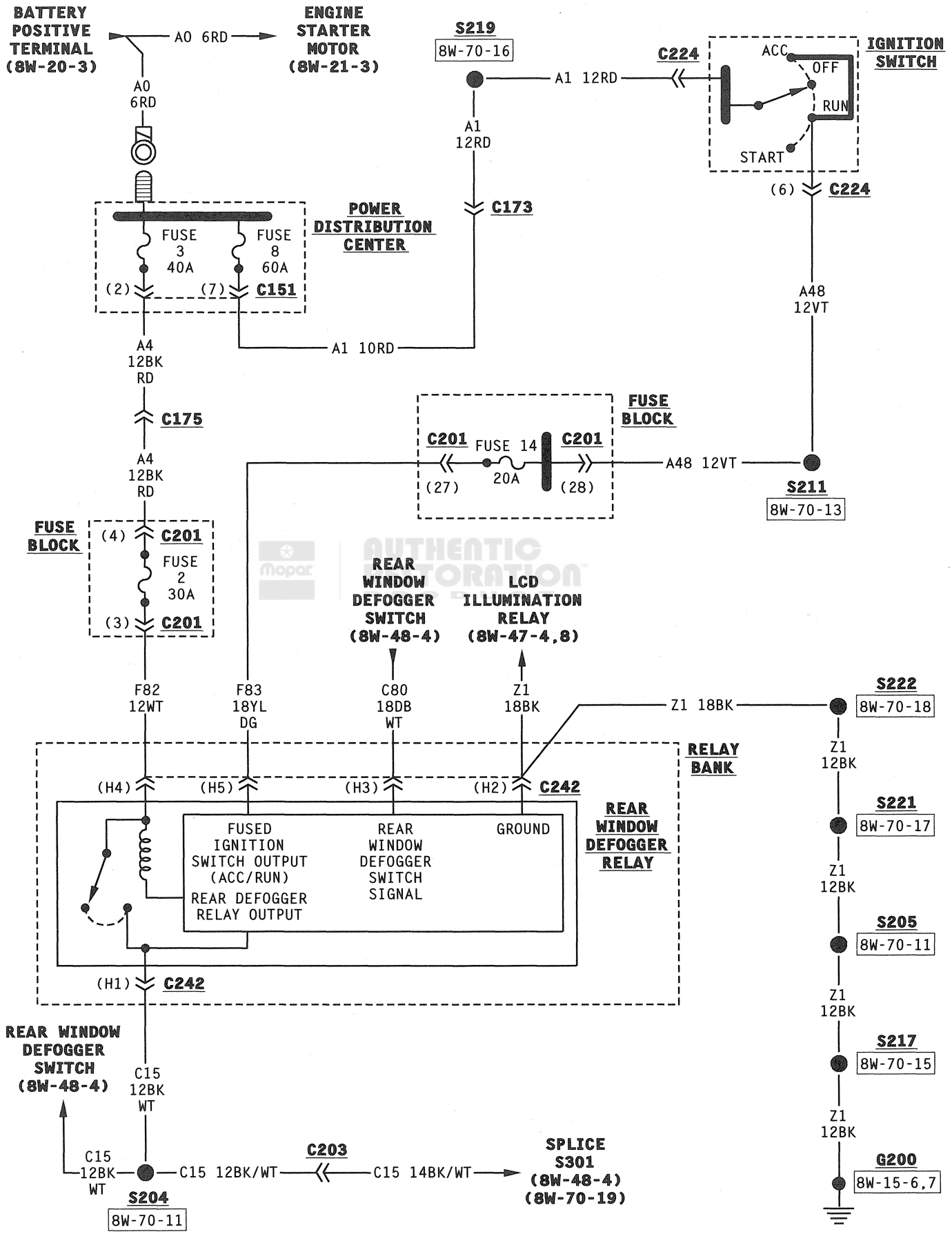
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

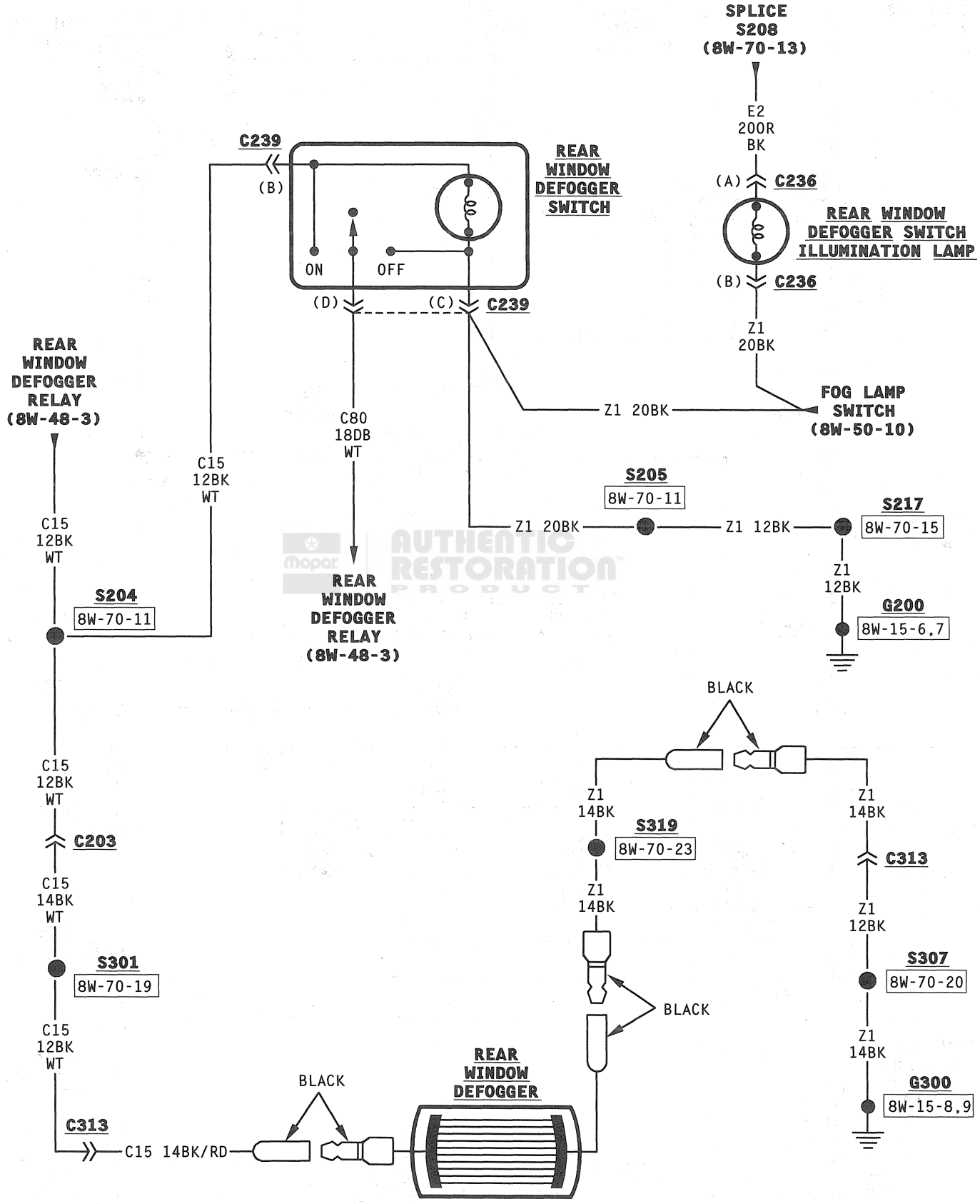
DIAGRAM INDEX

Component	Page
Fuse 2	8W-48-3
Fuse 14	8W-48-3
Fuse 3 (PDC)	8W-48-3
Fuse 8 (PDC)	8W-48-3
Ignition Switch	8W-48-3
Rear Window Defogger	8W-48-4
Rear Window Defogger Relay	8W-48-3
Rear Window Defogger Switch	8W-48-4
Rear Window Defogger Switch Illumination Lamp	8W-48-4

Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION



Mopar AUTHENTIC RESTORATION PRODUCT

8W-50 FRONT LIGHTING

INDEX

page

DESCRIPTION AND OPERATION
FOG LAMPS 2
HEADLAMP DELAY MODULE 1
HEADLAMPS 1
PARKING LAMPS 1
SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

PARKING LAMPS

Circuit A3 from fuse 13 in the Power Distribution Center (PDC) connects to a bus bar in the fuse block which feeds circuit L7. Fuse 9 in the fuse block protects circuit L7.

The headlamp switch has three positions: ON, PARK (parking lamps) and OFF, plus a dimmer switch. When the headlamp switch is in the PARK or ON position, the switch connects circuit L7 to circuit L90. From the headlamp switch, circuit L90 branches to power the front parking lamps and rear tail lamps, side marker lamps, and rear license plate lamps.

GROUND CIRCUIT

Circuit Z1 provides a ground for the parking lamps. The Z1 circuit also provide ground for the headlamps.

HELPFUL INFORMATION

- Check fuse 13 in PDC.
- Check fuse 9 in the fuse block.
- When the headlamp switch is in the PARK or ON position, the dimmer circuit, L7, also connects to circuit E2. Circuit E2 continues through fuse 19 in the fuse block. Circuit E2 powers the illumination lamps.

HEADLAMPS

The headlamp switch has three positions: ON, PARK (parking lamps) and OFF. Circuit A3 from fuse 13 in the Power Distribution Center (PDC) connects to the headlamp switch and feeds the circuit L7 through fuse 9 in the fuse block. Circuit L7 connects to the headlamp switch.

Circuit A3 also splices to feed circuit L11 through fuse 10 in the fuse block. Circuit L11 connects to the dimmer switch circuitry in the multi-function switch.

Circuit A3 also supplies battery voltage to the headlamp switch. The headlamp switch has an internal circuit breaker that connects circuit A3 to circuit F34. Circuit F34 connects to the dimmer switch circuitry in the multi-function switch.

HEADLAMP SWITCH IN OFF OR PARKING LAMP POSITION

Circuit L11 connects to the dimmer switch portion of the multi-function switch. Circuit L11 supplies power for the high beams on circuit L3 when the operator flashes the headlamps with the turn signal stalk of the multi-function switch.

HEADLAMP SWITCH IN ON POSITION

When the headlamp switch is in the ON position, circuit A3 from fuse 13 in the PDC connects to circuit F34. Circuit F34 connects to the dimmer switch portion of the multi-function switch and feeds circuit L4. Circuit L4 powers the low beam of the headlamps.

When the operator selects high beam operation with the turn signal stalk of the multi-function switch, circuit L11 connects to the L3 circuit. Circuit L3 powers high beam operation.

HEADLAMP GROUND

Circuit Z1 provides ground for both the right and left headlamps. Circuit Z1 also supplies ground for the fog lamps, if equipped.

HELPFUL INFORMATION

- Check fuse 13 in the PDC.
- The headlamp switch has an internal circuit breaker.

HEADLAMP DELAY MODULE

When the operator turns off the ignition switch and then turns off the headlamp switch, the headlamp delay module powers the headlamps for approximately 45 seconds.

When the ignition switch is in the RUN position, circuit A21 powers circuit F87 through fuse 26 in the fuse block. Circuit F87 supplies the IGNITION ON/OFF signal to the headlamp delay module. Circuit Z1 provides ground for the module.

When the headlamp delay module activates, it connects circuit X4 from fuse 5 in the fuse block to cir-

DESCRIPTION AND OPERATION (Continued)

cuit F34. Circuit F34 connects to circuit L4 through the headlamp dimmer switch circuit L4. Circuit L4 powers the low beams of the headlamps.

HELPFUL INFORMATION

Circuit A7 from fuse 3 in the PDC supplies voltage to the fuse block bus bar that powers circuit X4 through the fuse in cavity 5.

FOG LAMPS

The fog lamps are controlled by the fog lamp switch, park lamp relay and high beam relay. The fog lamps operate only when the headlamp switch is in the ON position, and the operator has selected low-beam operation. When the headlamps are in high-beam operation, the fog lamps will not operate.

Circuit F39 from fuse 17 in the Power Distribution Center (PDC) supplies voltage to the contact side of the park lamp relay.

Circuit L90 supplies power to the coil side of the park lamp relay. Circuit L35 connects to the coil side of the relay and to circuit Z1 through the fog lamp switch. Ground for the coil side of the relay is provided on circuit Z1 through the fog lamp switch.

When the fog lamp switch CLOSES, the park lamp relay contacts CLOSE and circuit F39 passes through the relay to the contact side of the high beam relay. When the headlamp high beams are OFF, the high beam relay is not energized and voltage flows through the normally closed contacts to circuit L39.

Circuit L39 supplies voltage to the fog lamps. Circuit Z1 provides ground for the fog lamps.

If the high beam lamps are ON, circuit G465 energizes the high beam relay. When the high beam relay energizes, the contacts open and power is not supplied to the fog lamps. Circuit Z1 provides ground for the coil side of the high beam relay.

Circuit E2 provides voltage for the illumination lamp in the fog lamp switch.

HELPFUL INFORMATION

Circuit L3 splices to power circuit G465. Circuit L3 powers the high beam circuit of the headlamps.

SCHEMATICS AND DIAGRAMS

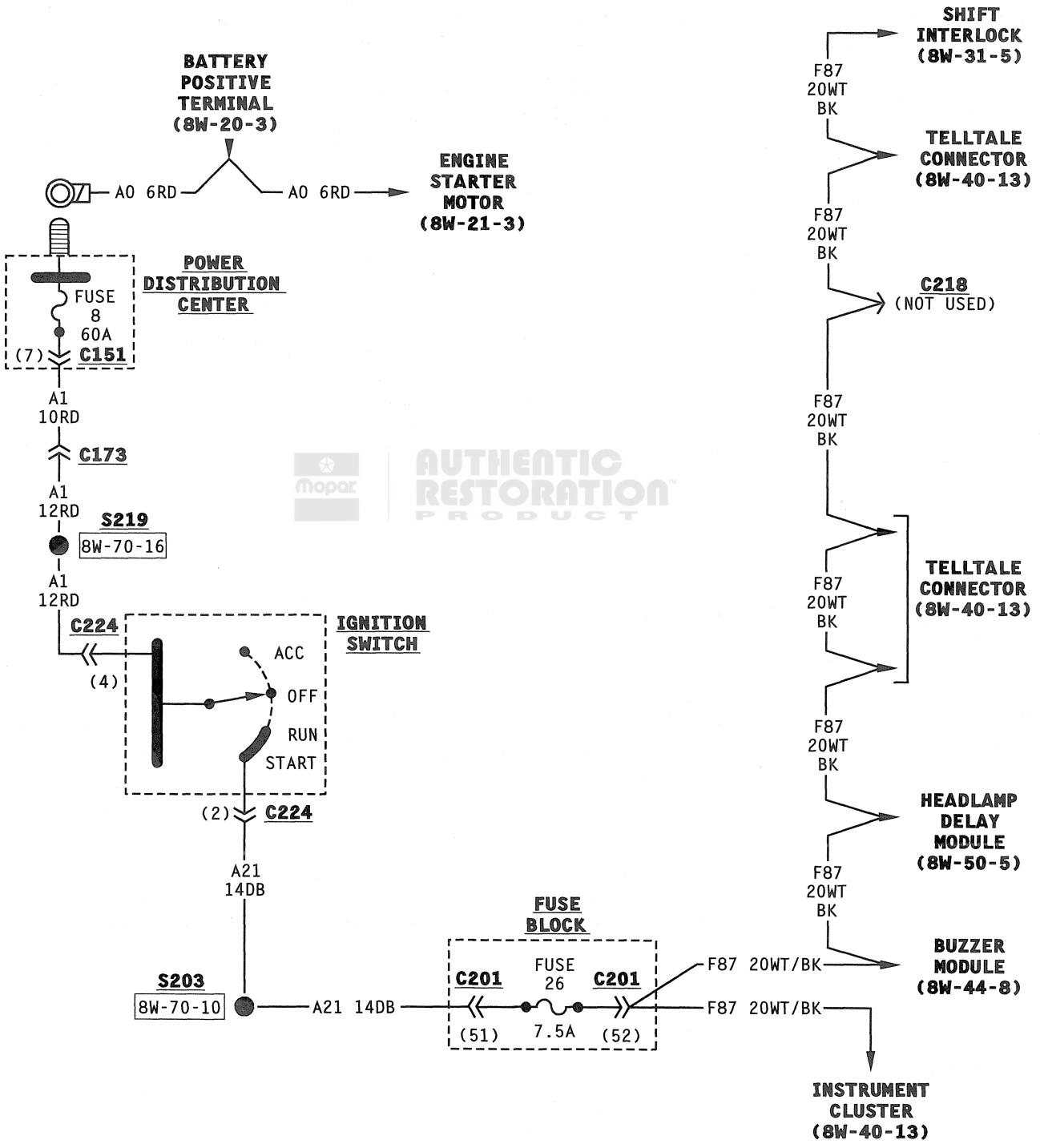
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

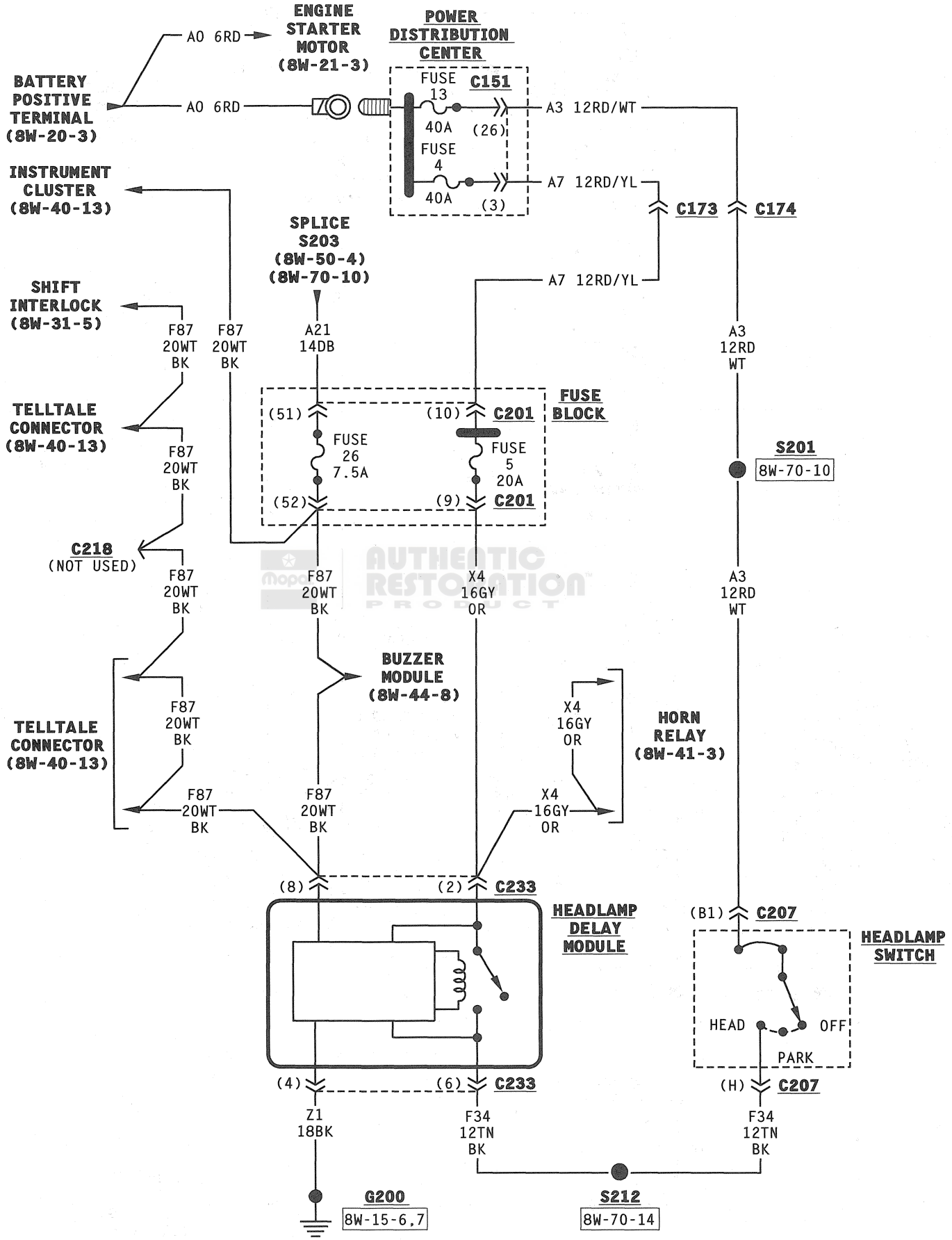
DIAGRAM INDEX

Component	Page
Fog Lamp Switch	8W-50-10
Fog Lamp Switch Illumination Lamp	8W-50-10
Fog Lamps	8W-50-10
Front Park/Turn Signal Lamps	8W-50-8
Front Side Marker Lamps	8W-50-8
Fuse 5	8W-50-5
Fuse 9	8W-50-6, 9
Fuse 10	8W-50-6
Fuse 25	8W-50-9
Fuse 26	8W-50-4, 5
Fuse 4 (PDC)	8W-50-5
Fuse 8 (PDC)	8W-50-4
Fuse 13 (PDC)	8W-50-5, 6, 9
Fuse 17 (PDC)	8W-50-9
Headlamp Delay Module	8W-50-5
Headlamp Dimmer Switch	8W-50-6
Headlamp Switch	8W-50-5, 6, 9
Headlamps	8W-50-7
High Beam Relay	8W-50-10
Ignition Switch	8W-50-4
Park Lamp Relay	8W-50-9

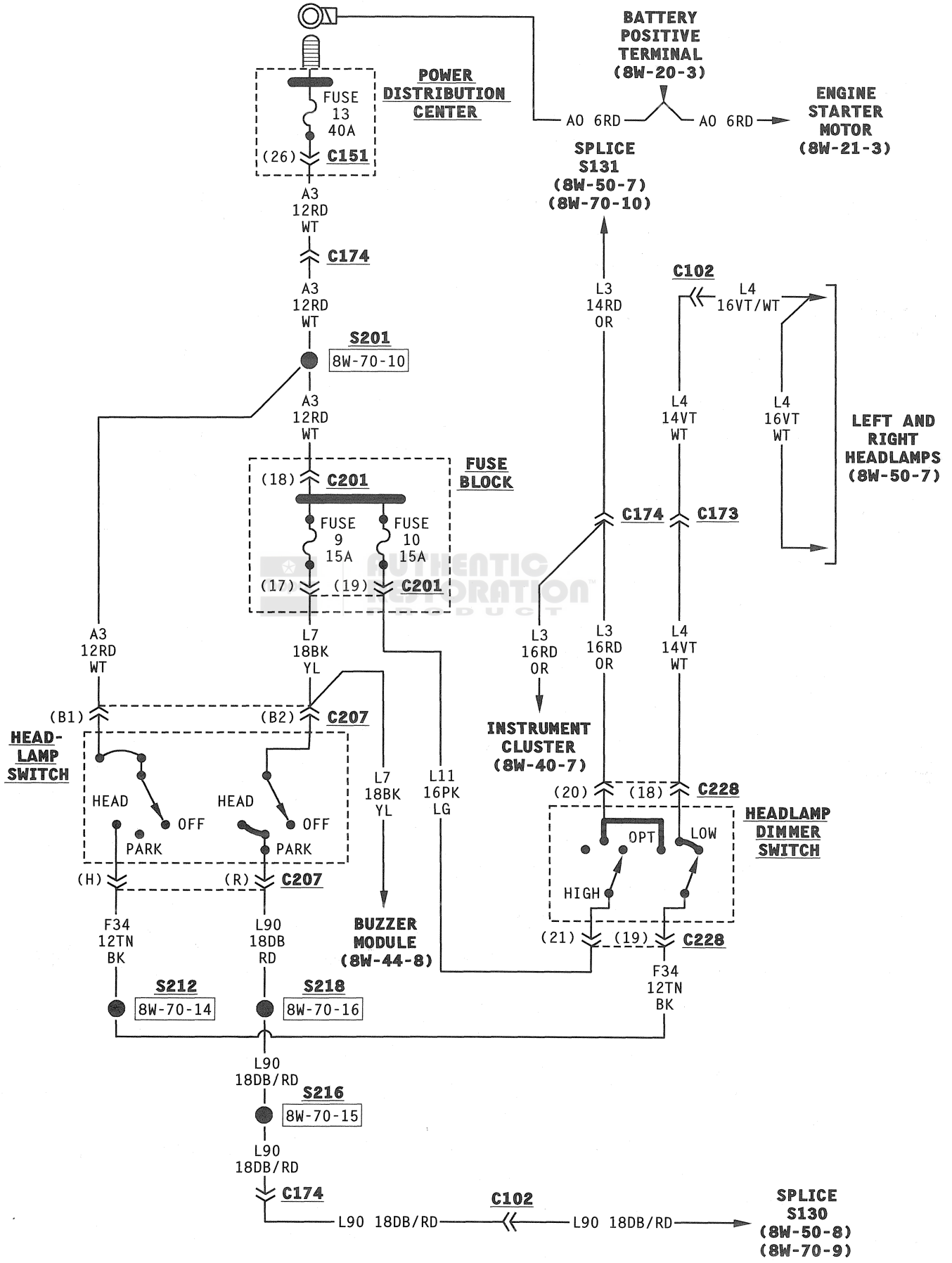
Mopar AUTHENTIC RESTORATION PRODUCT

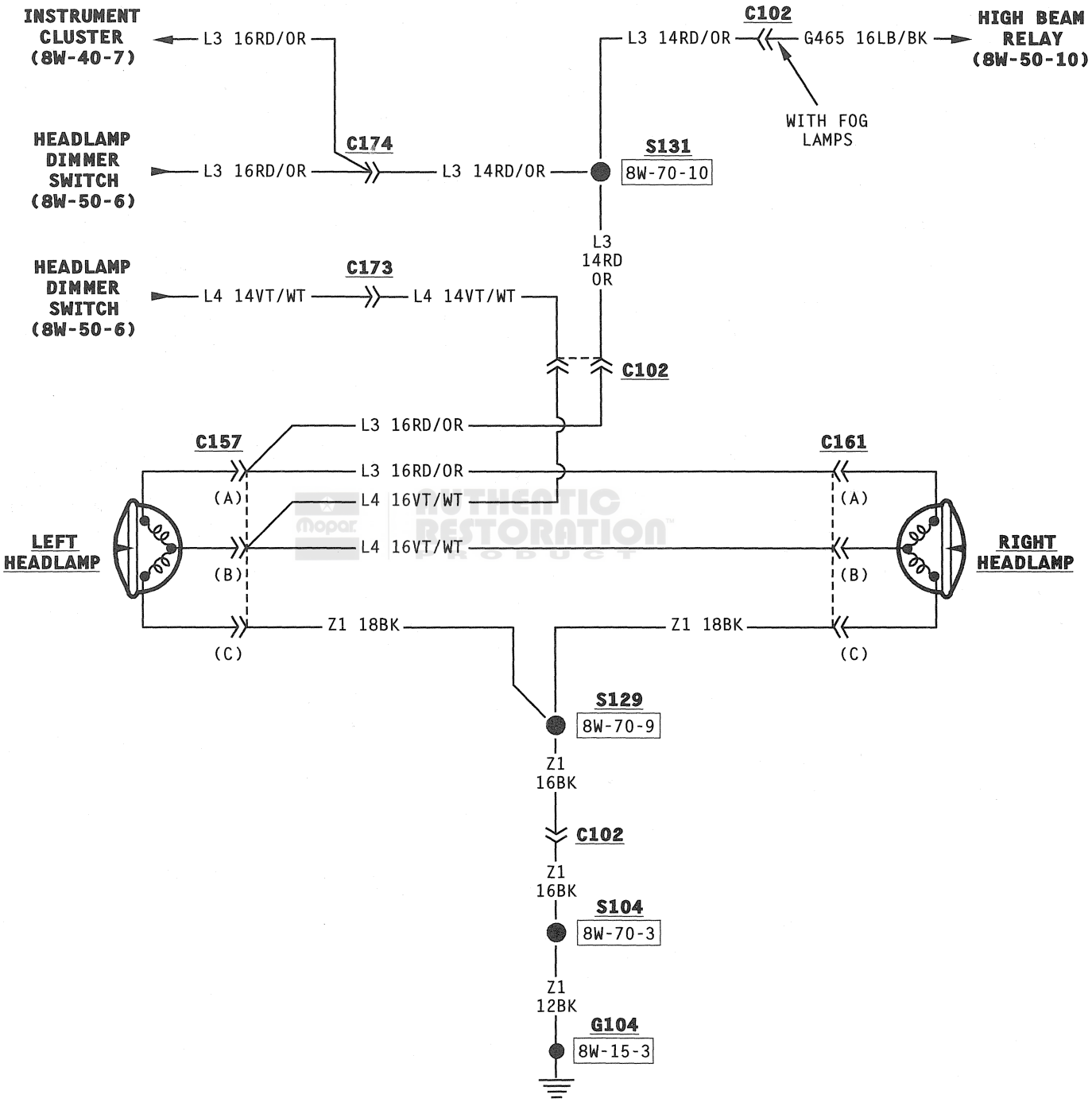


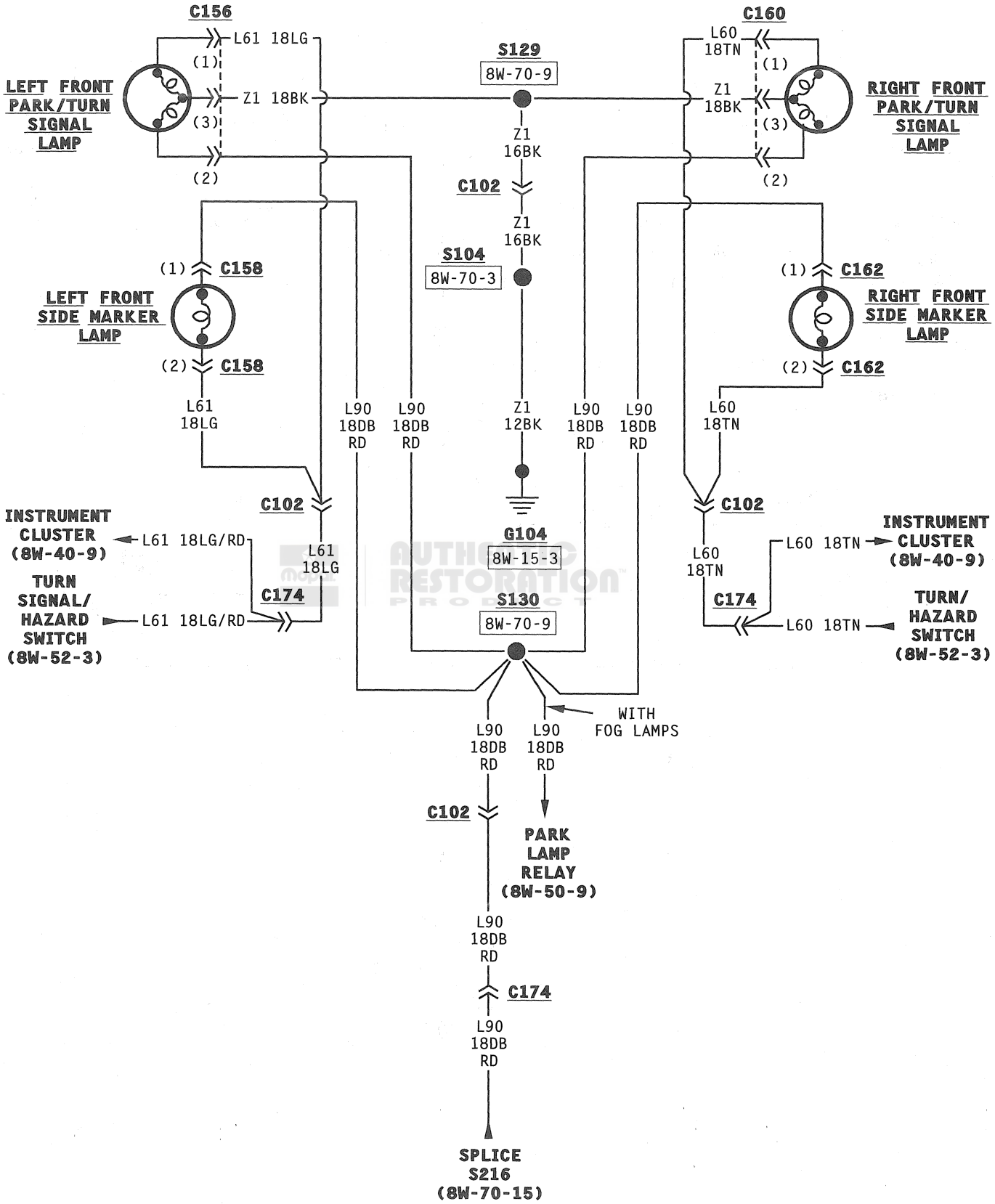
Mopar AUTHENTIC RESTORATION PRODUCT

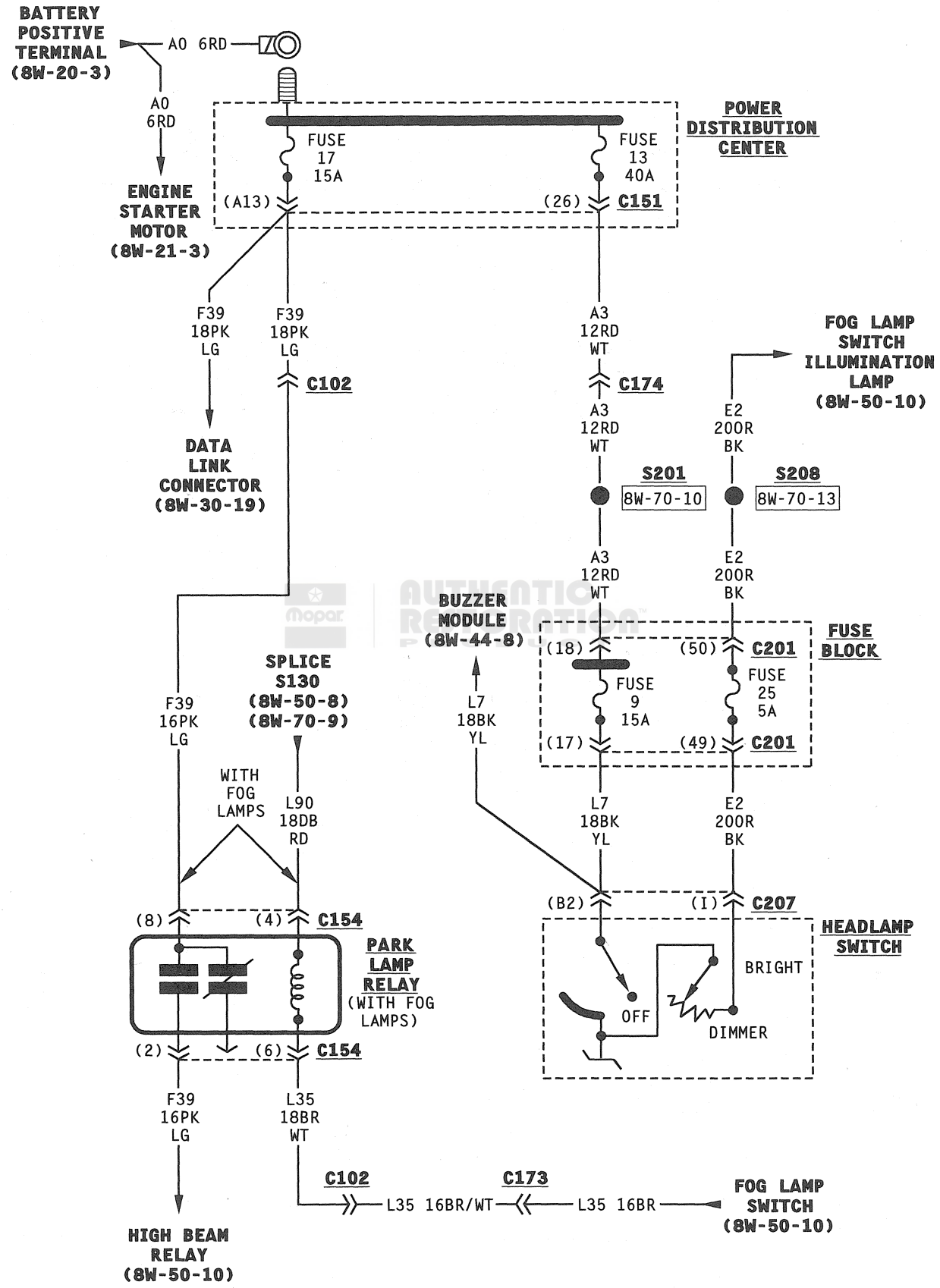


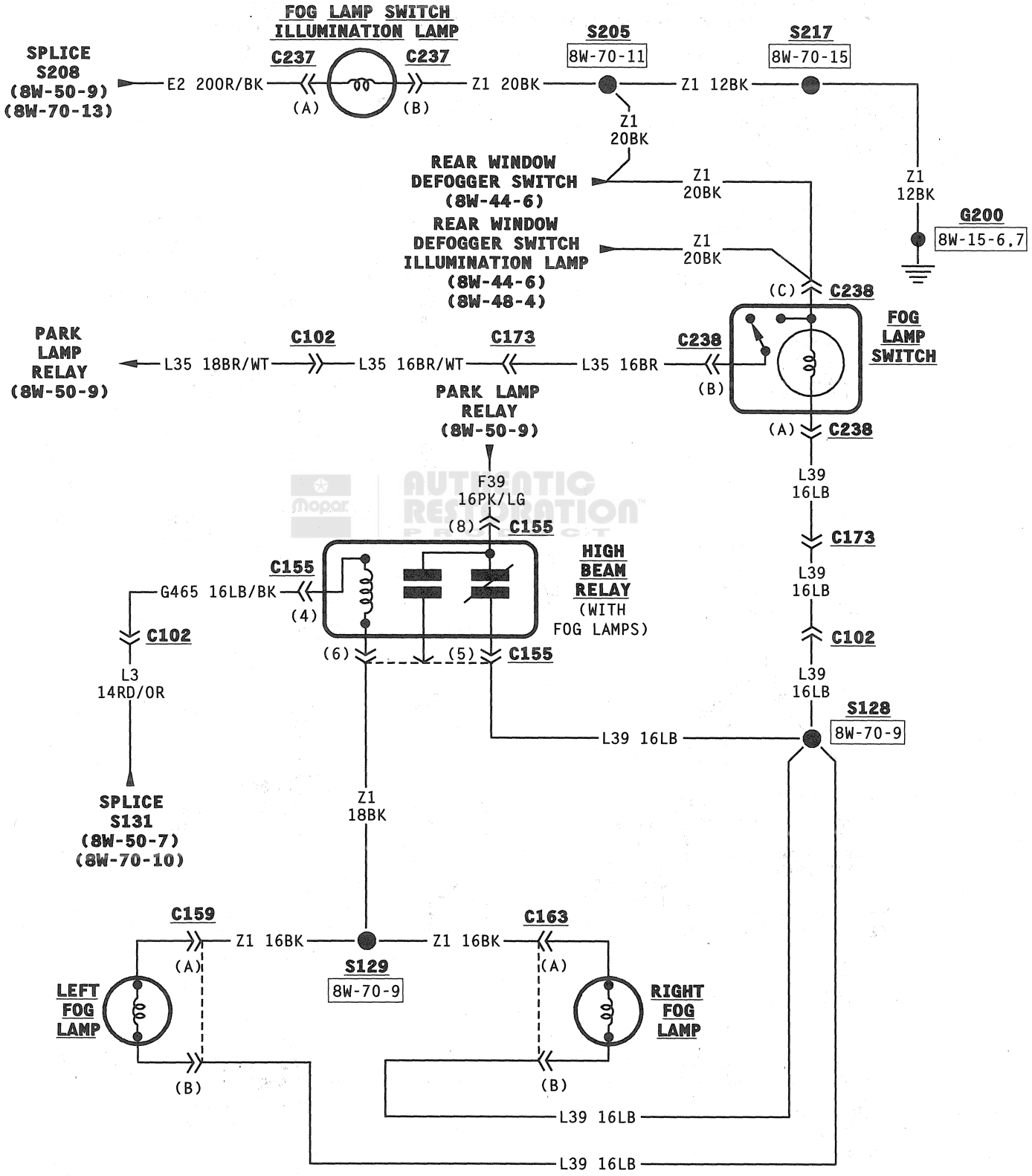
AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
SPLICE S131 (8W-50-7) (8W-70-10)
A3 12RD WT
C174
A3 12RD WT
S201
8W-70-10
A3 12RD WT
L3 14RD OR
C102
L4 16VT/WT
L4 14VT WT
L4 16VT WT
LEFT AND RIGHT HEADLAMPS (8W-50-7)
FUSE BLOCK
(18) C201
FUSE 9 15A
FUSE 10 15A
(17) (19) C201
C174 C173
L7 18BK YL
L3 16RD OR
L3 16RD OR
L4 14VT WT
A3 12RD WT
(B1) (B2) C207
HEAD-LAMP SWITCH
HEAD
OFF
PARK
HEAD
OFF
PARK
INSTRUMENT CLUSTER (8W-40-7)
L7 18BK YL
L11 16PK LG
(20) (18) C228
HEADLAMP DIMMER SWITCH
OPT
LOW
HIGH
(H) (R) C207
F34 12TN BK
L90 18DB RD
BUZZER MODULE (8W-44-8)
(21) (19) C228
F34 12TN BK
S212
8W-70-14
S218
8W-70-16
L90 18DB/RD
S216
8W-70-15
L90 18DB/RD
C174
C102
L90 18DB/RD
L90 18DB/RD
SPLICE S130 (8W-50-8) (8W-70-9)


INSTRUMENT CLUSTER (8W-40-7)
L3 16RD/OR
C102
L3 14RD/OR
G465 16LB/BK
HIGH BEAM RELAY (8W-50-10)
WITH FOG LAMPS
HEADLAMP DIMMER SWITCH (8W-50-6)
C174
L3 16RD/OR
L3 14RD/OR
S131
8W-70-10
L3 14RD OR
HEADLAMP DIMMER SWITCH (8W-50-6)
C173
L4 14VT/WT
L4 14VT/WT
C102
C157
L3 16RD/OR
C161
L3 16RD/OR
(A)
L4 16VT/WT
(A)
LEFT HEADLAMP
(B)
L4 16VT/WT
(B)
RIGHT HEADLAMP
(C)
Z1 18BK
Z1 18BK
(C)
S129
8W-70-9
Z1 16BK
C102
Z1 16BK
S104
8W-70-3
Z1 12BK
G104
8W-15-3


C156
L61 18LG
(1)
LEFT FRONT PARK/TURN SIGNAL LAMP
Z1 18BK
(3)
(2)
S129
8W-70-9
C160
L60 18TN
(1)
Z1 18BK
(3)
(2)
RIGHT FRONT PARK/TURN SIGNAL LAMP
Z1 16BK
C102
Z1 16BK
S104
8W-70-3
(1) C158
LEFT FRONT SIDE MARKER LAMP
(2) C158
(1) C162
RIGHT FRONT SIDE MARKER LAMP
(2) C162
L61 18LG
L90 18DB RD
L90 18DB RD
Z1 12BK
L90 18DB RD
L90 18DB RD
L60 18TN
C102
INSTRUMENT CLUSTER (8W-40-9)
L61 18LG/RD
L61 18LG
C174
TURN SIGNAL/ HAZARD SWITCH (8W-52-3)
L61 18LG/RD
G104
8W-15-3
S130
8W-70-9
C102
L60 18TN
C174
L60 18TN
INSTRUMENT CLUSTER (8W-40-9)
L60 18TN
TURN/ HAZARD SWITCH (8W-52-3)
WITH FOG LAMPS
L90 18DB RD
L90 18DB RD
C102
PARK LAMP RELAY (8W-50-9)
L90 18DB RD
C174
L90 18DB RD
SPLICE S216 (8W-70-15)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 17 15A
FUSE 13 40A
(A13)
(26)
C151
F39 18PK LG
F39 18PK LG
C102
DATA LINK CONNECTOR (8W-30-19)
A3 12RD WT
C174
A3 12RD WT
S201
8W-70-10
A3 12RD WT
FOG LAMP SWITCH ILLUMINATION LAMP (8W-50-10)
E2 20OR BK
S208
8W-70-13
E2 20OR BK
BUZZER MODULE (8W-44-8)
L7 18BK YL
(18)
(50)
C201
FUSE 9 15A
FUSE 25 5A
(17)
(49)
C201
FUSE BLOCK
SPLICE S130 (8W-50-8) (8W-70-9)
F39 16PK LG
WITH FOG LAMPS
L90 18DB RD
L7 18BK YL
E2 20OR BK
(B2)
(I)
C207
HEADLAMP SWITCH
BRIGHT
OFF
DIMMER
(8)
(4)
C154
PARK LAMP RELAY (WITH FOG LAMPS)
(2)
(6)
C154
F39 16PK LG
L35 18BR WT
C102
L35 16BR/WT
C173
L35 16BR
FOG LAMP SWITCH (8W-50-10)
HIGH BEAM RELAY (8W-50-10)


FOG LAMP SWITCH ILLUMINATION LAMP
C237
C237
(A)
(B)
SPLICE S208 (8W-50-9) (8W-70-13)
E2 200R/BK
Z1 20BK
S205
8W-70-11
Z1 12BK
S217
8W-70-15
Z1 20BK
REAR WINDOW DEFOGGER SWITCH (8W-44-6)
Z1 20BK
Z1 12BK
G200
8W-15-6,7
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6) (8W-48-4)
Z1 20BK
(C)
C238
FOG LAMP SWITCH
C238
(B)
(A)
C238
PARK LAMP RELAY (8W-50-9)
C102
C173
L35 18BR/WT
L35 16BR/WT
L35 16BR
PARK LAMP RELAY (8W-50-9)
F39 16PK/LG
(8)
C155
L39 16LB
C173
L39 16LB
C102
L39 16LB
S128
8W-70-9
C155
G465 16LB/BK
(4)
HIGH BEAM RELAY (WITH FOG LAMPS)
(6)
(5)
C155
C102
L3 14RD/OR
SPLICE S131 (8W-50-7) (8W-70-10)
L39 16LB
Z1 18BK
C159
C163
Z1 16BK
Z1 16BK
(A)
(A)
S129
8W-70-9
LEFT FOG LAMP
RIGHT FOG LAMP
(B)
(B)
L39 16LB
L39 16LB

8W-51 REAR LIGHTING

DIAGNOSIS AND TESTING

TAIL LAMPS AND REAR LICENSE PLATE LAMPS

Circuit A3 from fuse 13 in the Power Distribution Center (PDC) connects to a bus bar in the fuse block which feeds circuit L7. Fuse 9 in the fuse block protects circuit L7.

The headlamp switch has three positions: ON, PARK (parking lamps) and OFF, plus a dimmer switch. When the headlamp switch is in the PARK or ON position, the switch connects circuit L7 to circuit L90. From the headlamp switch, circuit L90 branches to power the front parking lamps and rear tail lamps, side marker lamps, and rear license plate lamp.

GROUND CIRCUIT

Circuit Z1 provides a ground for the parking lamps, tail lamps, and rear license plate lamp.

HELPFUL INFORMATION

- Check fuse 13 in PDC.
- Check fuse 9 in the fuse block.
- When the headlamp switch is in the PARK or ON position, circuit L7 also connects to circuit E2. Circuit E2 continues through fuse 25 in the fuse block. Circuit E2 powers the illumination lamps.

STOP LAMPS AND CHMSL LAMPS

Circuit L9 from fuse 2 in the Power Distribution Center (PDC) connects to the stop lamp switch. When the operator depresses the brake pedal, the stop lamp switch closes and connects circuit L9 to circuit L50. Circuit L50 connects to the stop lamps and Center High Mounted Stop Lamps (CHMSL). Circuit Z1 provides a ground for the stop lamps.

HELPFUL INFORMATION

- Check fuses 2 in the PDC.
- Check for continuity across the stop lamp switch when it is closed.

BACK-UP LAMPS

In the START or RUN position, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 feeds a bus bar in the PDC that powers circuit F12 through fuse 18.

Circuit F12 supplies power to the back-up lamp switch (part of the Park/Neutral position switch). When the operator puts the transmission in REVERSE, the switch connects circuit F12 to circuit L10. Circuit L10 feeds the back-up lamps. Circuit Z1 provides ground for the back-up lamps.

HELPFUL INFORMATION

- Check fuses 8 and 18 in the PDC.
- Check for continuity across the back-up lamp switch when it is closed.

SCHEMATICS AND DIAGRAMS

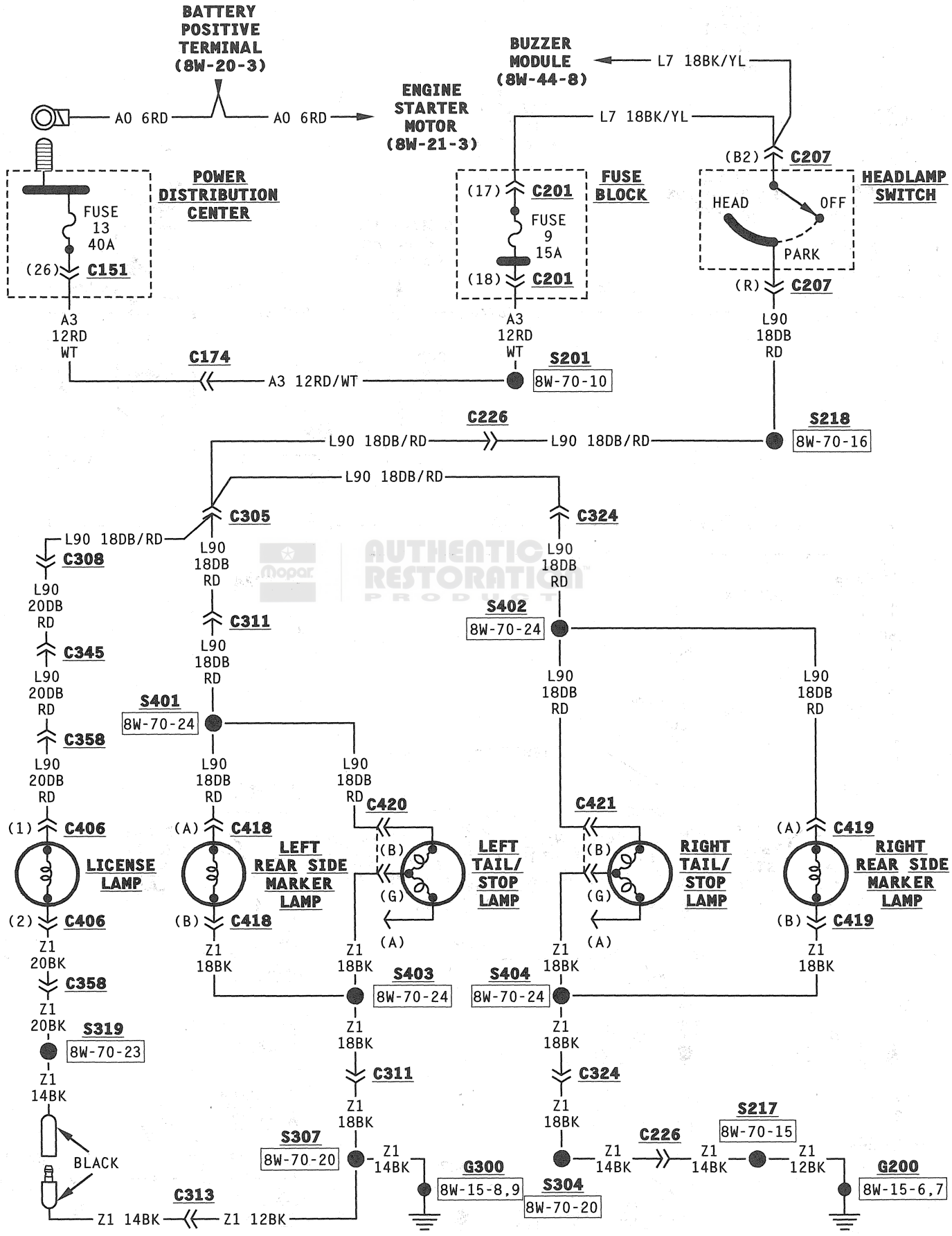
WIRING DIAGRAM INDEX

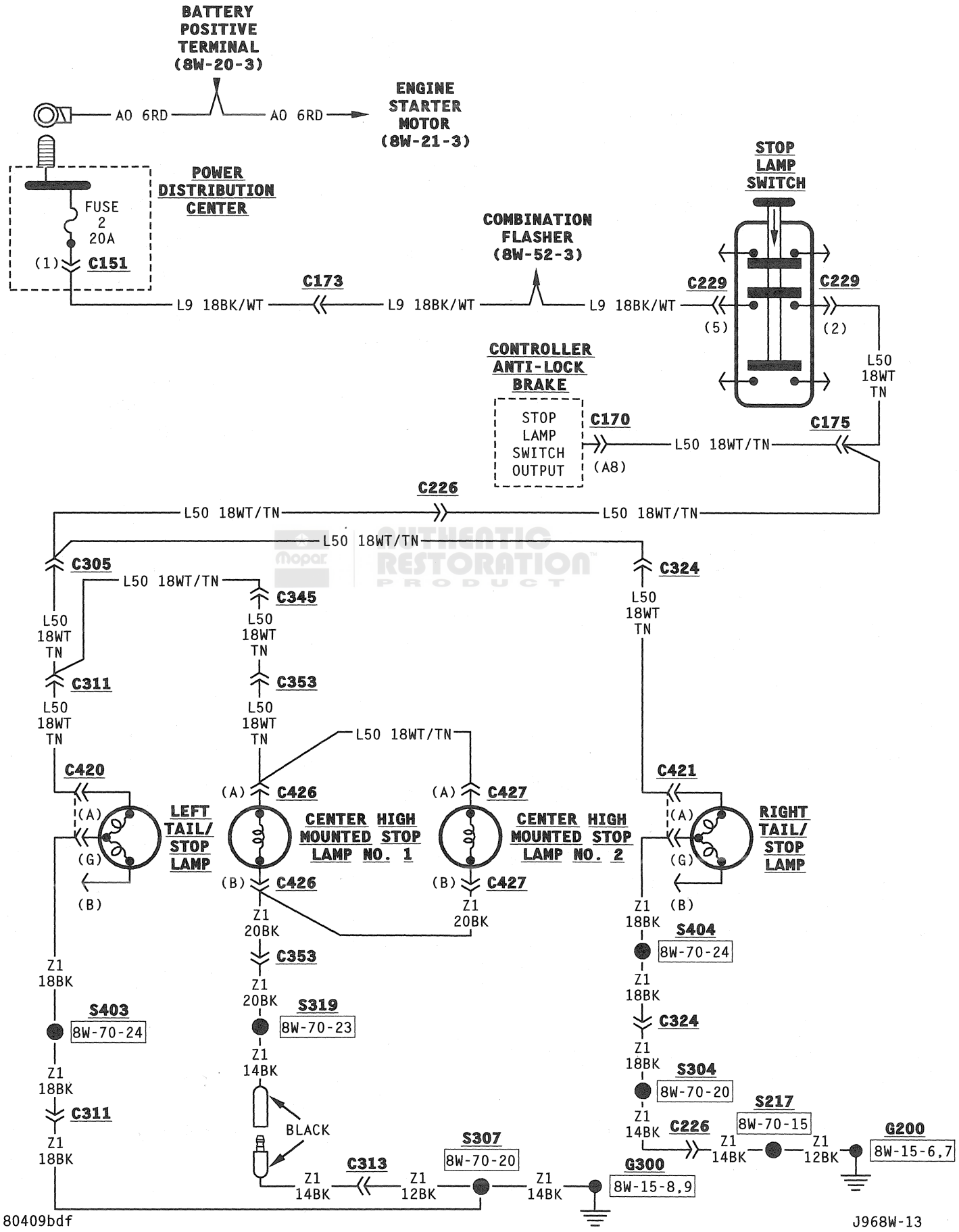
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

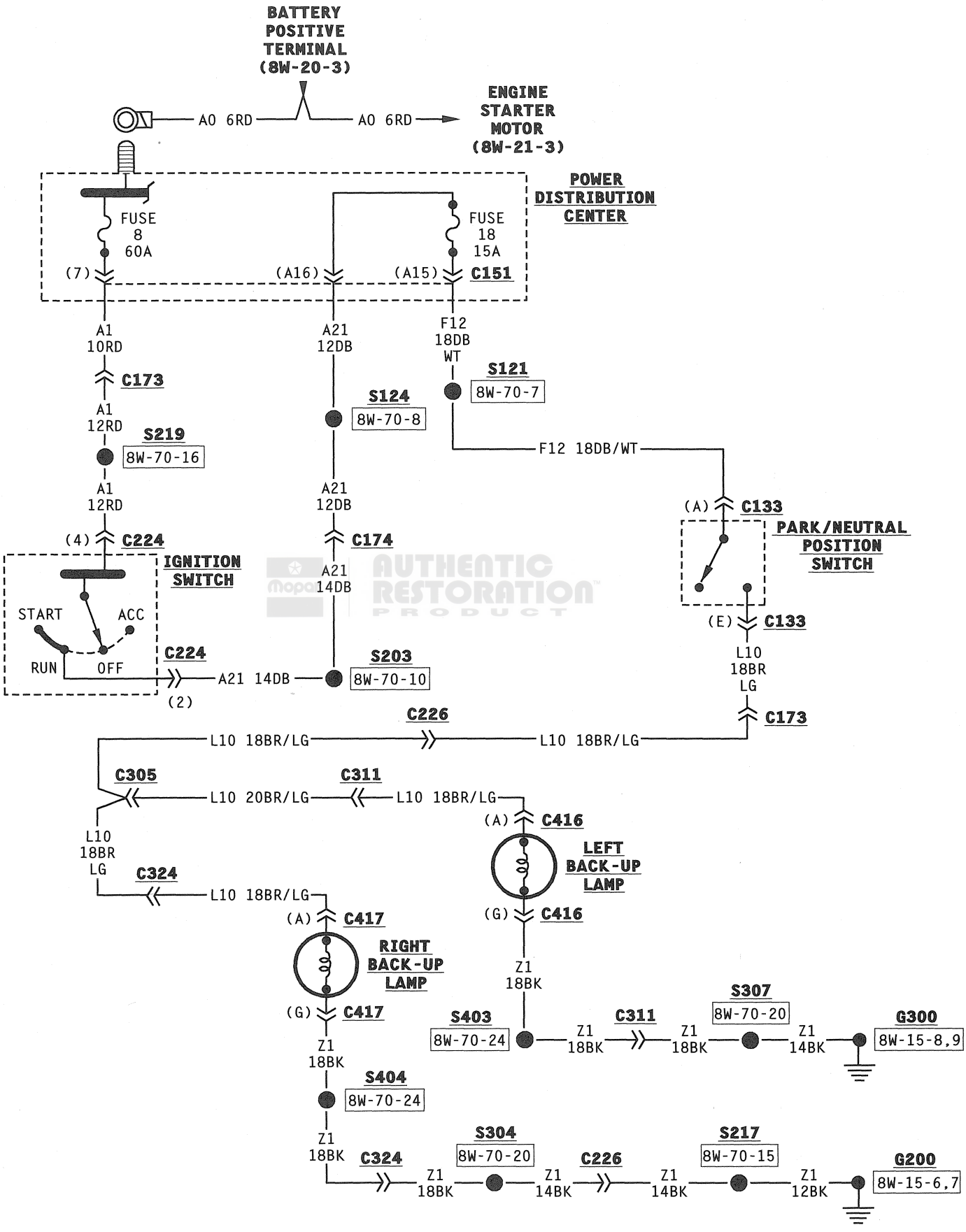
Component	Page
Back-Up Lamps	8W-51-5
Center High Mounted Stop Lamps	8W-51-4
Controller Anti-Lock Brake	8W-51-4
Fuse 9	8W-51-3
Fuse 2 (PDC)	8W-51-4
Fuse 8 (PDC)	8W-51-5
Fuse 13 (PDC)	8W-51-3
Fuse 18 (PDC)	8W-51-5
Headlamp Switch	8W-51-3
Ignition Switch	8W-51-5
License Lamp	8W-51-3
Park/Neutral Position Switch	8W-51-5
Rear Side Marker Lamps	8W-51-3
Stop Lamp Switch	8W-51- 4
Tail/Stop Lamps	8W-51- 3, 4

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
BUZZER MODULE (8W-44-8)
L7 18BK/YL
L7 18BK/YL
POWER DISTRIBUTION CENTER
FUSE 13 40A
(26) C151
A3 12RD WT
C174
A3 12RD/WT
FUSE BLOCK
(17) C201
FUSE 9 15A
(18) C201
A3 12RD WT
S201
8W-70-10
(B2) C207
HEADLAMP SWITCH
HEAD
OFF
PARK
(R) C207
L90 18DB RD
C226
L90 18DB/RD
L90 18DB/RD
S218
8W-70-16
L90 18DB/RD
C305
C324
L90 18DB/RD
C308
L90 18DB RD
L90 20DB RD
C345
L90 20DB RD
C358
L90 20DB RD
C311
L90 18DB RD
S401
8W-70-24
S402
8W-70-24
L90 18DB RD
L90 18DB RD
L90 18DB RD
L90 18DB RD
(1) C406
LICENSE LAMP
(2) C406
Z1 20BK
C358
Z1 20BK
S319
8W-70-23
Z1 14BK
BLACK
(A) C418
LEFT REAR SIDE MARKER LAMP
(B) C418
Z1 18BK
C420
(B)
(G)
(A)
LEFT TAIL/ STOP LAMP
Z1 18BK
S403
8W-70-24
Z1 18BK
C311
Z1 18BK
S307
8W-70-20
Z1 14BK
C313
Z1 14BK
Z1 12BK
G300
8W-15-8,9
C421
(B)
(G)
(A)
RIGHT TAIL/ STOP LAMP
Z1 18BK
S404
8W-70-24
Z1 18BK
C324
Z1 18BK
C226
Z1 14BK
S304
8W-70-20
(A) C419
RIGHT REAR SIDE MARKER LAMP
(B) C419
Z1 18BK
S217
8W-70-15
Z1 14BK
Z1 12BK
G200
8W-15-6,7



AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-52 TURN SIGNALS

DESCRIPTION AND OPERATION

TURN SIGNALS

When the operator selects the right turn signal, the multi-function switch connects power from circuit L5 to circuit L60. Circuit L60 feeds the right front and right rear turn signal lamps. Circuit L60 also splices to power the right turn signal indicator lamp on the instrument cluster.

When the operator selects the left turn signal, the multi-function switch connects power from circuit L5 to circuit L61. Circuit L61 feeds the left front and left rear turn signal lamp. Circuit L61 also splices to power the left turn signal indicator lamp on the instrument cluster.

Circuit Z1 provides ground for the turn signal lamps.

HELPFUL INFORMATION

- The turn signal lamps are the same lamps used for the hazard flasher.
- Check fuse 8 in the PDC if the turn signals do not operate.

COMBINATION FLASHER

In the ACCESSORY or RUN position, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 connects to the combination flasher. When the turn signals operate, the combination flasher connects circuit A21 to circuit L5. Circuit L5 powers the turn signals through the multi-function switch. The multi-function switch supplies voltage to the turn signals and side marker lamps on circuits L60 and L61.

Circuit L9 from fuse 2 in the PDC supplies battery voltage to the combination flasher for the hazard lamps. When the hazard flashers operate, the combination flasher connects circuit L9 to circuit L12. Circuit L12 connects to the multi-function switch to supply power to the hazard flasher circuits. The multi-function switch connects to the turn signal and side marker lamps on circuits L60 and L61

Circuit Z1 provides ground for the combination flasher.

HAZARD FLASHERS

When the operator selects the hazard flashers, the multi-function switch circuit L12 from the combination flasher to circuits L60 and L61.

Circuit L60 feeds the right front and right rear turn signal lamp. Circuit L60 also splices to power the right turn signal indicator lamp on the instrument cluster.

Circuit L61 feeds the left front and left rear turn signal lamp. Circuit L61 also splices to power the left turn signal indicator lamp on the instrument cluster.

Circuit Z1 provides ground for the hazard flasher lamps.

HELPFUL INFORMATION

- The hazard flasher lamps are the same lamps used for the turn signals.
- Circuit L9 powers circuit L12 through the combination flasher. Circuit L9 also connects to the stop lamp switch.

SCHEMATICS AND DIAGRAMS

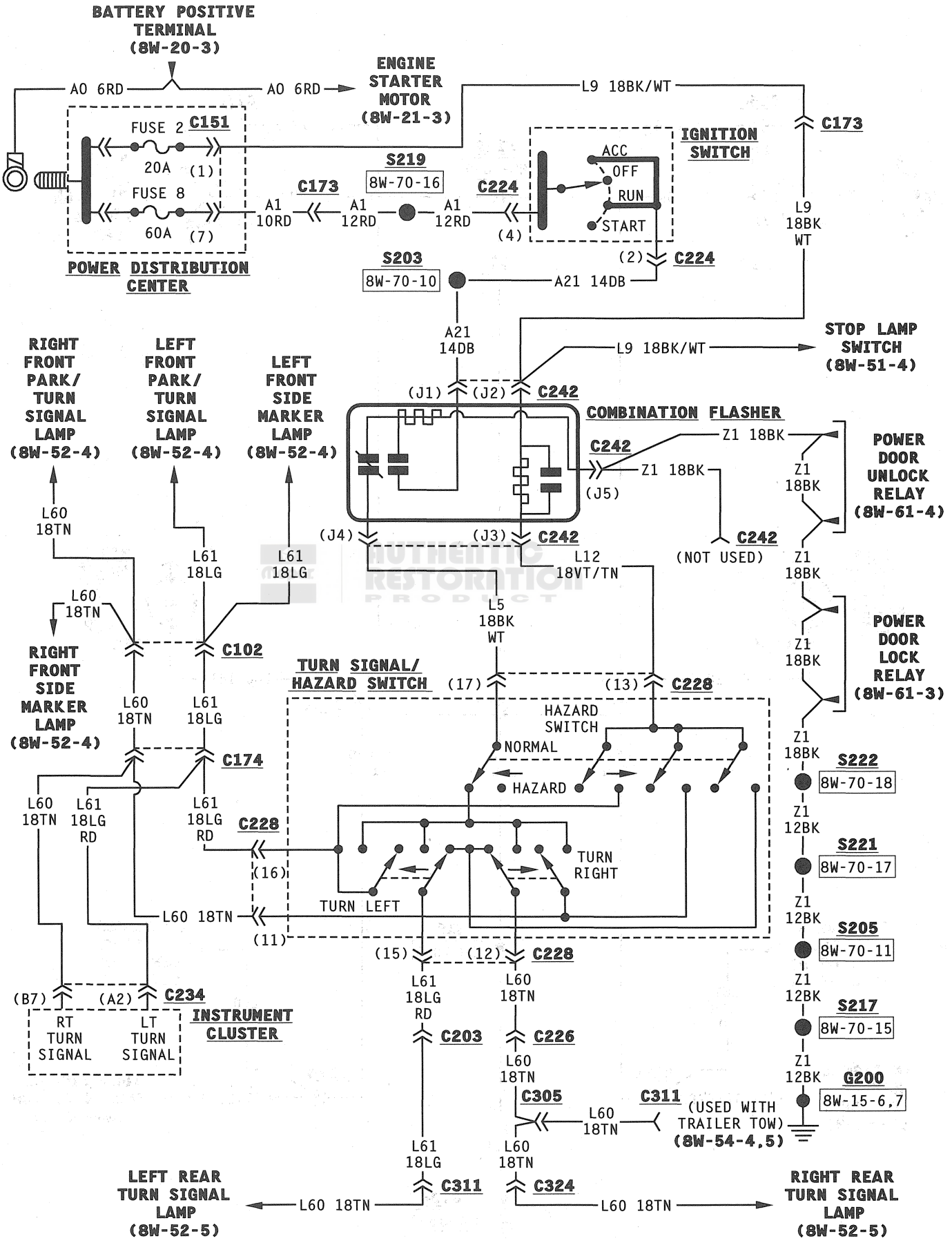
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

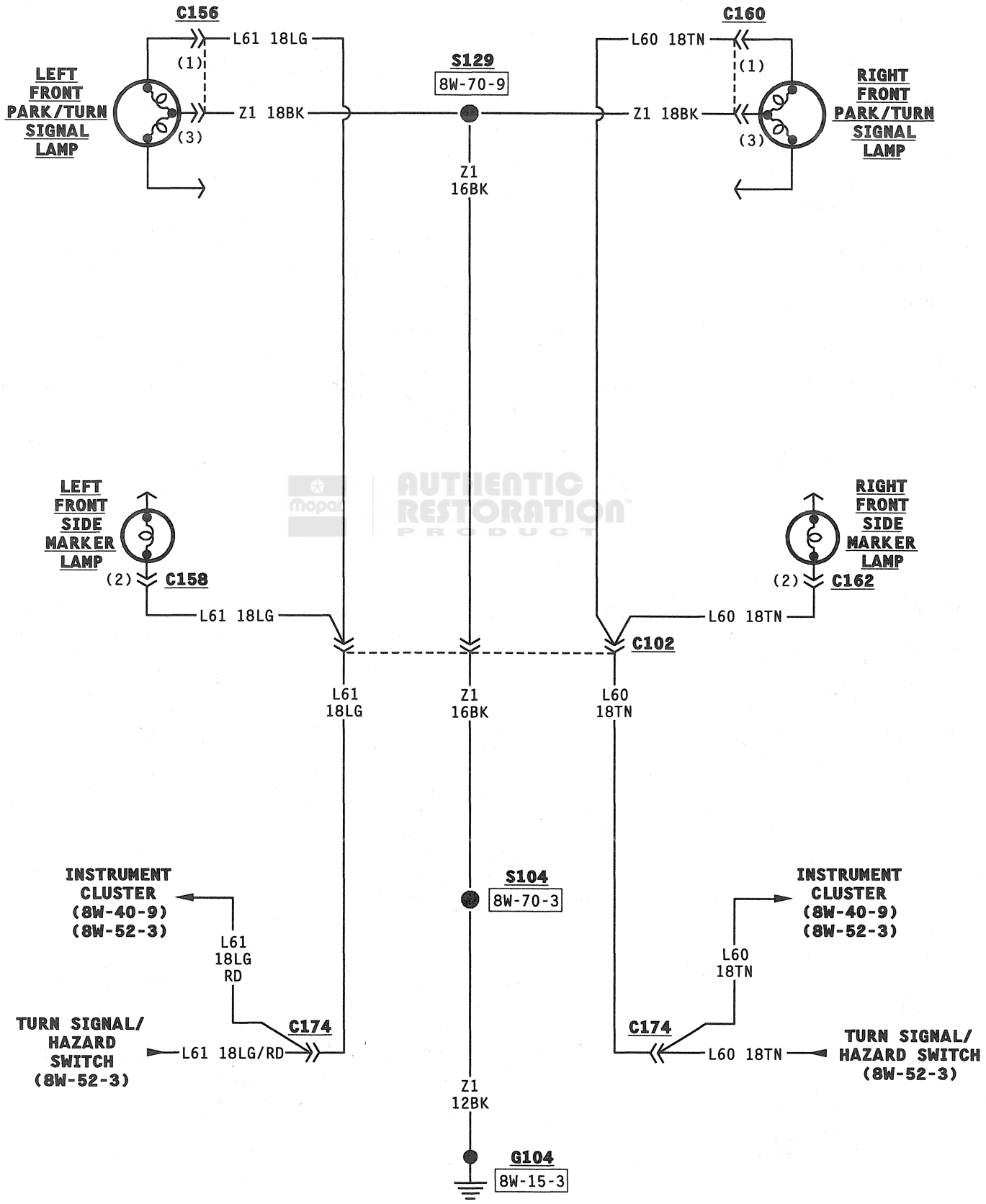
DIAGRAM INDEX

Component	Page
Combination Flasher	8W-52-3
Front Park /Turn Signal Lamps	8W-52-4
Front Side Marker Lamps	8W-52-4
Fuse 2 (PDC)	8W-52-3
Fuse 8 (PDC)	8W-52-3
Ignition Switch	8W-52-3
Instrument Cluster	8W-52-3
Rear Turn Signal Lamps	8W-52-5
Turn Signal/Hazard Switch	8W-52-3

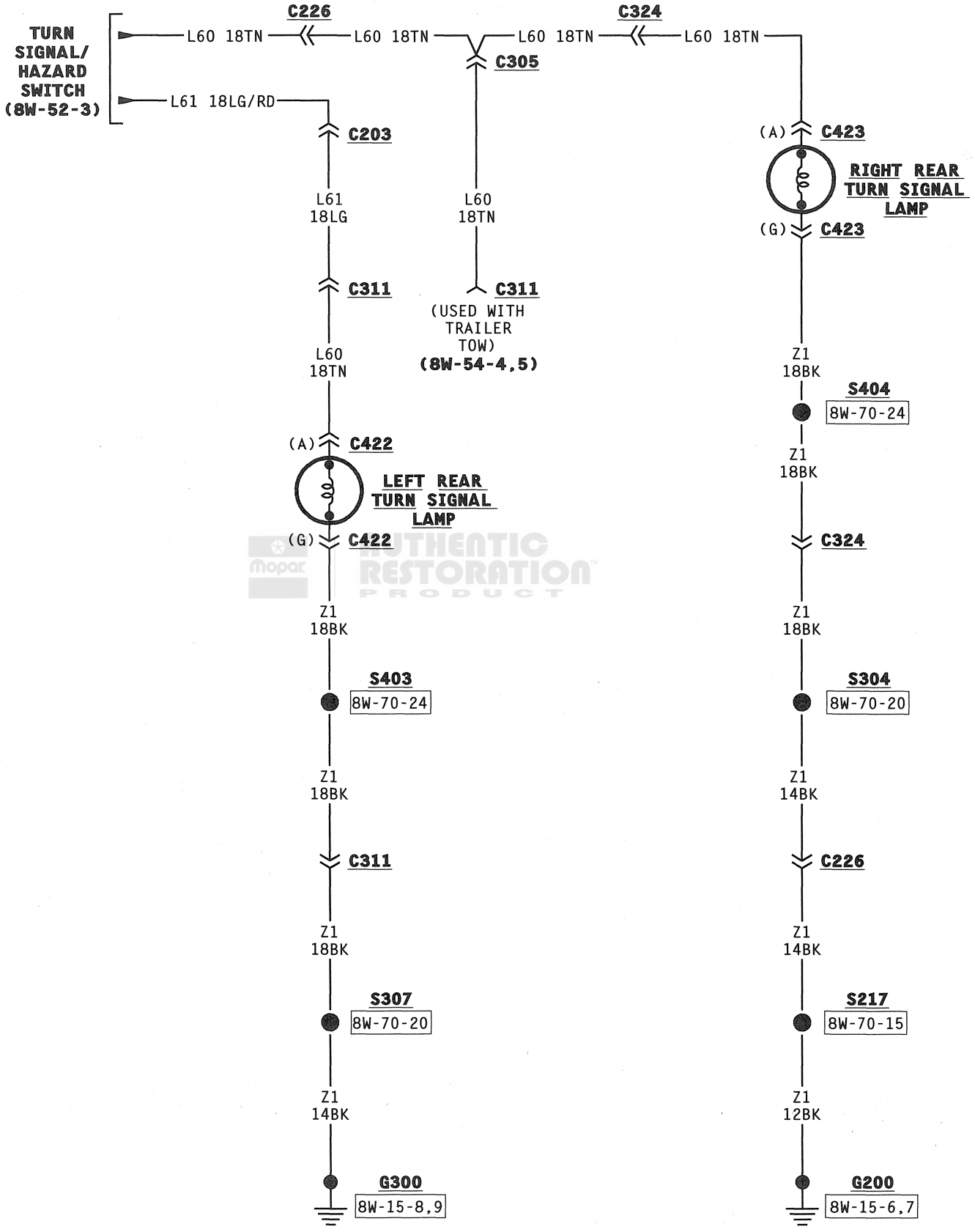
Mopar AUTHENTIC RESTORATION PRODUCT



AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-53 WIPERS

DESCRIPTION AND OPERATION

INTERMITTENT WIPERS

A circuit breaker powers the intermittent wiper system. The intermittent wiper system operates at either LOW or HIGH or DELAY speeds.

In the ACCESSORY or RUN position, the ignition switch connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) with circuit A48. Circuit A48 supplies voltage to circuit F86 through the circuit breaker in cavity 3 of the fuse block.

Circuit F86 supplies power to the front wiper motor and the intermittent wiper control module. Circuit Z1 provides ground for the front wiper motor and the intermittent wiper control module.

When the operator moves the wiper switch to the LOW position, battery voltage passes through the switch to circuit V3. Circuit V3 feeds the wiper motor low speed brushes. If the operator selects wiper HIGH speed operation, the wiper switch passes current to circuit V4. Circuit V4 feeds the wiper motor high speed brushes.

The DELAY portion of the wiper switch contains a variable resistor. The variable resistor connects to the intermittent wiper module on circuit V51. The amount of delay selected by the operator determines the voltage drop through the resistor and the voltage level received by the intermittent wiper module.

After the intermittent wiper control module determines the amount of delay selected, it cycles the wipers by periodically energizing circuit V3. Circuit V3 powers the wiper motor low speed brushes.

As the windshield wiper motor turns, the park switch, internal to the motor, moves from its DOWN position to the UP position. When the wiper switch is turned OFF, the V55 circuit prevents the wipers from stopping in any position but park.

The windshield washer uses a pump motor located inside the windshield washer fluid reservoir. When the washer switch is pressed, circuit V11 provides an input to the intermittent wiper module. The module powers the pump motor on circuit V10. Circuit Z1 provides ground for the pump motor.

HELPFUL INFORMATION

Circuit Z1 also provides ground for the rear wiper washer pump.

REAR WIPER SYSTEM

In the RUN position, the ignition switch connects circuit A1 from fuse 8 in the PDC with circuit A38. Circuit A38 connects to a fuse block bus bar that powers circuit V15 through the fuse in cavity 19. Circuit V15 supplies power to the rear wiper switch.

In the WIPE or WASH positions, the rear wiper switch supplies voltage to the wiper motor on circuit V13. Circuit Z1 provides ground for the wiper motor.

The rear windshield washer uses a pump motor located inside the windshield washer fluid reservoir. When the rear wiper switch is in the WASH position, power is supplied through the wiper switch to the rear wiper and the pump motor on circuit V20. Circuit Z1 provides ground for the pump motor.

As the rear wiper motor turns, the park switch, internal to the motor, moves from the RUN position to the PARK position. When the wiper switch is turned OFF, the F20 circuit prevents the wipers from stopping in any position but park.

LOW WASHER FLUID WARNING LAMP

Circuit G29 connects the low washer fluid switch to the warning lamp in the instrument cluster. Circuit F12 supplies battery voltage to the switch.

When the low washer fluid switch closes, it connects circuits G29 and F12. Battery voltage from circuit F12 powers the low washer fluid lamp. Circuit Z1 at the instrument cluster provides ground to illuminate the warning lamp.

SCHEMATICS AND DIAGRAMS

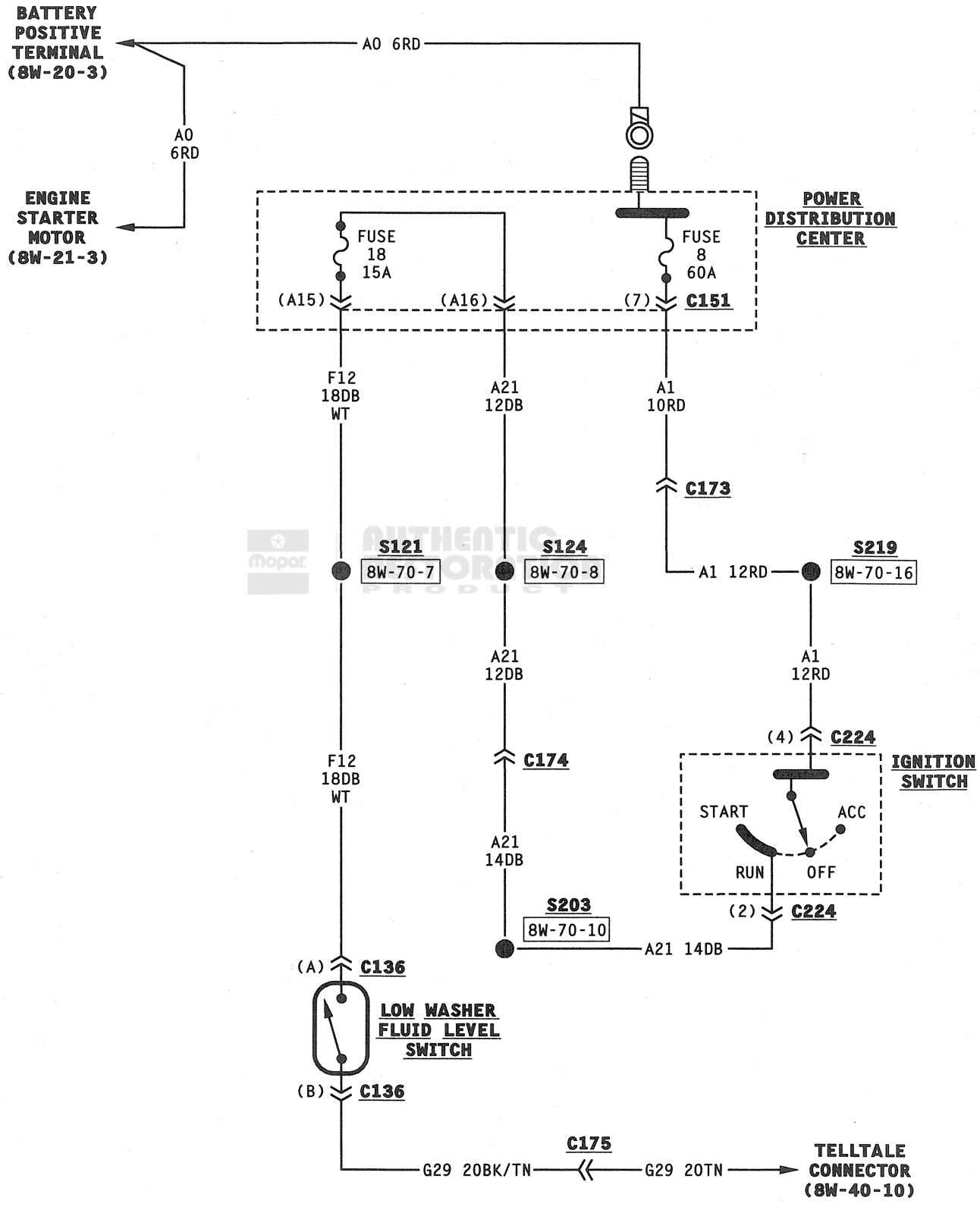
WIRING DIAGRAM INDEX

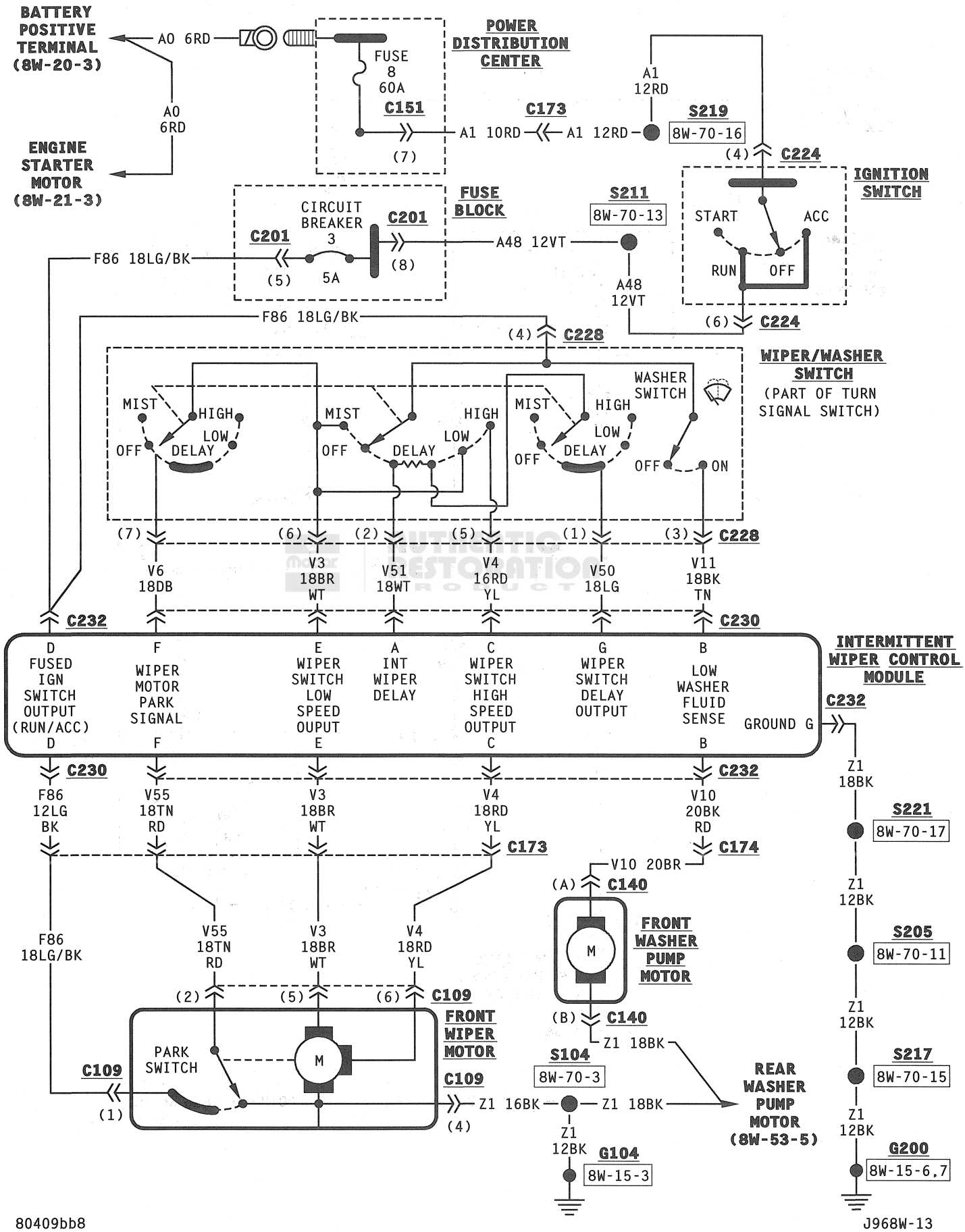
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

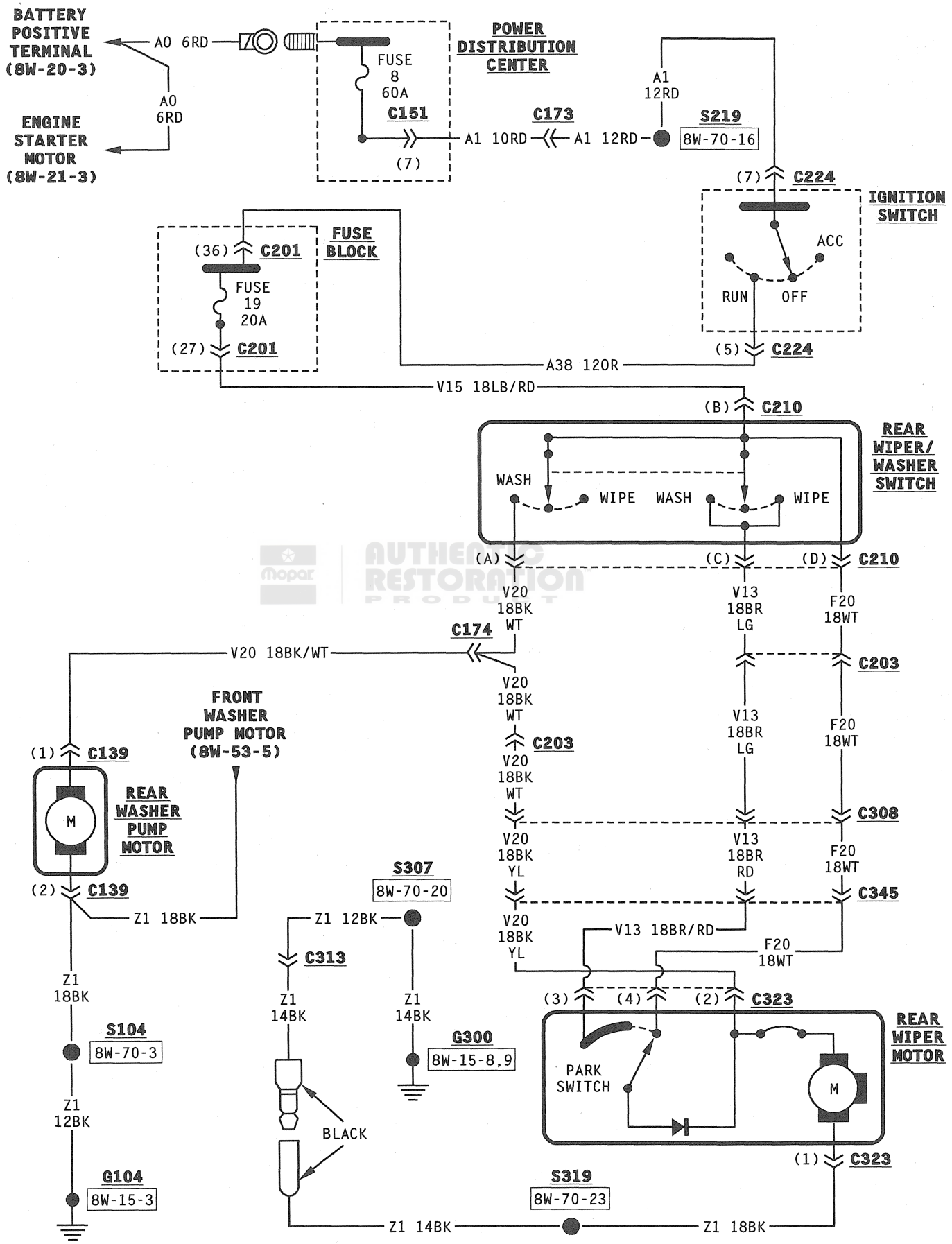
DIAGRAM INDEX

Component	Page
Circuit Breaker 3	8W-53-4
Front Washer Pump Motor	8W-53-4
Front Wiper Motor	8W-53-4
Fuse 19	8W-53-5
Fuse 8 (PDC)	8W-53-3, 4, 5
Fuse 18 (PDC)	8W-53-3
Ignition Switch	8W-53-3, 4, 5
Intermittent Wiper Control Module	8W-53-4
Low Washer Fluid Level Switch	8W-53-3
Rear Washer Pump Motor	8W-53-5
Rear Wiper Motor	8W-53-5
Rear Wiper/Washer Switch	8W-53-5
Wiper/Washer Switch	8W-53-4

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 18 15A
FUSE 8 60A
(A15)
(A16)
(7)
C151
F12 18DB WT
A21 12DB
A1 10RD
C173
S121
8W-70-7
S124
8W-70-8
A1 12RD
S219
8W-70-16
A21 12DB
A1 12RD
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
F12 18DB WT
C174
A21 14DB
S203
8W-70-10
(2)
C224
A21 14DB
(A)
C136
LOW WASHER FLUID LEVEL SWITCH
(B)
C136
C175
G29 20BK/TN
G29 20TN
TELLTALE CONNECTOR (8W-40-10)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
FUSE 8 60A
C151
(7)
POWER DISTRIBUTION CENTER
C173
A1 10RD
A1 12RD
A1 12RD
S219
8W-70-16
(4)
C224
IGNITION SWITCH
START
ACC
RUN
OFF
(6)
C224
FUSE BLOCK
CIRCUIT BREAKER 3
C201
C201
(5)
5A
(8)
F86 18LG/BK
A48 12VT
S211
8W-70-13
A48 12VT
F86 18LG/BK
(4)
C228
WIPER/WASHER SWITCH
(PART OF TURN SIGNAL SWITCH)
MIST
HIGH
LOW
OFF
DELAY
WASHER SWITCH
OFF
ON
(7)
(6)
(2)
(5)
(1)
(3)
C228
V6 18DB
V3 18BR WT
V51 18WT
V4 16RD YL
V50 18LG
V11 18BK TN
C232
C230
INTERMITTENT WIPER CONTROL MODULE
D FUSED IGN SWITCH OUTPUT (RUN/ACC)
F WIPER MOTOR PARK SIGNAL
E WIPER SWITCH LOW SPEED OUPUT
A INT WIPER DELAY
C WIPER SWITCH HIGH SPEED OUTPUT
G WIPER SWITCH DELAY OUTPUT
B LOW WASHER FLUID SENSE
GROUND G
C232
C230
C232
F86 12LG BK
V55 18TN RD
V3 18BR WT
V4 18RD YL
V10 20BK RD
C173
C174
V10 20BR
(A)
C140
FRONT WASHER PUMP MOTOR
M
(B)
C140
F86 18LG/BK
V55 18TN RD
V3 18BR WT
V4 18RD YL
(2)
(5)
(6)
C109
FRONT WIPER MOTOR
PARK SWITCH
M
C109
(1)
C109
(4)
Z1 16BK
S104
8W-70-3
Z1 18BK
Z1 18BK
REAR WASHER PUMP MOTOR (8W-53-5)
Z1 12BK
G104
8W-15-3
Z1 18BK
S221
8W-70-17
Z1 12BK
S205
8W-70-11
Z1 12BK
S217
8W-70-15
Z1 12BK
G200
8W-15-6,7



Mopar AUTHENTIC RESTORATION PRODUCT

80409bb9

J968W-13

8W-54 TRAILER TOW

DIAGNOSIS AND TESTING

TRAILER TOW

The factory installed trailer tow system in this vehicle uses three relays and a circuit breaker along with the trailer tow wiring connector located below the rear bumper.

Battery voltage for the trailer tow circuit breaker and relays is supplied on circuit A11. This circuit is HOT at all times and connects to the power accessory tap in the fuse block. An in line 10 amp circuit breaker protects circuit A11 and the trailer tow circuits. The trailer tow circuit breaker is located in the left rear quarter panel.

STOP LAMP RELAY

Power for the coil side of the stop lamp relay is supplied by circuit L50. This circuit connects to the stop lamps. Ground for the coil side is supplied on circuit Z1.

When the operator presses the brake pedal, voltage flows through the coil of the relay to ground causing the contacts in the relay to connect circuits A11 and L495.

Circuit L495 connects to the left and right turn signal relays. Voltage flows through the CLOSED contacts in the relays to the trailer tow connector.

RIGHT TURN RELAY

Power for the coil side of the right turn relay is supplied by circuit L60 from the multi-function switch. Circuit L60 connects to the right side turn signal lamps. Ground for the coil side of the relay is supplied on circuit Z1.

When the operator turns the right turn signal ON, power flows through the coil in the relay to ground causing the contacts in the relay to switch from the normally CLOSED position to connect circuits L494 and L60.

Circuit L494 is the feed for the contact side of the relay. Circuit L60 connects from the relay to the trailer tow connector.

Circuit L494 is fed power through the normally CLOSED side of the stop lamp relay by circuit A11. The A11 circuit is HOT at all times and protected by a 10 amp circuit breaker located in the left rear quarter panel.

LEFT TURN RELAY

Power for the coil side of the left turn relay is supplied by circuit L61 from the multi-function switch. Circuit L61 connects to the left side turn signal lamps. Ground for the coil side of the relay is supplied on circuit Z1.

When the operator turns the left turn signal ON, power flows through the coil in the relay to ground causing the contacts in the relay to switch from there normally CLOSED position and connect circuits L494 and L61.

Circuit L494 is the feed for the contact side of the relay. Circuit L61 connects from the relay to the trailer tow connector.

Circuit L494 is fed power through the normally CLOSED side of the stop lamp relay by circuit A11. The A11 circuit is HOT at all times and protected by a 10 amp circuit breaker located in the right rear quarter panel.

HELPFUL INFORMATION

Check the In-Line circuit breaker.

SCHEMATICS AND DIAGRAMS

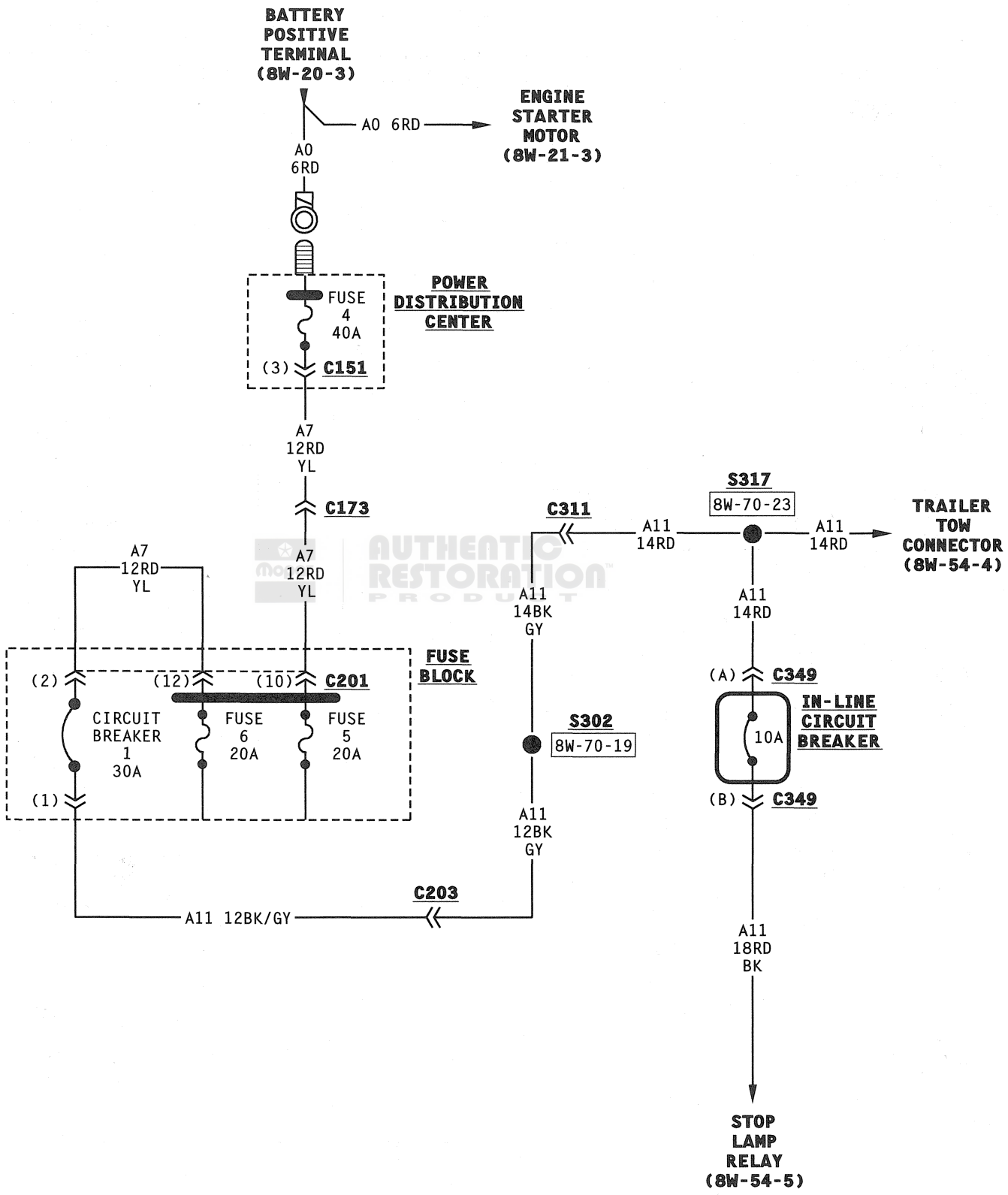
WIRING DIAGRAM INDEX

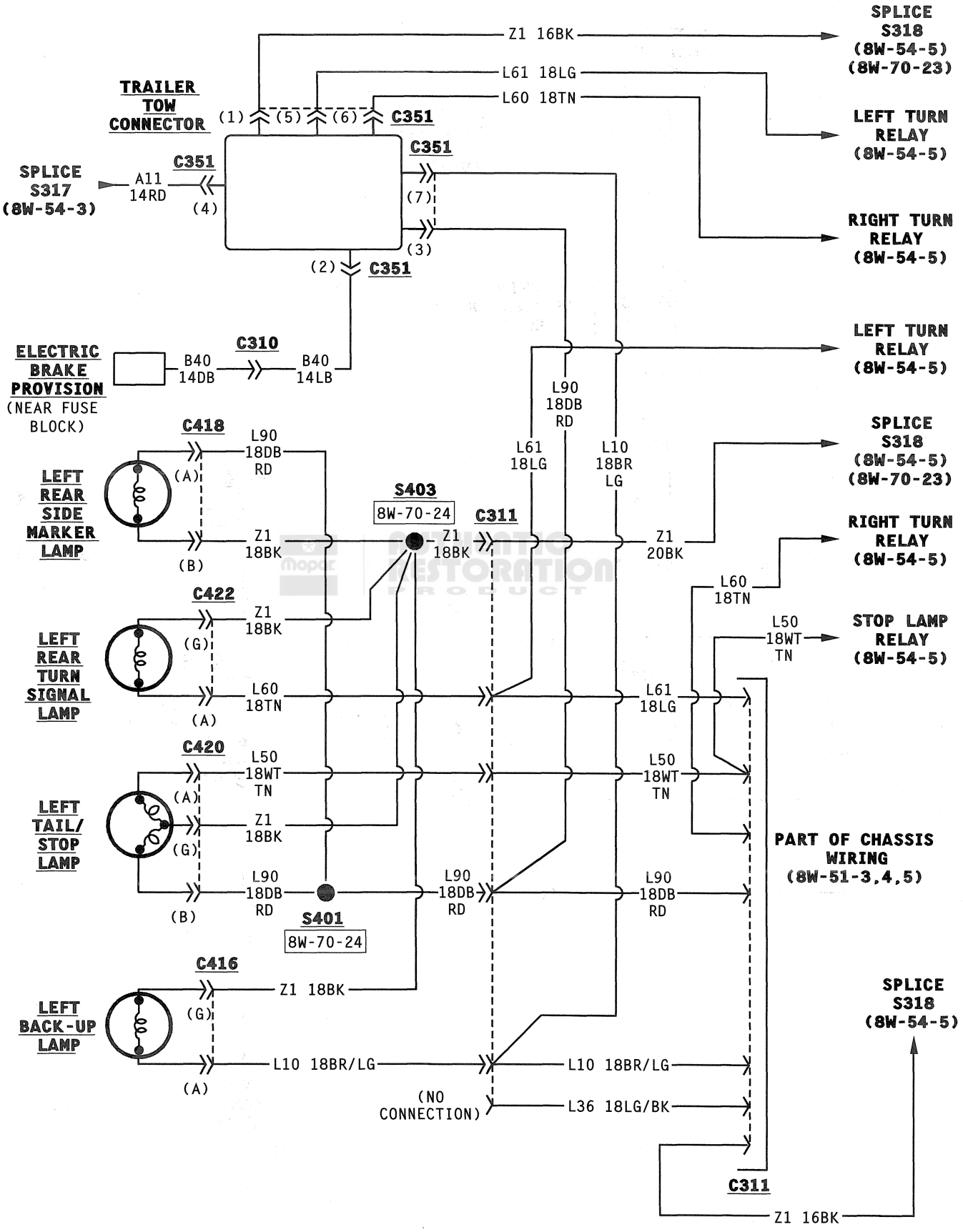
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

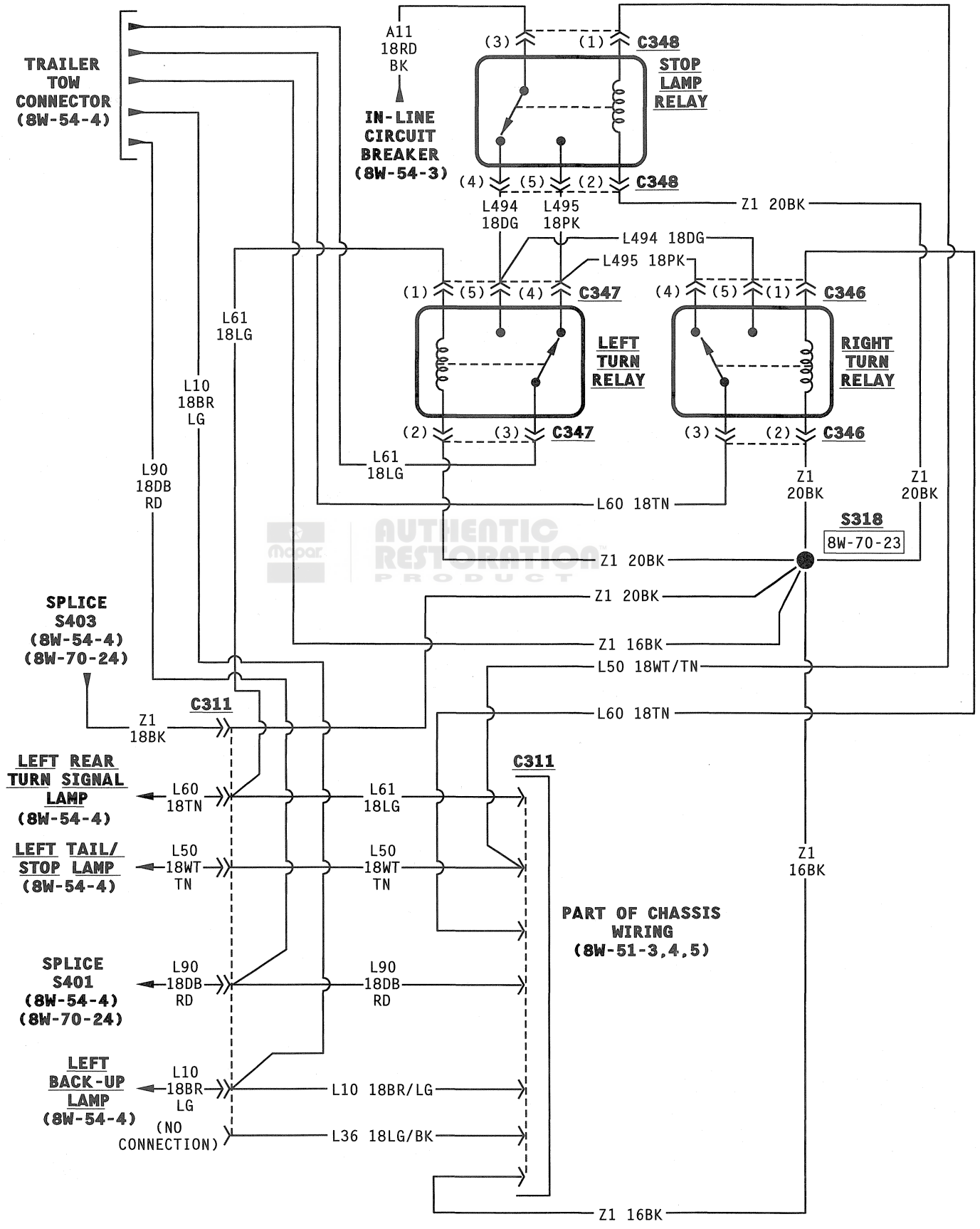
DIAGRAM INDEX

Component	Page
Circuit Breaker 1	8W-54-3
Electric Brake Provision	8W-54-4
Fuse 5	8W-54-3
Fuse 6	8W-54-3
Fuse 4 (PDC)	8W-54-3
In-Line Circuit Breaker	8W-54-3
Left Back-Up Lamp	8W-54-4
Left Rear Side Marker Lamp	8W-54-4
Left Rear Turn Signal Lamp	8W-54-4
Left Tail/Stop Lamp	8W-54-4
Left Turn Relay	8W-54-5
Right Turn Relay	8W-54-5
Stop Lamp Relay	8W-54-5
Trailer Tow Connector	8W-54-4

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
A0 6RD
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3) C151
A7 12RD YL
C173
A7 12RD YL
A7 12RD YL
FUSE BLOCK
(2)
(12)
(10) C201
CIRCUIT BREAKER 1 30A
FUSE 6 20A
FUSE 5 20A
(1)
C311
A11 14BK GY
S302
8W-70-19
A11 12BK GY
C203
A11 12BK/GY
S317
8W-70-23
A11 14RD
A11 14RD
TRAILER TOW CONNECTOR (8W-54-4)
A11 14RD
(A) C349
IN-LINE CIRCUIT BREAKER
10A
(B) C349
A11 18RD BK
STOP LAMP RELAY (8W-54-5)


Z1 16BK
SPLICE S318 (8W-54-5) (8W-70-23)
L61 18LG
L60 18TN
LEFT TURN RELAY (8W-54-5)
TRAILER TOW CONNECTOR
(1) (5) (6) C351
C351
SPLICE S317 (8W-54-3)
A11 14RD
C351
(4)
(7)
(3)
RIGHT TURN RELAY (8W-54-5)
(2) C351
ELECTRIC BRAKE PROVISION (NEAR FUSE BLOCK)
C310
B40 14DB
B40 14LB
LEFT TURN RELAY (8W-54-5)
L90 18DB RD
L61 18LG
L10 18BR LG
C418
L90 18DB RD
SPLICE S318 (8W-54-5) (8W-70-23)
LEFT REAR SIDE MARKER LAMP
(A)
S403
8W-70-24
C311
Z1 18BK
Z1 18BK
Z1 20BK
(B)
RIGHT TURN RELAY (8W-54-5)
L60 18TN
C422
Z1 18BK
L50 18WT TN
STOP LAMP RELAY (8W-54-5)
LEFT REAR TURN SIGNAL LAMP
(G)
L60 18TN
L61 18LG
(A)
C420
L50 18WT TN
L50 18WT TN
LEFT TAIL/ STOP LAMP
(A)
Z1 18BK
(G)
PART OF CHASSIS WIRING (8W-51-3,4,5)
L90 18DB RD
L90 18DB RD
L90 18DB RD
(B)
S401
8W-70-24
C416
Z1 18BK
SPLICE S318 (8W-54-5)
LEFT BACK-UP LAMP
(G)
L10 18BR/LG
L10 18BR/LG
(A)
(NO CONNECTION)
L36 18LG/BK
C311
Z1 16BK



Mopar AUTHENTIC RESTORATION PRODUCT

8W-60 POWER WINDOWS

INDEX

page

DESCRIPTION AND OPERATION
HELPFUL INFORMATION 2
POWER WINDOWS 1

SCHEMATICS AND DIAGRAMS
WIRING DIAGRAM INDEX 2

DESCRIPTION AND OPERATION

POWER WINDOWS

When the ignition switch is in the ACCESSORY or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A48. Circuit A48 powers circuit F81 through fuse 12 in the fuse block. Circuit F81 supplies voltage to the power window system.

Circuit F81 connects to the master window switch. Circuit Z1 provides ground for the power windows.

A LOCK-OUT feature is provided on the driver's door window switch. When this feature is engaged the other windows in the system will not operate.

RIGHT FRONT WINDOW OPERATION

When the operator selects window DOWN operation power is supplied on the F81 circuit through the switch to circuit Q12. Circuit Q12 connects the switch to the power window motor. Ground for the motor is supplied on the Q22 circuit back to the switch. A bus bar, internal to the switch, connects the Q22 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuit Q22 is the feed, and circuit Q12 is the ground.

LEFT FRONT WINDOW OPERATION

When the DRIVER selects window DOWN operation, power is supplied on the F81 circuit through the switch to circuit Q26. Circuit Q26 connects the drivers door switch to the left front door switch. Power is passed through this switch to circuit Q21. The Q21 circuit then goes to the left front window motor.

Ground for the window motor is supplied on the Q11 circuit back to the left front door switch. Circuity internal to the switch then passes the ground to circuit Q16. Circuit Q16 connects the left front door switch to the master switch. A bus bar, internal to the switch, connects the Q16 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuits Q16 and Q11 are the feeds, and circuits Q21 and Q26 are the grounds.

If the switch is being operated from the PASSENGER'S front door, and the operator is requesting window DOWN operation, power is supplied on the Q1 circuit from the driver's master switch circuit through the switch to the Q21 circuit.

Ground for the motor is supplied on the Q11 circuit through the switch and back to the master switch on circuit Q16. A bus bar, internal to the switch, connects the Q16 circuit to the Z1 circuit.

For window UP operation, the circuits are reversed. Circuit Q11 is the power and circuit Q21 is the ground.

LEFT REAR WINDOW

When the DRIVER selects window DOWN operation power is supplied on the F81 circuit through the switch to circuit Q17. Circuit Q17 connects the drivers door switch to the left rear door power window switch. Power is passed through the switch to circuit Q22. The Q22 circuit connects to the left rear window motor.

Ground for the window motor is supplied on the Q12 circuit back to the left rear door switch. Circuity internal to the switch then passes the ground to circuit Q27. Circuit Q27 connects the left rear door switch to the master switch. A bus bar, internal to the switch, connects the Q27 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuits Q27 and Q12 are the feeds, and circuits Q22 and Q17 are the grounds.

If the switch is being operated from the LEFT REAR door, and the operator is requesting window DOWN operation, power is supplied on the Q1 circuit from the driver's master switch circuit through the switch to the Q22 circuit.

Ground for the motor is supplied on the Q12 circuit through the switch and to circuit Q27. Circuit Q27 connects to the master window switch. A bus bar, internal to the switch, connects the Q27 circuit to the Z1 circuit.

For window UP operation, the circuits are reversed. Circuit Q12 is the power and circuits Q22, and Q17 are the grounds.

RIGHT REAR WINDOW

When the DRIVER selects window DOWN operation, power is supplied on the F81 circuit through the

DESCRIPTION AND OPERATION (Continued)

switch to circuit Q18. Circuit Q18 connects the drivers door switch to the right rear door window switch connector. Power is passed through this switch to circuit Q22. The Q22 circuit connects to the right rear window motor.

Ground for the window motor is supplied on the Q12 circuit back to the right rear door switch. Circuity internal to the switch then passes the ground to circuit Q28. Circuit Q28 connects the right rear door switch to the master switch. A bus bar, internal to the switch, connects the Q28 circuit to the Z1 circuit.

For window UP operation the circuits are reversed. Circuits Q28 and Q12 are the feeds, and circuits Q22, Q33 and Q18 are the grounds.

If the switch is being operated from the RIGHT REAR door, and the operator is requesting window DOWN operation, power is supplied on the Q1 circuit from the driver's master switch circuit through the switch to the Q22 circuit.

Ground for the motor is supplied on the Q12 circuit through the switch and back to the master switch on circuit Q28. A bus bar, internal to the switch, connects the Q28 circuit to the Z1 circuit.

For window UP operation, the circuits are reversed. Circuit Q12 is the power and circuits Q22 and Q18 are the ground.

HELPFUL INFORMATION

Refer to the appropriate group of the Service Manual for test procedures.

SCHEMATICS AND DIAGRAMS

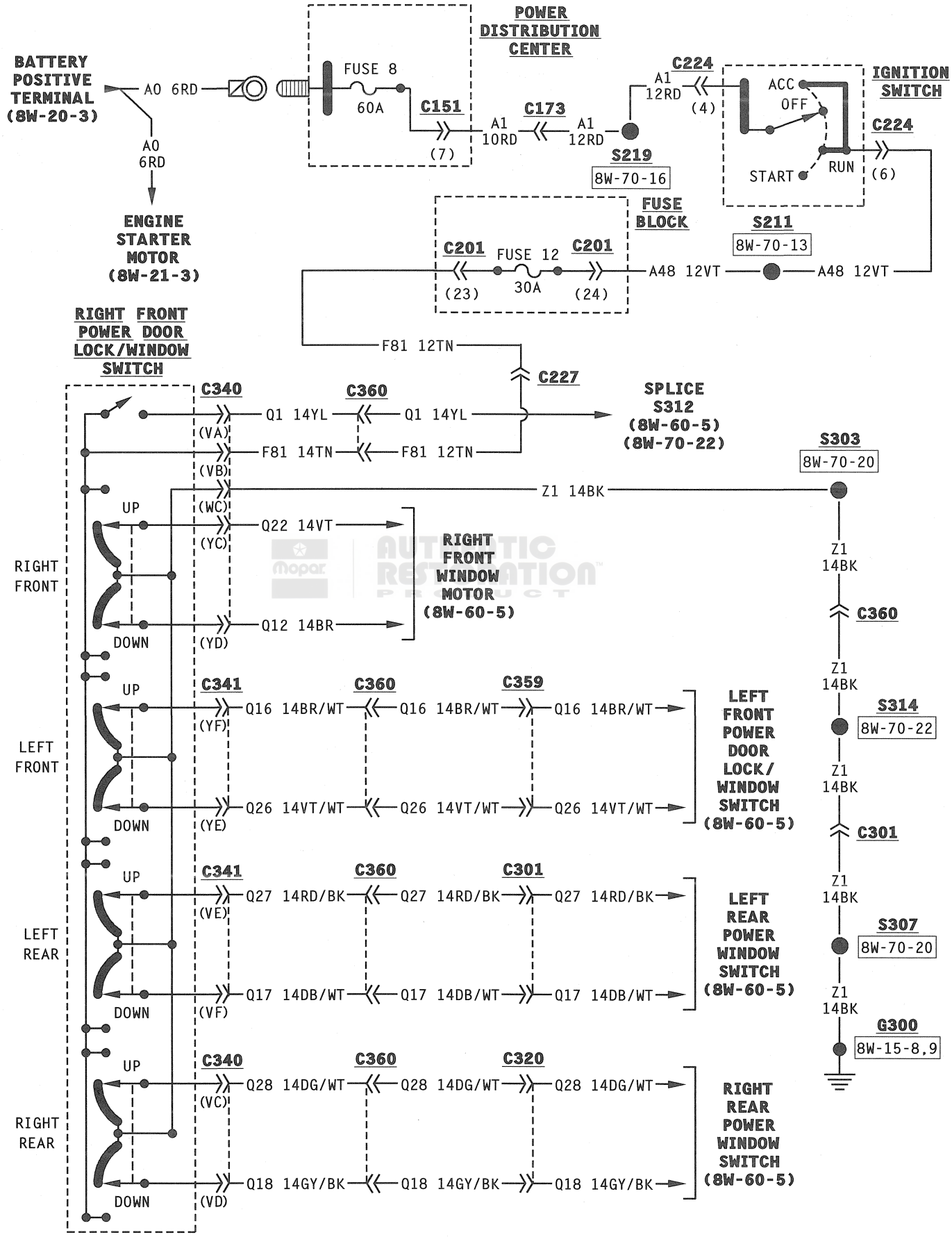
WIRING DIAGRAM INDEX

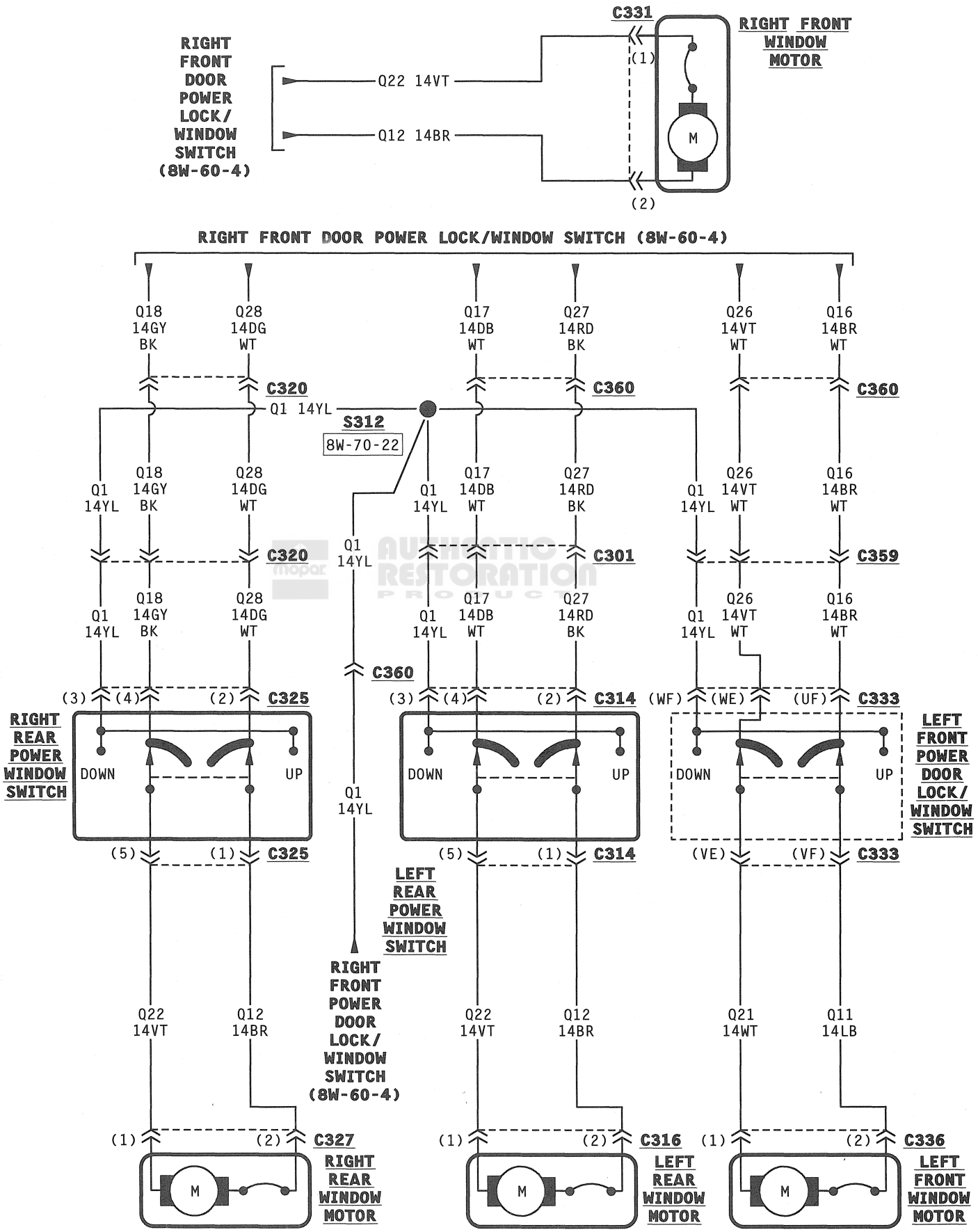
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Fuse 12	8W-60-4
Fuse 8 (PDC)	8W-60-4
Ignition Switch	8W-60-4
Left Front Power Door Lock/Window Switch	8W-60-5
Left Front Window Motor	8W-60-5
Left Rear Power Window Switch	8W-60-5
Left Rear Window Motor	8W-60-5
Right Front Power Door Lock/Window Switch	8W-60-4
Right Front Window Motor	8W-60-5
Right Rear Power Window Switch	8W-60-5
Right Rear Window Motor	8W-60-5

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 8
60A
C151
(7)
C173
A1 10RD
A1 12RD
S219
8W-70-16
C224
A1 12RD
(4)
IGNITION SWITCH
ACC
OFF
START
RUN
C224
(6)
FUSE BLOCK
S211
8W-70-13
C201
FUSE 12
C201
(23)
30A
(24)
A48 12VT
A48 12VT
F81 12TN
C227
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH
C340
C360
Q1 14YL
Q1 14YL
(VA)
F81 14TN
F81 12TN
(VB)
SPLICE S312 (8W-60-5) (8W-70-22)
S303
8W-70-20
Z1 14BK
(WC)
UP
Q22 14VT
(YC)
RIGHT FRONT
RIGHT FRONT WINDOW MOTOR (8W-60-5)
Q12 14BR
DOWN
(YD)
Z1 14BK
C360
Z1 14BK
C341
C360
C359
UP
Q16 14BR/WT
Q16 14BR/WT
Q16 14BR/WT
(YF)
LEFT FRONT
LEFT FRONT POWER DOOR LOCK/ WINDOW SWITCH (8W-60-5)
S314
8W-70-22
Q26 14VT/WT
Q26 14VT/WT
Q26 14VT/WT
DOWN
(YE)
Z1 14BK
C301
Z1 14BK
C341
C360
C301
UP
Q27 14RD/BK
Q27 14RD/BK
Q27 14RD/BK
(VE)
LEFT REAR
LEFT REAR POWER WINDOW SWITCH (8W-60-5)
S307
8W-70-20
Q17 14DB/WT
Q17 14DB/WT
Q17 14DB/WT
DOWN
(VF)
Z1 14BK
G300
8W-15-8,9
C340
C360
C320
UP
Q28 14DG/WT
Q28 14DG/WT
Q28 14DG/WT
(VC)
RIGHT REAR
RIGHT REAR POWER WINDOW SWITCH (8W-60-5)
Q18 14GY/BK
Q18 14GY/BK
Q18 14GY/BK
DOWN
(VD)



AUTHENTIC RESTORATION PRODUCTS

8W-61 POWER DOOR LOCKS

DESCRIPTION AND OPERATION

INTRODUCTION

Two relays provide power for the power door lock motors. The Unlock relay provides power for the unlock circuits while the Lock relay powers the lock circuits. Either power door lock switch can operate the Unlock and Lock relays.

LOCK RELAY

Circuit A7 from fuse 4 in the Power Distribution Center (PDC) powers circuits P37 and P38 through fuse 6 in the fuse block. When either power door lock switch is put in the LOCK position, the switch connects circuit P38 to circuit P35. Circuit P35 supplies power to the coil side of the lock relay, causing the relay contacts to close. Circuit Z1 provides ground for the coil side of the lock relay.

When the lock relay contacts close, they connect battery voltage from circuit P37 to circuit P2. Circuit P2 then supplies battery voltage to the power door lock motors to LOCK the doors.

When the power doors LOCK, ground for the motors is on circuit P34 through the normally closed contacts in the door unlock relay to ground on circuit Z1.

UNLOCK RELAY

Circuit A7 from fuse 4 in the Power Distribution Center (PDC) powers circuits P37 and P38 through fuse 6 in the fuse block. When either power door lock switch is put in the UNLOCK position, the switch connects circuit P38 to circuit P36. Circuit P36 supplies power to the coil side of the unlock relay, causing the relay contacts to close. Circuit Z1 provides ground for the coil side of the unlock relay.

When the unlock relay contacts close, they connect battery voltage from circuit P37 to circuit P34. Circuit P34 then supplies battery voltage to the power door lock motors to UNLOCK the doors.

When the power doors UNLOCK, ground for the motors is on circuit P2 through the normally closed contacts in the door lock relay to ground on circuit Z1.

SCHEMATICS AND DIAGRAMS

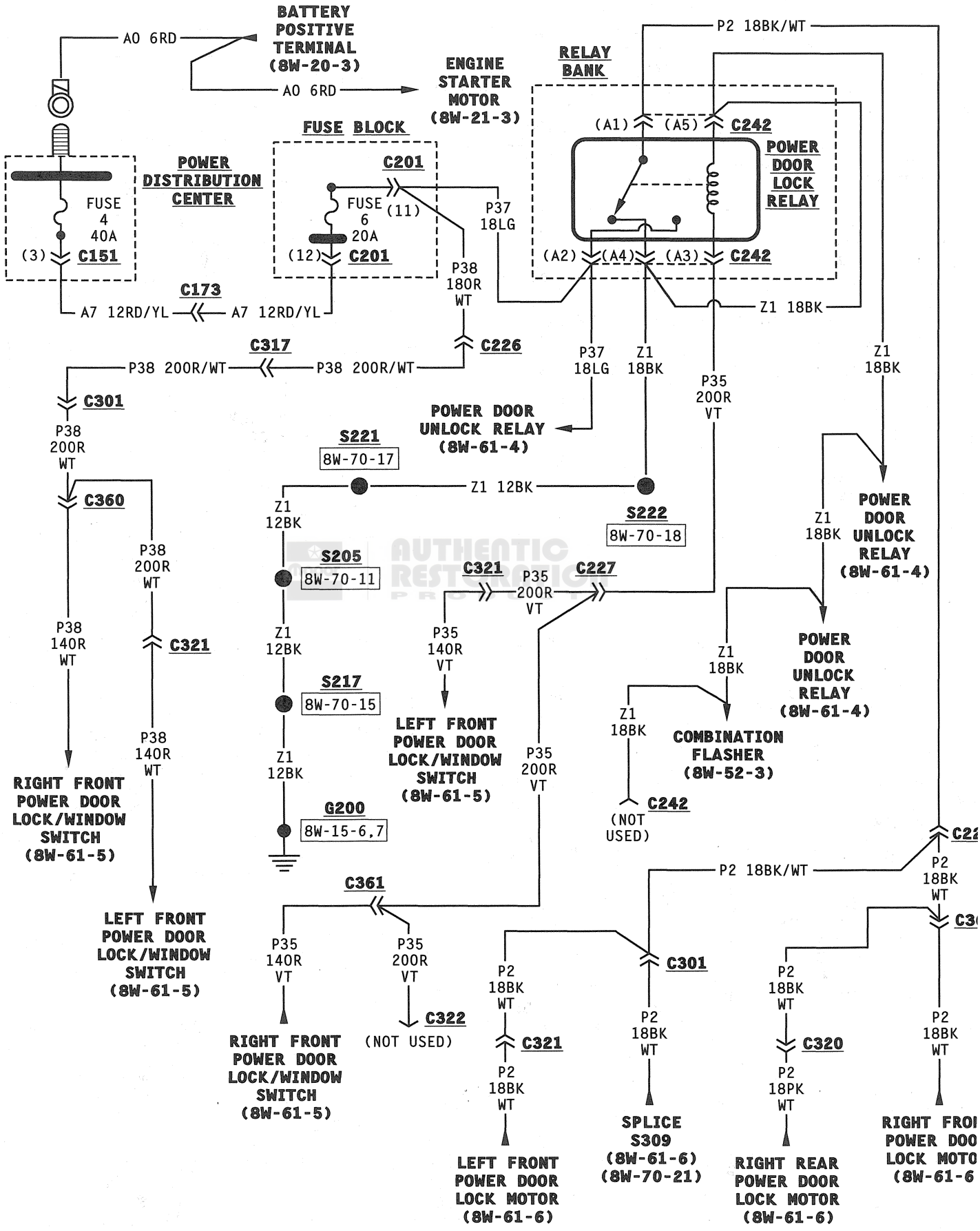
WIRING DIAGRAM INDEX

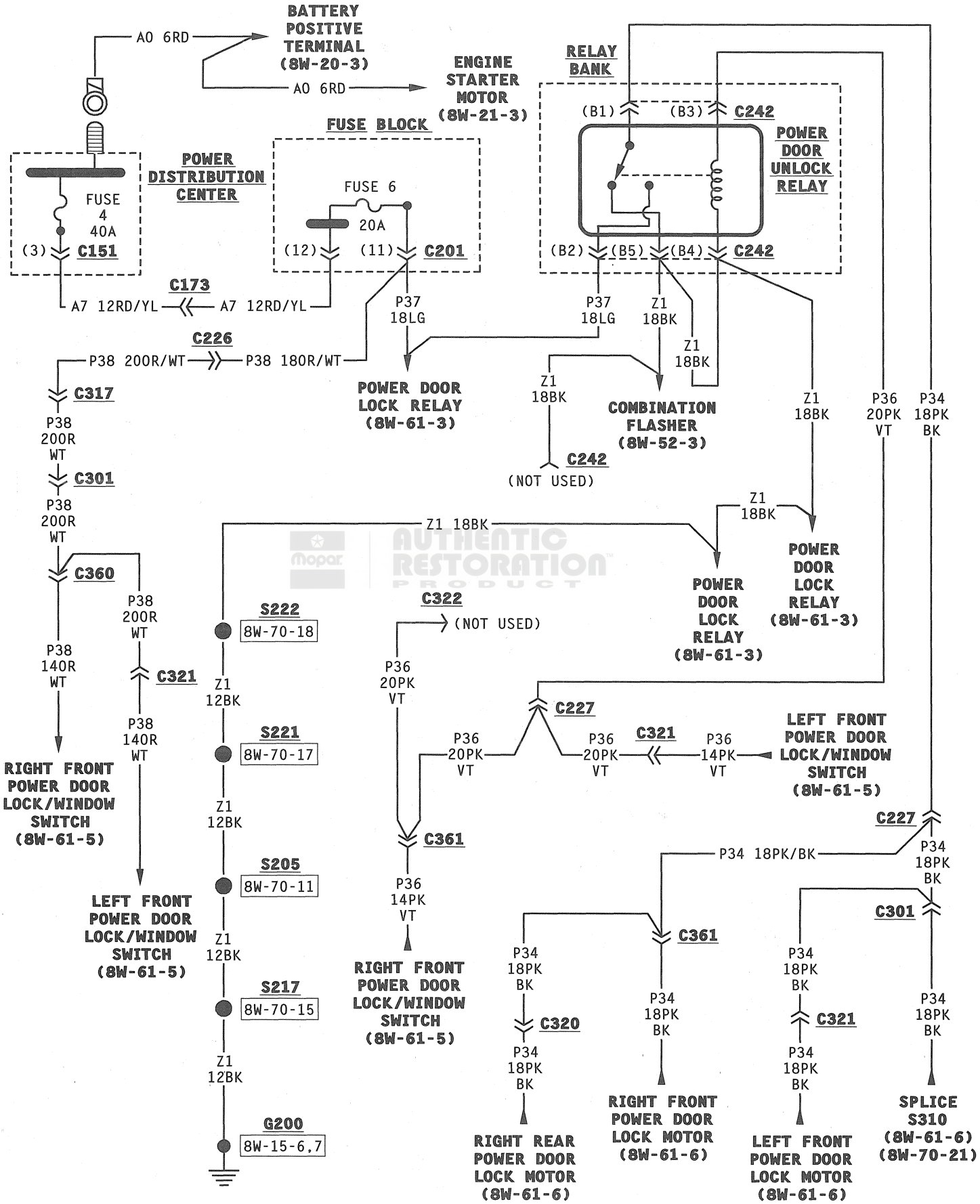
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

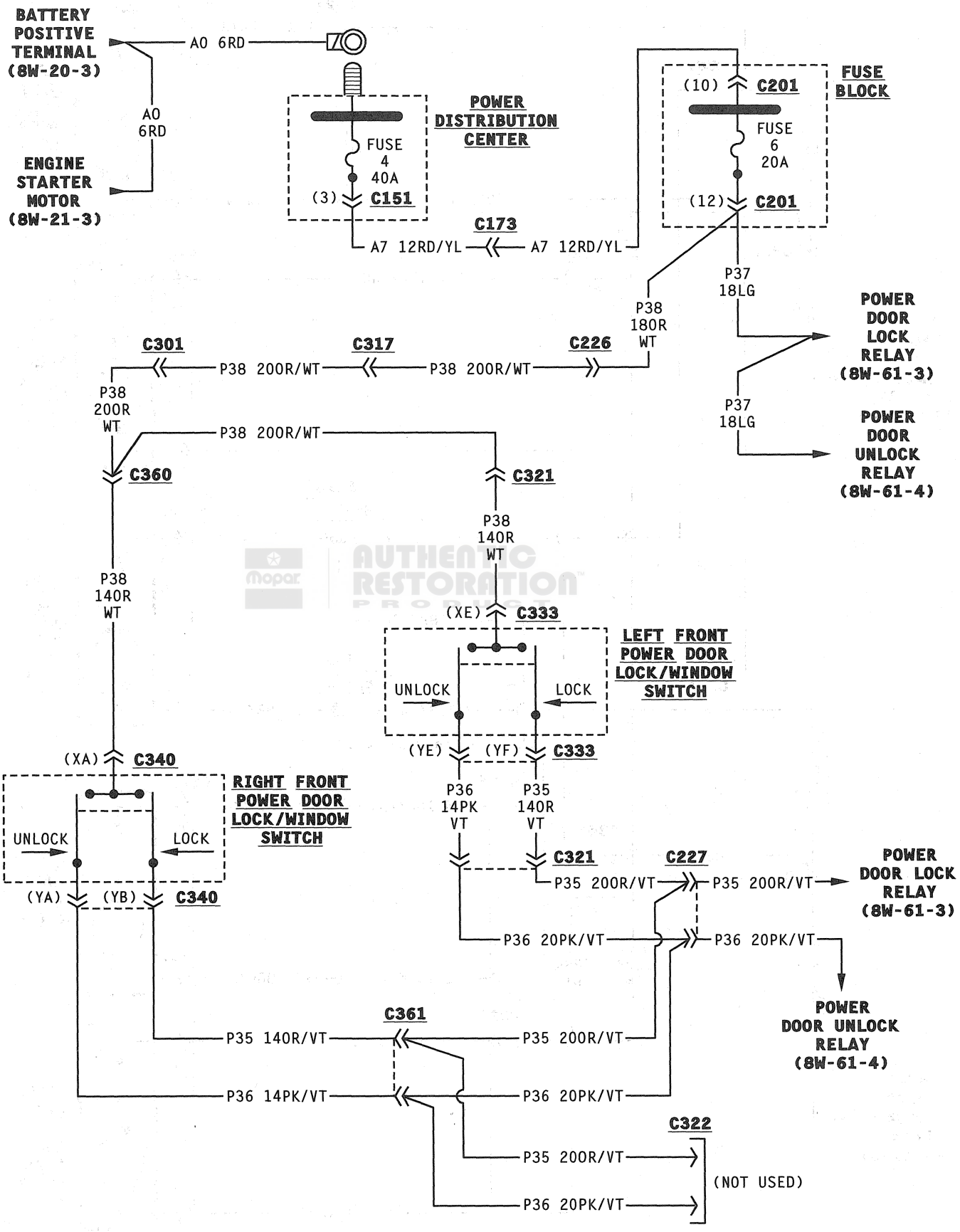
Component	Page
Fuse 6	8W-61-3, 4, 5
Fuse 4 (PDC)	8W-61-3, 4, 5
Left Front Power Door Lock Motor	8W-61-6
Left Front Power Door Lock/Window Switch	8W-61-5
Left Rear Power Door Lock Motor	8W-61-6
Liftgate Lock Motor	8W-61-6
Power Door Lock Relay	8W-61-3
Power Door Unlock Relay	8W-61-4
Right Front Power Door Lock Motor	8W-61-6
Right Front Power Door Lock/Window Switch	8W-61-5
Right Rear Power Door Lock Motor	8W-61-6

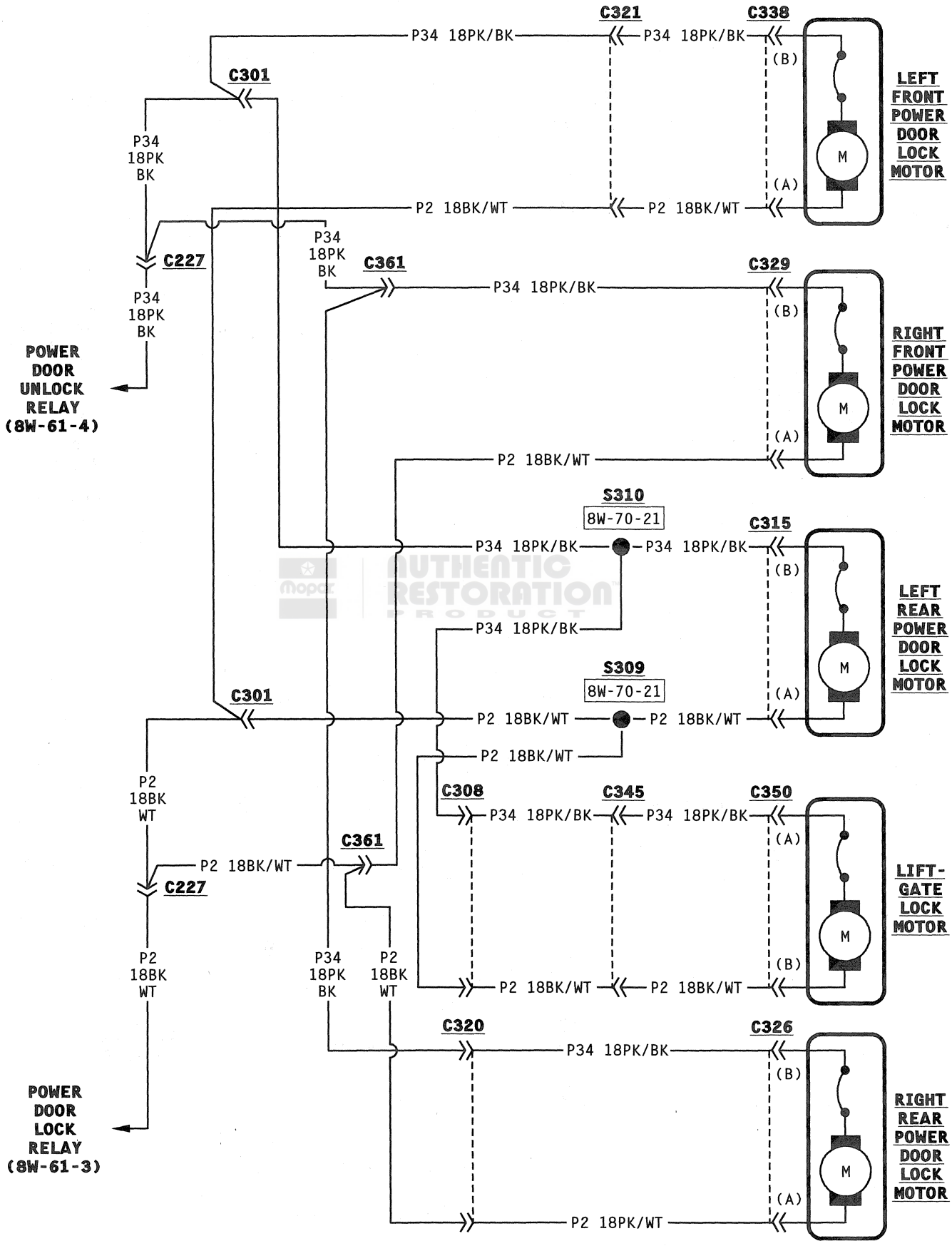
Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
P2 18BK/WT
RELAY BANK
(A1)
(A5)
C242
POWER DOOR LOCK RELAY
FUSE BLOCK
C201
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3) C151
FUSE 6 20A
(11)
(12) C201
P37 18LG
P38 180R WT
(A2)
(A4)
(A3)
C242
Z1 18BK
C173
A7 12RD/YL
A7 12RD/YL
C317
P38 200R/WT
P38 200R/WT
C226
C301
P38 200R WT
P37 18LG
Z1 18BK
P35 200R VT
Z1 18BK
POWER DOOR UNLOCK RELAY (8W-61-4)
S221
8W-70-17
Z1 12BK
S222
8W-70-18
C360
P38 200R WT
Z1 12BK
S205
8W-70-11
C321
P35 200R VT
C227
Z1 18BK
POWER DOOR UNLOCK RELAY (8W-61-4)
P38 140R WT
P38 200R WT
C321
Z1 12BK
P35 140R VT
Z1 18BK
POWER DOOR UNLOCK RELAY (8W-61-4)
S217
8W-70-15
Z1 18BK
COMBINATION FLASHER (8W-52-3)
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-5)
P38 140R WT
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-5)
Z1 12BK
G200
8W-15-6,7
P35 200R VT
Z1 18BK
C242
(NOT USED)
C361
P2 18BK/WT
P2 18BK WT
P35 140R VT
P35 200R VT
C301
P2 18BK WT
P2 18BK WT
C321
C322
(NOT USED)
P2 18BK WT
P2 18BK WT
C320
P2 18BK WT
P2 18PK WT
P2 18BK WT
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-61-5)
LEFT FRONT POWER DOOR LOCK MOTOR (8W-61-6)
SPLICE S309 (8W-61-6) (8W-70-21)
RIGHT REAR POWER DOOR LOCK MOTOR (8W-61-6)
RIGHT FRO POWER DOO LOCK MOTO (8W-61-6



Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3) C151
C173
A7 12RD/YL
A7 12RD/YL
FUSE BLOCK
(10) C201
FUSE 6 20A
(12) C201
P37 18LG
P38 180R WT
POWER DOOR LOCK RELAY (8W-61-3)
P37 18LG
POWER DOOR UNLOCK RELAY (8W-61-4)
C301
C317
C226
P38 200R/WT
P38 200R/WT
P38 200R WT
P38 200R/WT
C360
C321
P38 140R WT
P38 140R WT
(XE) C333
LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH
UNLOCK
LOCK
(YE) (YF) C333
P36 14PK VT
P35 140R VT
(XA) C340
RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH
UNLOCK
LOCK
(YA) (YB) C340
C321
C227
P35 200R/VT
P35 200R/VT
POWER DOOR LOCK RELAY (8W-61-3)
P36 20PK/VT
P36 20PK/VT
POWER DOOR UNLOCK RELAY (8W-61-4)
C361
P35 140R/VT
P35 200R/VT
P36 14PK/VT
P36 20PK/VT
C322
P35 200R/VT
(NOT USED)
P36 20PK/VT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-62 POWER MIRRORS

DESCRIPTION AND OPERATION

POWER MIRRORS

Four switches operates the left and right power mirrors. One switch selects right or left mirror. Each mirror has two motors; a LEFT/RIGHT motor and a UP/DOWN motor. The motors switch polarity to allow mirror adjustment.

Circuit A7 from fuse 4 in the Power Distribution Center (PDC) supplies battery voltage to fuse 7 in the fuse block. Fuse 7 supplies voltage to circuit P60. Circuit P60 powers the power mirror switch. Circuit Z1 connects to the power mirror switch and supplies ground for the power mirror system.

RIGHT POWER MIRROR OPERATION

In the right position, the power mirror switch supplies power to the right mirror LEFT/RIGHT motor on circuit P79 when a rightward adjustment is made. Circuit P77 provides the ground path the for rightward adjustments.

When the operator makes leftward adjustment, polarity reverses. For leftward adjustments, the switch supplies battery voltage to the right mirror LEFT/RIGHT motor on circuit P77. Circuit P79 supplies ground for leftward adjustments.

During upward adjustments, the switch supplies voltage to the right mirror UP/DOWN motor on circuit P79. Circuit P80 from the motor connects to circuit P78. Circuit P78 supplies ground during upward adjustments.

For downward adjustments, the polarity is reversed, the switch powers the right mirror UP/DOWN motor on circuits P78 and P80. Circuit P79 supplies the ground path.

LEFT POWER MIRROR OPERATION

In the left position, the power mirror switch supplies power to the left mirror LEFT/RIGHT motor on circuit P79 when a rightward adjustment is made. Circuit P77 from the motor connects to circuit P81. Circuit P81 provides the ground path the for rightward adjustments.

When the operator makes leftward adjustment, polarity reverses. For leftward adjustments, the switch supplies battery voltage the left mirror LEFT/RIGHT motor on circuits P81 and P77. Circuit P79 supplies ground for leftward adjustments.

During upward adjustments, the switch supplies voltage to the left mirror UP/DOWN motor on circuit P79. Circuit P78 from the motor connects to circuit P80. Circuit P80 supplies ground during upward adjustments.

For downward adjustments, the polarity is reversed, the switch powers the left mirror UP/DOWN motor on circuits P80 and P78. Circuit P79 supplies the ground path.

HELPFUL INFORMATION

Check fuse 4 in the PDC and fuse 7 in the fuse block.

HEATER ELEMENTS

The rear window defogger relay powers the heater elements in power mirrors. When the relay energizes, it supplies power to the heater elements on circuit C15. Circuit Z1 provides ground for the power mirror heater elements.

HELPFUL INFORMATION

- Circuit F82 from fuse 2 in the fuse block powers circuit C15 when the rear window defogger relay energizes.
- Circuit A4 from fuse 3 in the Power Distribution Center (PDC) supplies battery voltage to the fuse block for fuse 2 and circuit F82.
- Check fuse 2 in the fuse block.
- Check fuse 3 in the PDC.

SCHEMATICS AND DIAGRAMS

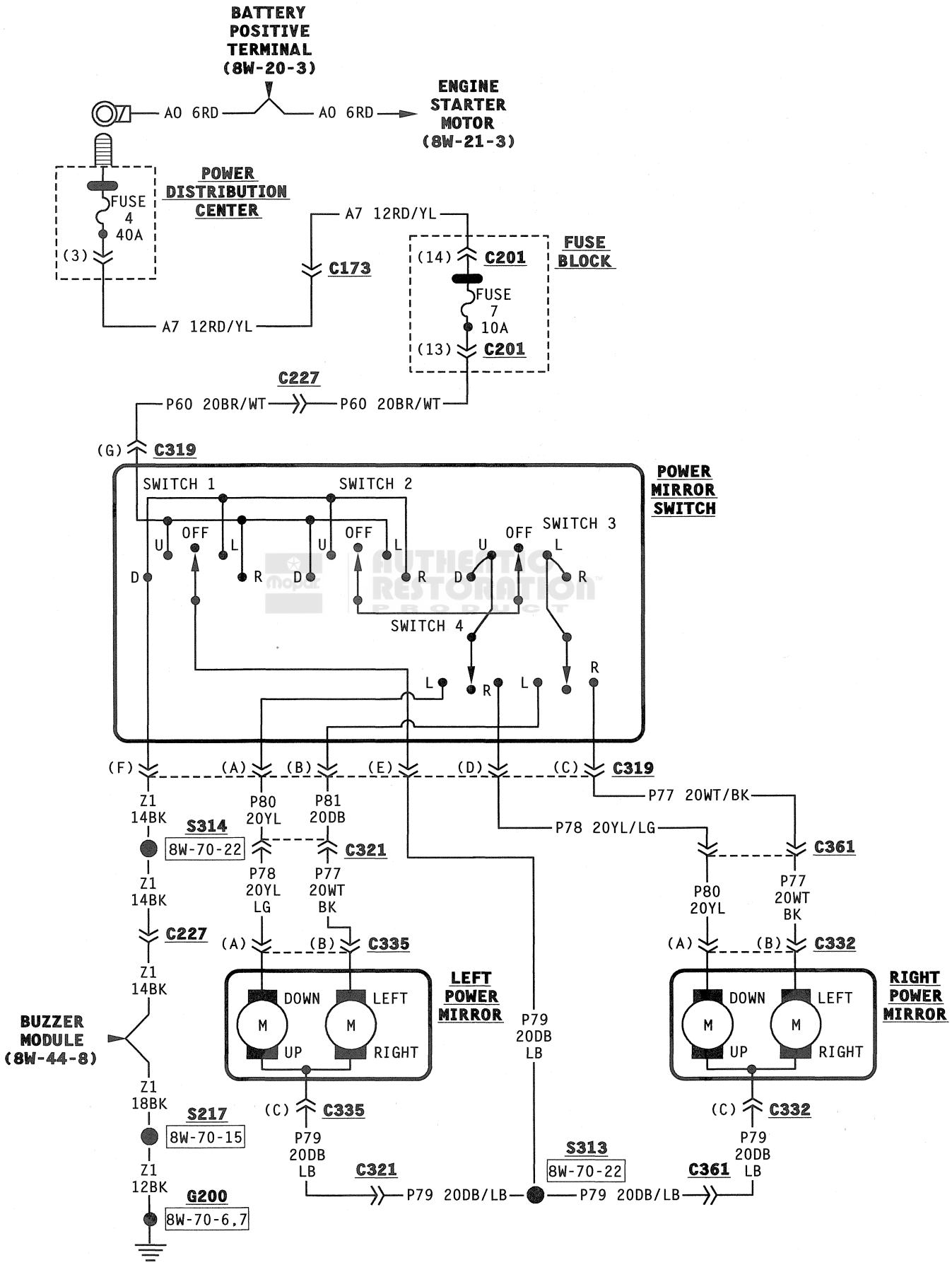
WIRING DIAGRAM INDEX

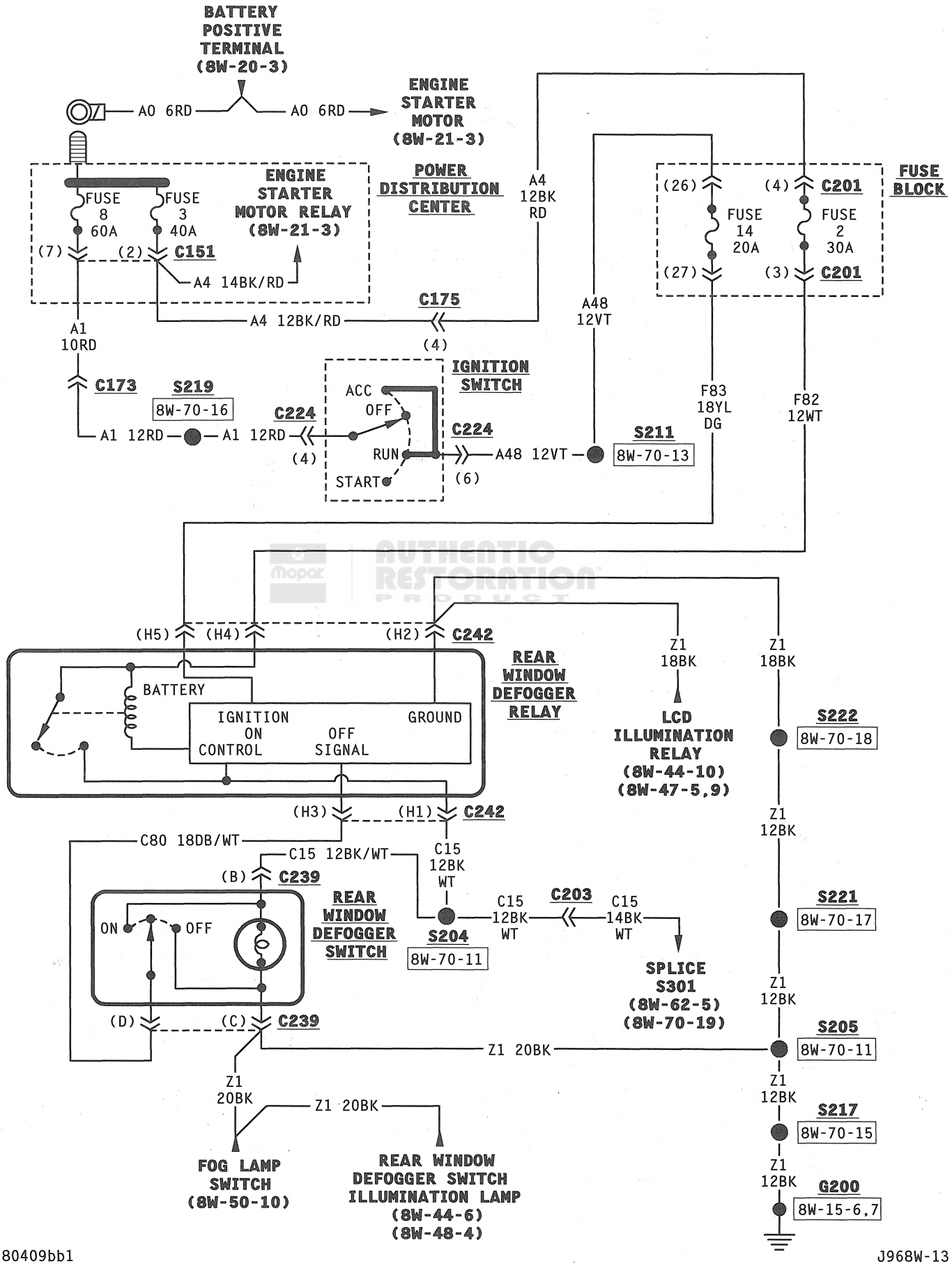
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

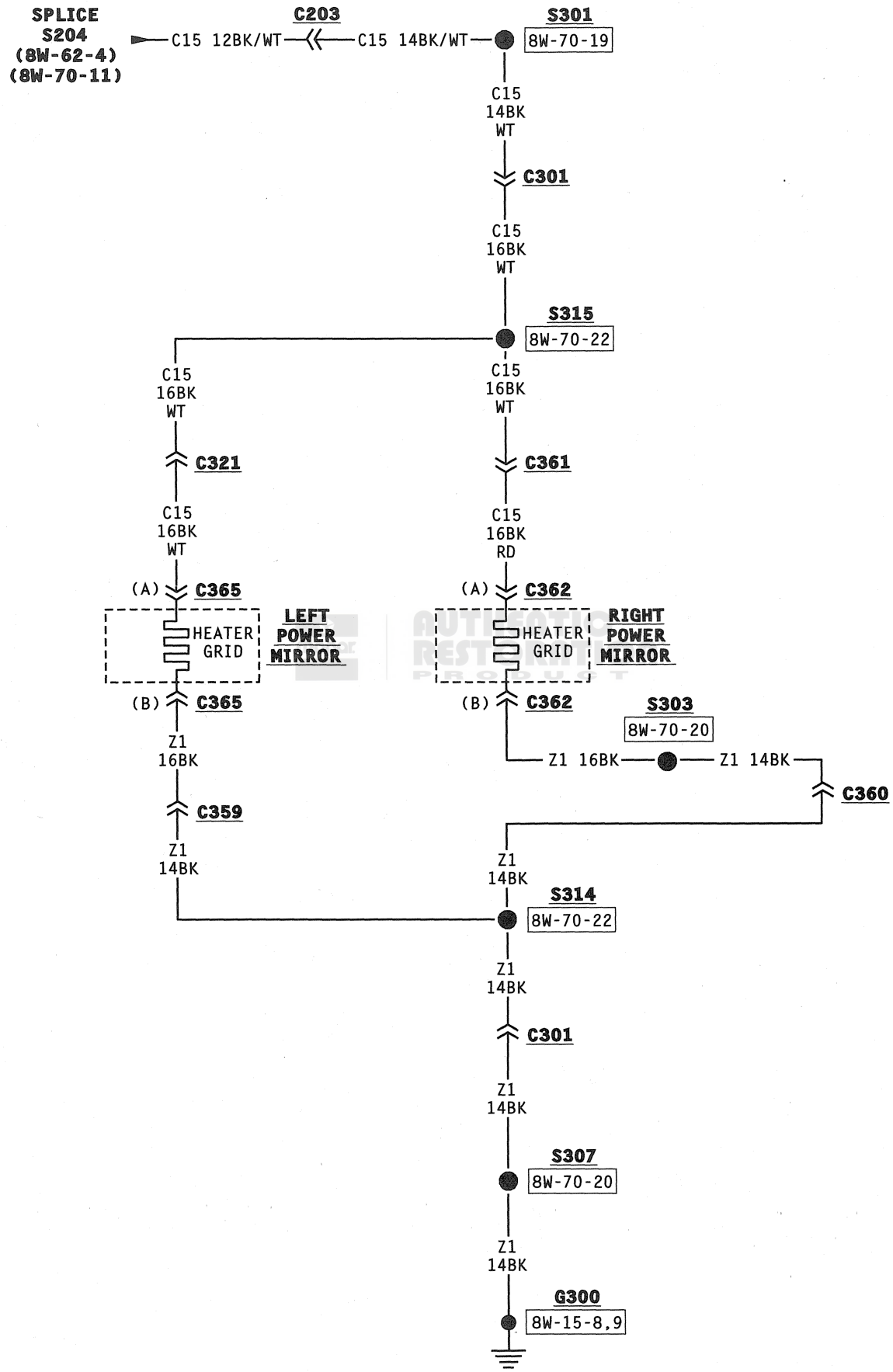
Component	Page
Fuse 2	8W-62-4
Fuse 7	8W-62-3
Fuse 14	8W-62-4
Fuse 3 (PDC)	8W-62-4
Fuse 4 (PDC)	8W-62-3
Fuse 8 (PDC)	8W-62-4
Ignition Switch	8W-62-4
Left Power Mirror	8W-62-3, 5
Power Mirror Switch	8W-62-3
Rear Window Defogger Relay	8W-62-4
Rear Window Defogger Switch	8W-62-4
Right Power Mirror	8W-62-3, 5

Mopar AUTHENTIC RESTORATION PRODUCT


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
FUSE 4 40A
(3)
A7 12RD/YL
C173
A7 12RD/YL
(14) C201
FUSE BLOCK
FUSE 7 10A
(13) C201
C227
P60 20BR/WT
P60 20BR/WT
(G) C319
POWER MIRROR SWITCH
SWITCH 1
SWITCH 2
SWITCH 3
SWITCH 4
OFF
U
L
D
R
(F)
(A)
(B)
(E)
(D)
(C) C319
Z1 14BK
P80 20YL
P81 20DB
P77 20WT/BK
P78 20YL/LG
S314
8W-70-22
C321
C361
P78 20YL LG
P77 20WT BK
P80 20YL
P77 20WT BK
C227
C335
C332
LEFT POWER MIRROR
RIGHT POWER MIRROR
DOWN
LEFT
UP
RIGHT
M
BUZZER MODULE (8W-44-8)
P79 20DB LB
Z1 18BK
S217
8W-70-15
Z1 12BK
G200
8W-70-6,7
(C) C335
(C) C332
P79 20DB LB
C321
S313
8W-70-22
C361
P79 20DB/LB
P79 20DB/LB



Mopar AUTHENTIC RESTORATION PARTS


SPLICE
S204
(8W-62-4)
(8W-70-11)
C203
C15 12BK/WT
C15 14BK/WT
S301
8W-70-19
C15
14BK
WT
C301
C15
16BK
WT
S315
8W-70-22
C15
16BK
WT
C321
C15
16BK
WT
(A)
C365
HEATER
GRID
LEFT
POWER
MIRROR
(B)
C365
Z1
16BK
C359
Z1
14BK
C15
16BK
WT
C361
C15
16BK
RD
(A)
C362
HEATER
GRID
RIGHT
POWER
MIRROR
(B)
C362
S303
8W-70-20
Z1 16BK
Z1 14BK
C360
Z1
14BK
S314
8W-70-22
Z1
14BK
C301
Z1
14BK
S307
8W-70-20
Z1
14BK
G300
8W-15-8,9

8W-63 POWER SEAT

DESCRIPTION AND OPERATION

POWER SEAT

Battery voltage for the power seat system is supplied by circuit A11 from the circuit breaker in cavity 1 of the fuse block. Circuit A11 is HOT at all times and connects to circuit F35. Circuit F35 supplies battery voltage to the power seat switch.

A BUS bar internal to the power seat switch connects the power from circuit F35 to the switches. Grounding for the seat system is supplied on circuit Z1.

The motors located under the seat are protected by circuit breakers wired in with the motors. Each motor has its own circuit breaker.

When the operator selects the FRONT VERTICAL UP function, power is passed on the F35 circuit through the closed contacts in the switch to the P19 circuit. The P19 circuit connects to the motor. Ground is provided on the P21 circuit back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For FRONT VERTICAL DOWN function the circuits are reversed. P21 is the feed and P19 is the ground.

When the operator selects the SEAT FORWARD function, power is passed on the F35 circuit through the closed contacts in the switch to the P15 circuit. The P15 circuit connects to the motor. Ground is provided on the P17 circuit back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For SEAT REARWARD function the circuits are reversed. P17 is the feed and P15 is the ground.

When the operator selects the REAR VERTICAL UP function, power is passed on the F35 circuit through the closed contacts in the switch to the P11 circuit. The P11 circuit connects to the motor. Ground is provided on the P13 circuit back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For REAR VERTICAL DOWN function the circuits are reversed. P13 is the feed and P11 is the ground.

When the operator selects the SEAT UP function power is passed on the F35 circuit through the closed contacts in the switch to the P11 and P19 circuits. The P11 circuit connects to the LEFT REAR VERTICAL motor, and P19 connects to the front LEFT FRONT VERTICAL motor. Ground is provided on the P13 and P21 circuits back to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

For SEAT DOWN function the circuits are reversed. P13 and P21 circuits are the feeds and P11 and P19 are the grounds.

HELPFUL INFORMATION

Check the 30 amp circuit breaker in located in cavity 1 of the fuse block

SCHEMATICS AND DIAGRAMS

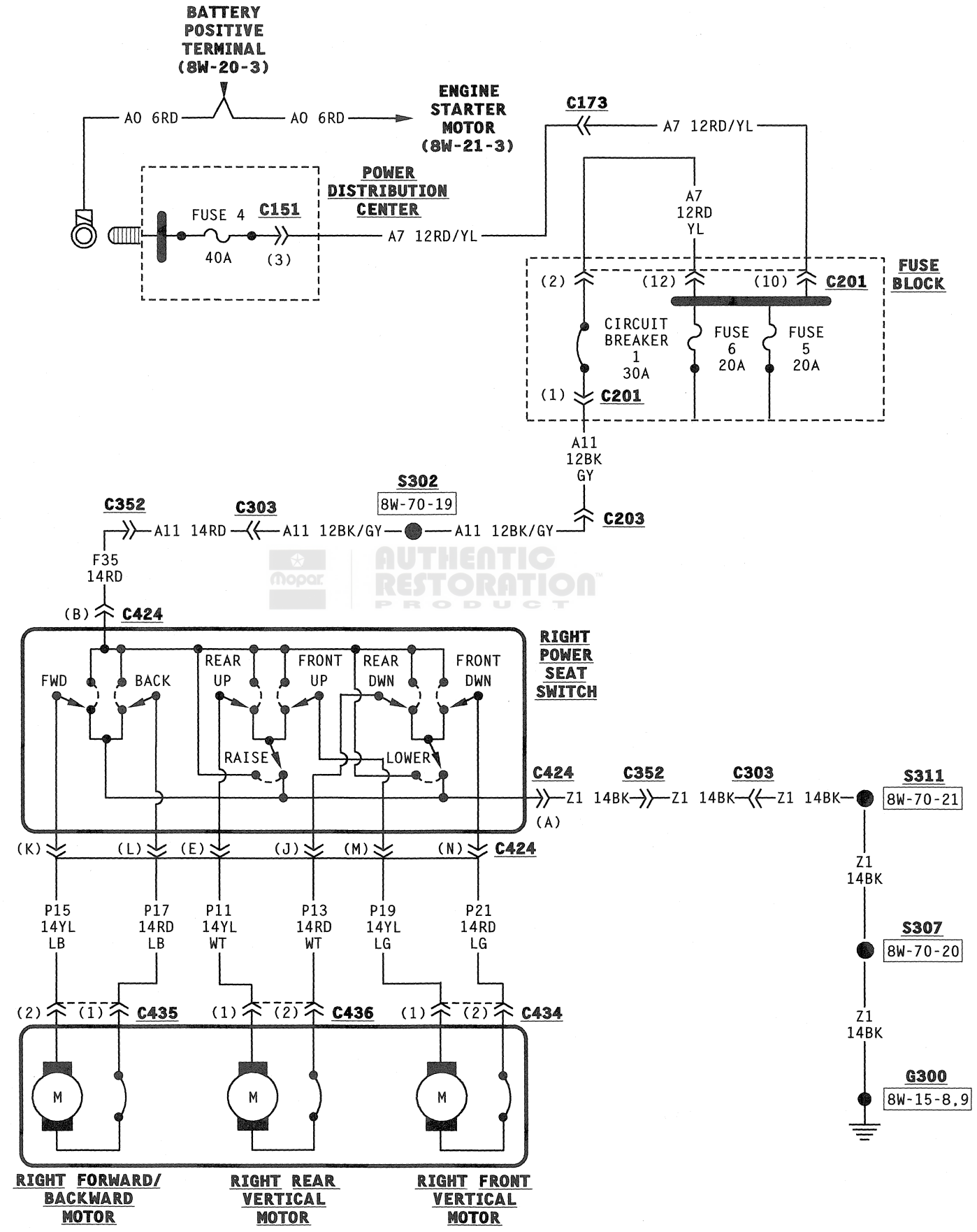
WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

DIAGRAM INDEX

Component	Page
Circuit Breaker 1	8W-63-3
Fuse 5	8W-63-3
Fuse 6	8W-63-3
Fuse 4 (PDC)	8W-63-3
Right Forward/Backward Motor	8W-63-3
Right Front Vertical Motor	8W-63-3
Right Power Seat Switch	8W-63-3
Right Rear Vertical Motor	8W-63-3

Mopar AUTHENTIC RESTORATION PRODUCT



Mopar AUTHENTIC RESTORATION PRODUCT

8W-70 SPLICE INFORMATION

DESCRIPTION AND OPERATION

INTRODUCTION

This section identifies all splices in the wiring diagrams. It also shows the splices in their entirety. All circuits that are part of the splices are shown, and the systems they affect are referenced. For viewing the location of each splice in the vehicle, refer to Section 8W-95.

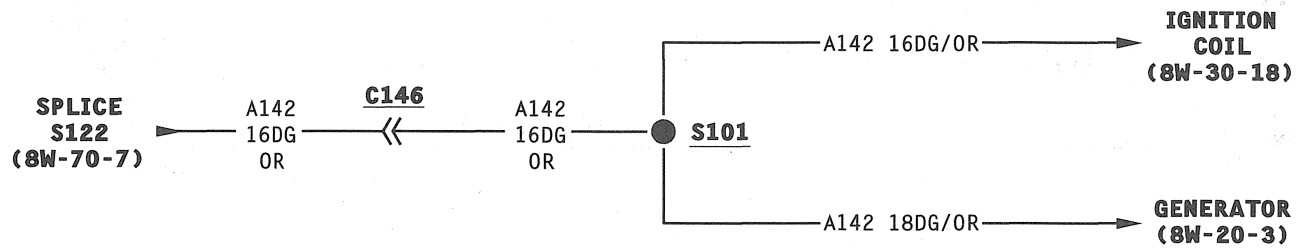
Mopar AUTHENTIC RESTORATION PRODUCT

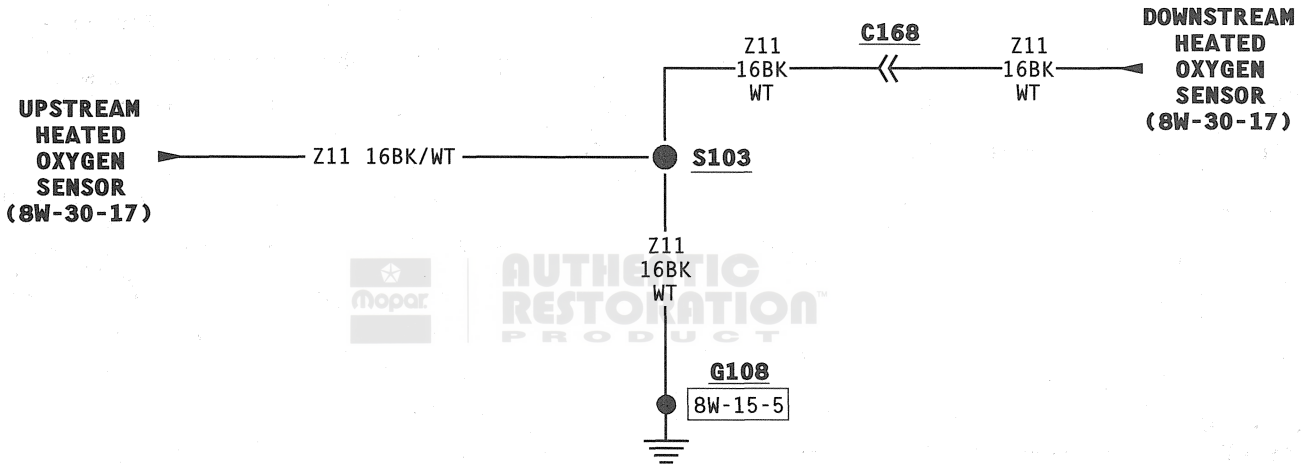
DIAGRAM INDEX

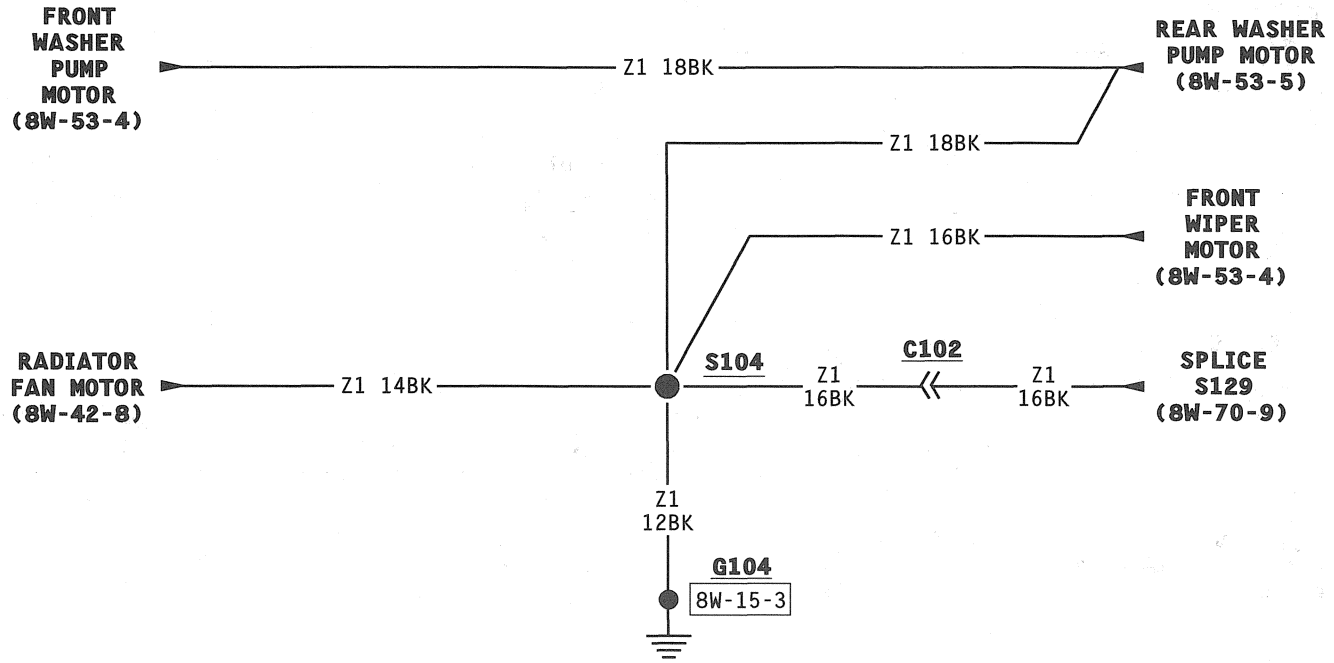
Component	Page
S101	8W-70-3
S103	8W-70-3
S104	8W-70-3
S105	8W-70-4
S107	8W-70-4
S108	8W-70-4
S109	8W-70-4
S110	8W-70-5
S111	8W-70-5
S112	8W-70-5
S114	8W-70-5
S115	8W-70-6
S116	8W-70-6
S118	8W-70-6
S119	8W-70-7
S120	8W-70-7
S121	8W-70-7
S122	8W-70-7
S123	8W-70-8
S124	8W-70-8
S128	8W-70-9
S129	8W-70-9
S130	8W-70-9
S131	8W-70-10
S201	8W-70-10
S202	8W-70-10
S203	8W-70-10
S204	8W-70-11
S205	8W-70-11
S206	8W-70-12
S207	8W-70-12
S208	8W-70-13
S209	8W-70-13

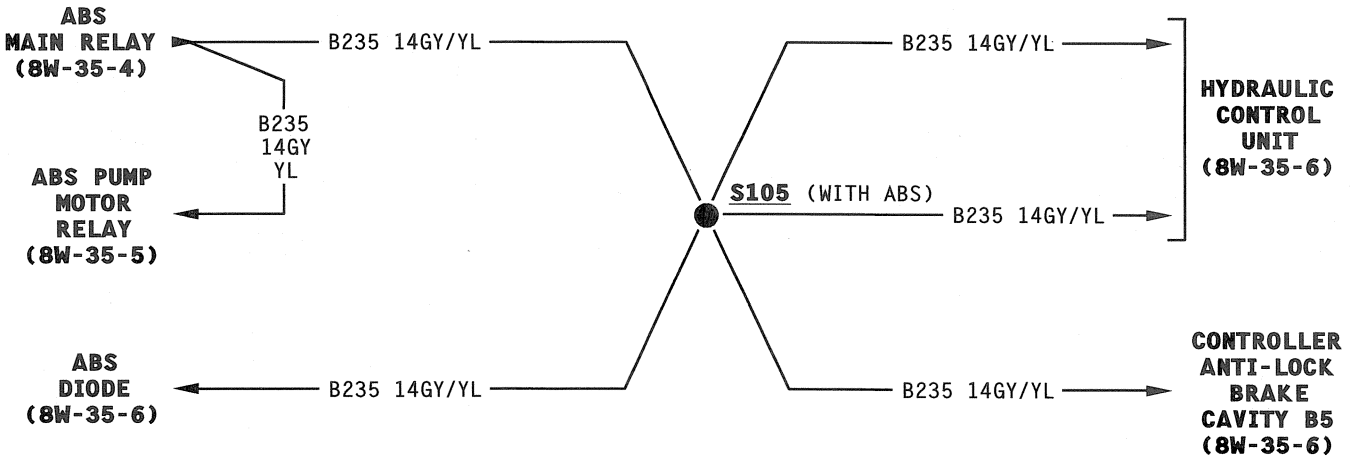
Component	Page
S210	8W-70-13
S211	8W-70-13
S212	8W-70-14
S213	8W-70-14
S214	8W-70-14
S215	8W-70-15
S216	8W-70-15
S217	8W-70-15
S218	8W-70-16
S219	8W-70-16
S220	8W-70-17
S221	8W-70-17
S222	8W-70-18
S223	8W-70-19
S301	8W-70-19
S302	8W-70-19
S303	8W-70-20
S304	8W-70-20
S307	8W-70-20
S309	8W-70-21
S310	8W-70-21
S311	8W-70-21
S312	8W-70-22
S313	8W-70-22
S314	8W-70-22
S315	8W-70-22
S317	8W-70-23
S318	8W-70-23
S319	8W-70-23
S401	8W-70-24
S402	8W-70-24
S403	8W-70-24
S404	8W-70-24

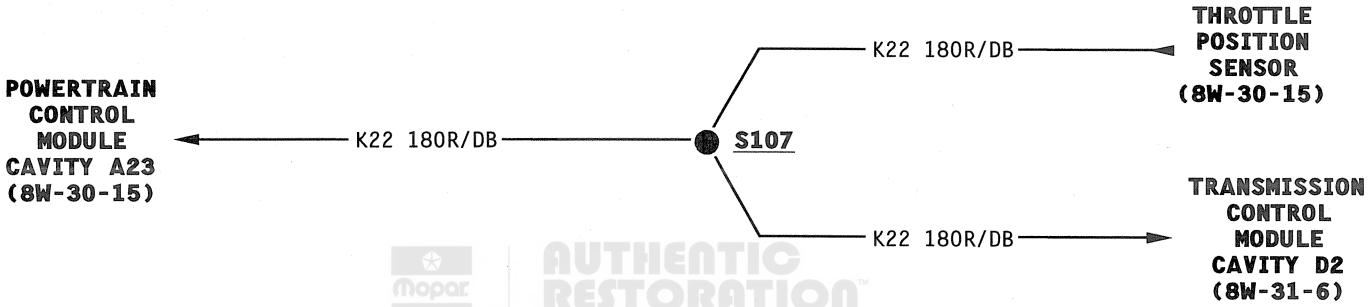
Mopar AUTHENTIC RESTORATION


SPLICE
S122
(8W-70-7)
A142
16DG
OR
C146
A142
16DG
OR
S101
A142 16DG/OR
IGNITION
COIL
(8W-30-18)
A142 18DG/OR
GENERATOR
(8W-20-3)

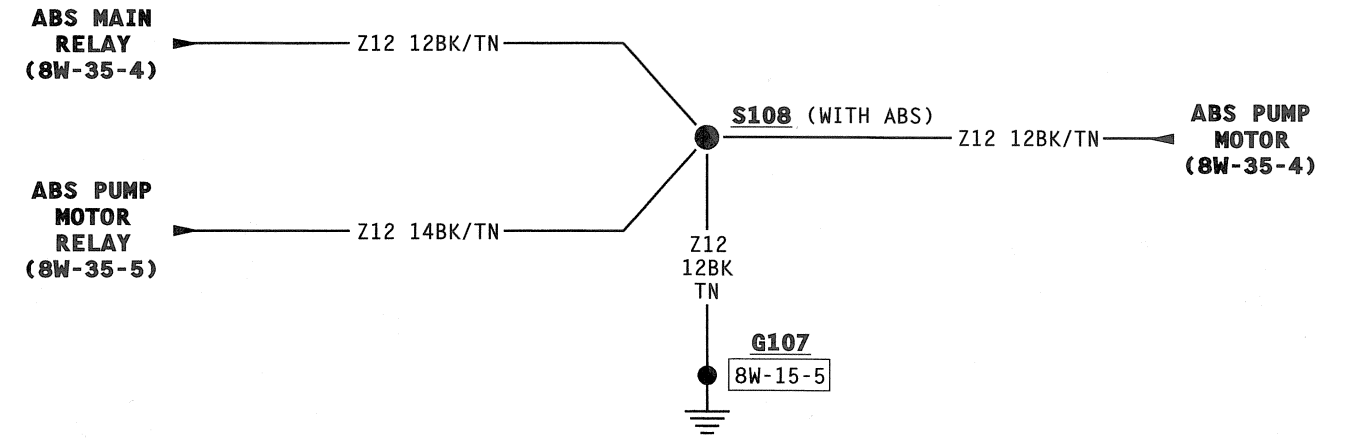

UPSTREAM
HEATED
OXYGEN
SENSOR
(8W-30-17)
Z11 16BK/WT
S103
Z11
16BK
WT
C168
Z11
16BK
WT
DOWNSTREAM
HEATED
OXYGEN
SENSOR
(8W-30-17)
Z11
16BK
WT
G108
8W-15-5

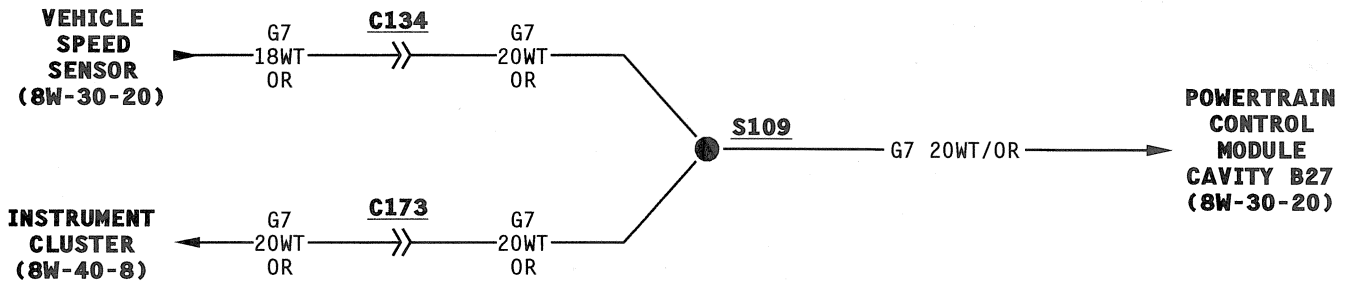

FRONT
WASHER
PUMP
MOTOR
(8W-53-4)
Z1 18BK
REAR WASHER
PUMP MOTOR
(8W-53-5)
Z1 18BK
Z1 16BK
FRONT
WIPER
MOTOR
(8W-53-4)
RADIATOR
FAN MOTOR
(8W-42-8)
Z1 14BK
S104
C102
Z1
16BK
Z1
16BK
SPLICE
S129
(8W-70-9)
Z1
12BK
G104
8W-15-3

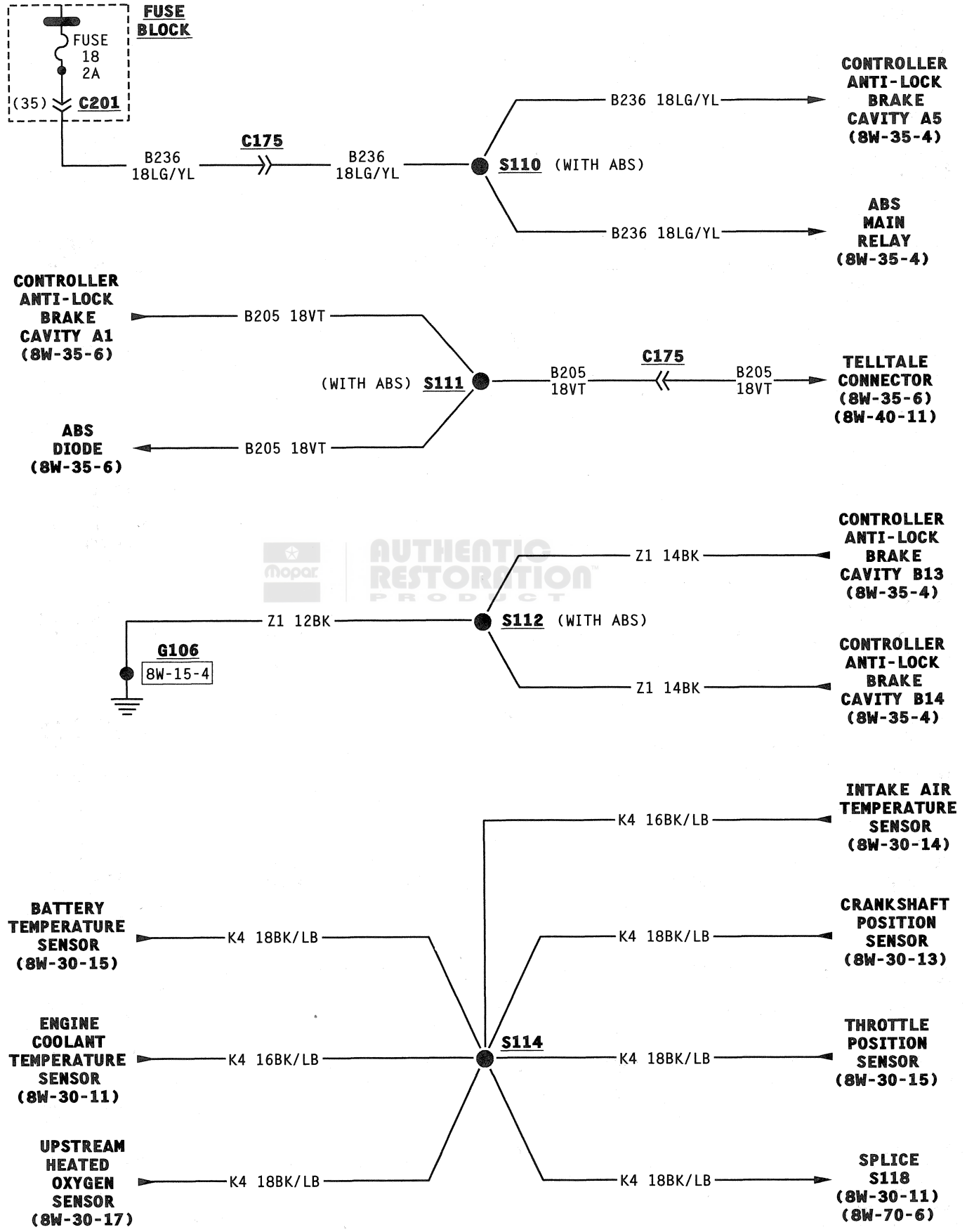




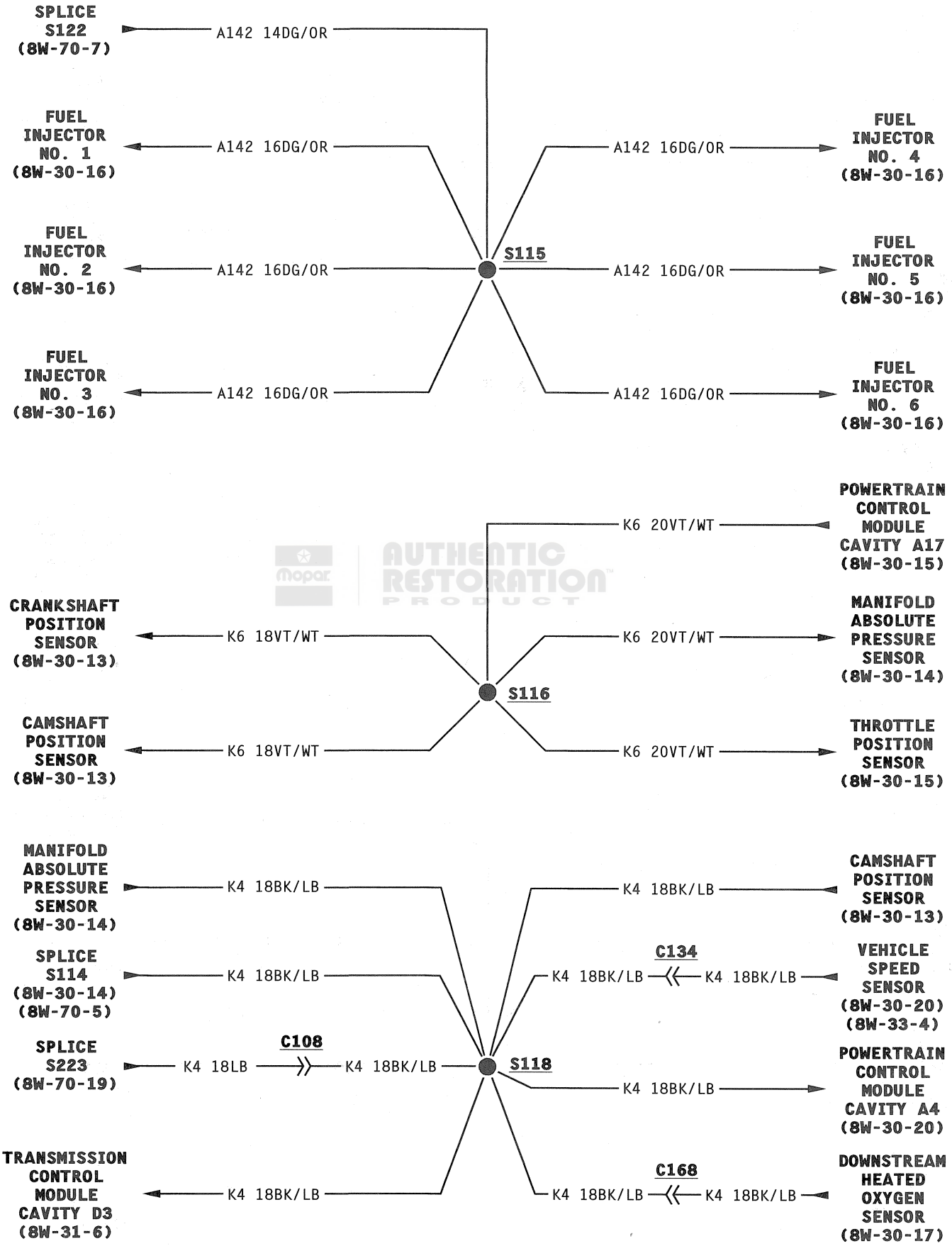
Mopar AUTHENTIC RESTORATION PRODUCT



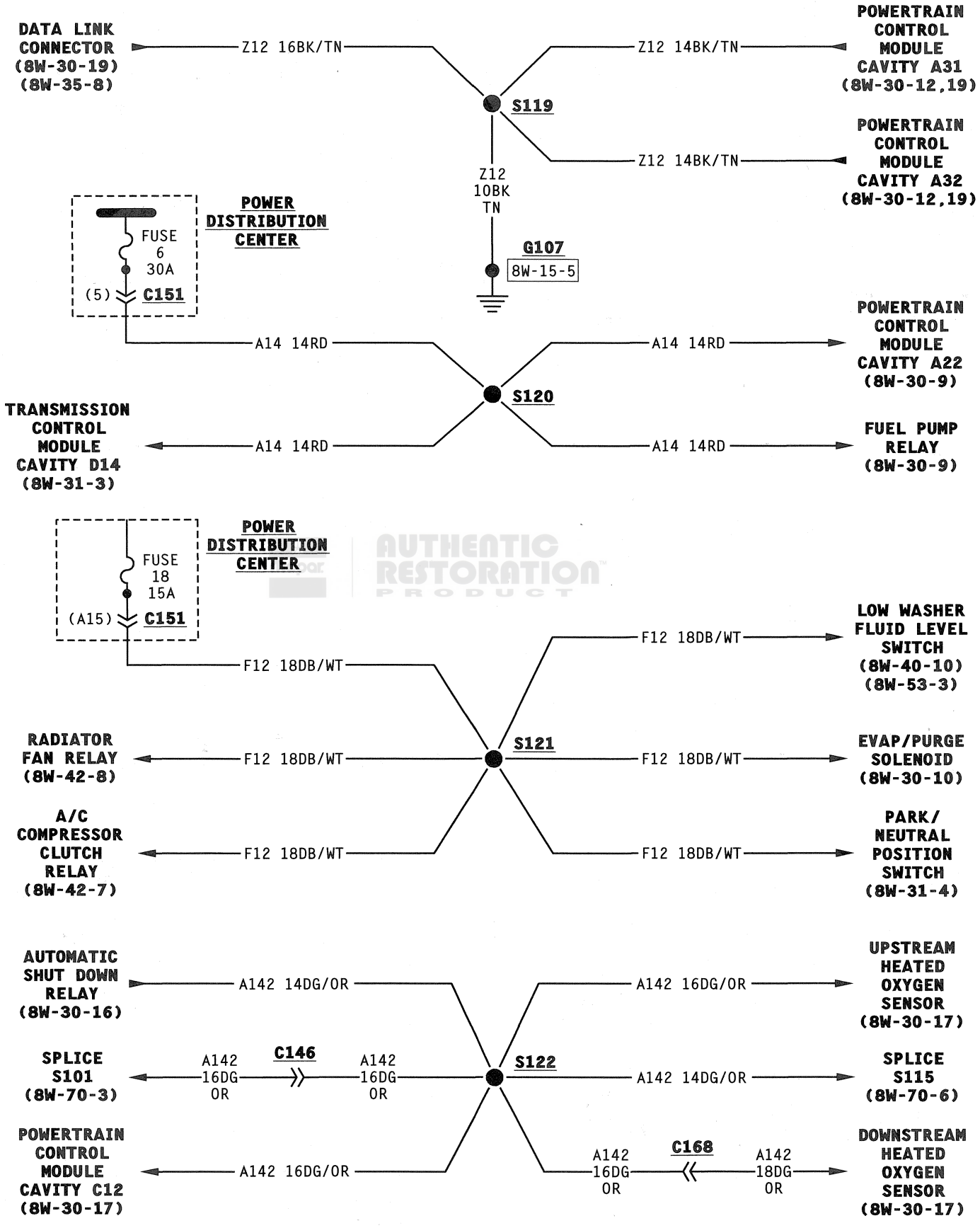




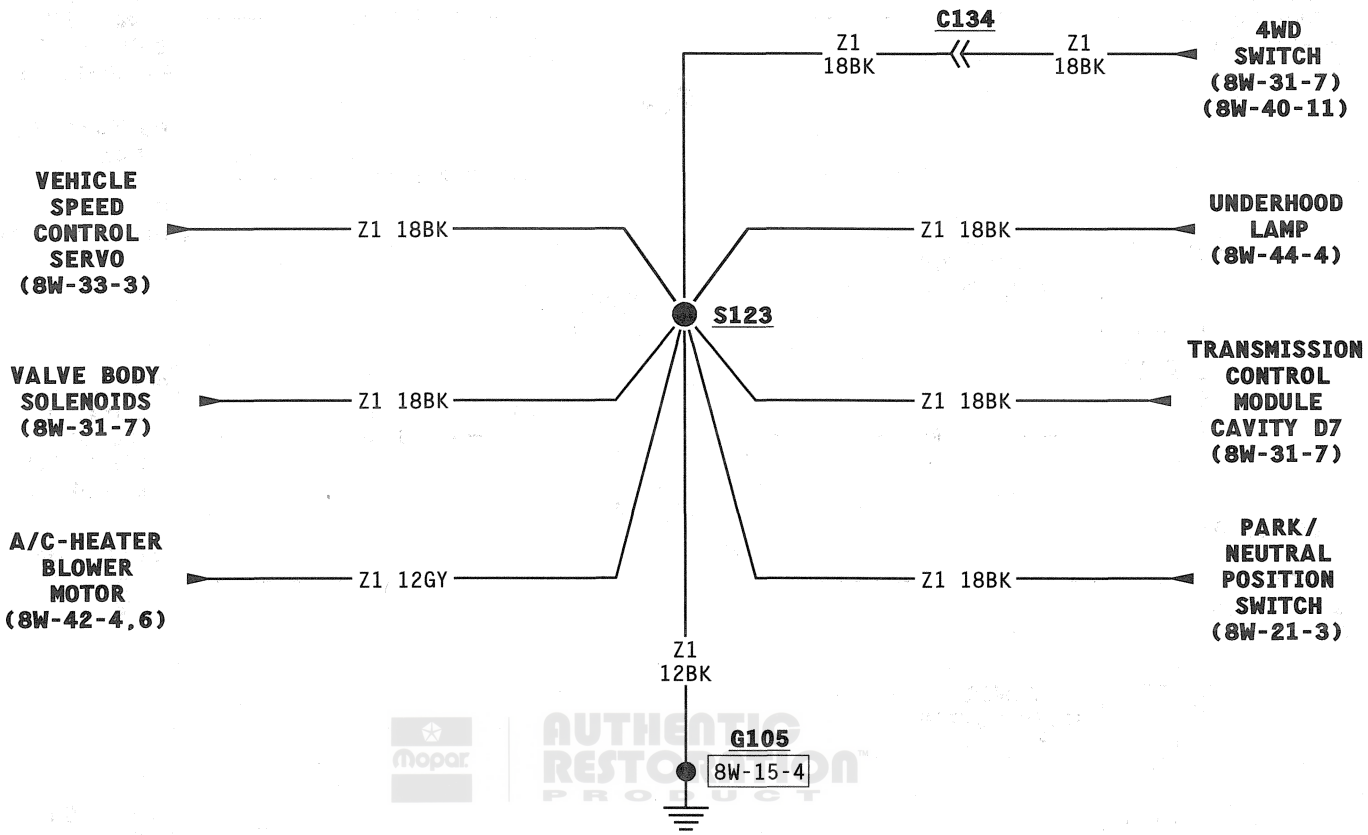
Mopar AUTHENTIC RESTORATION PRODUCT

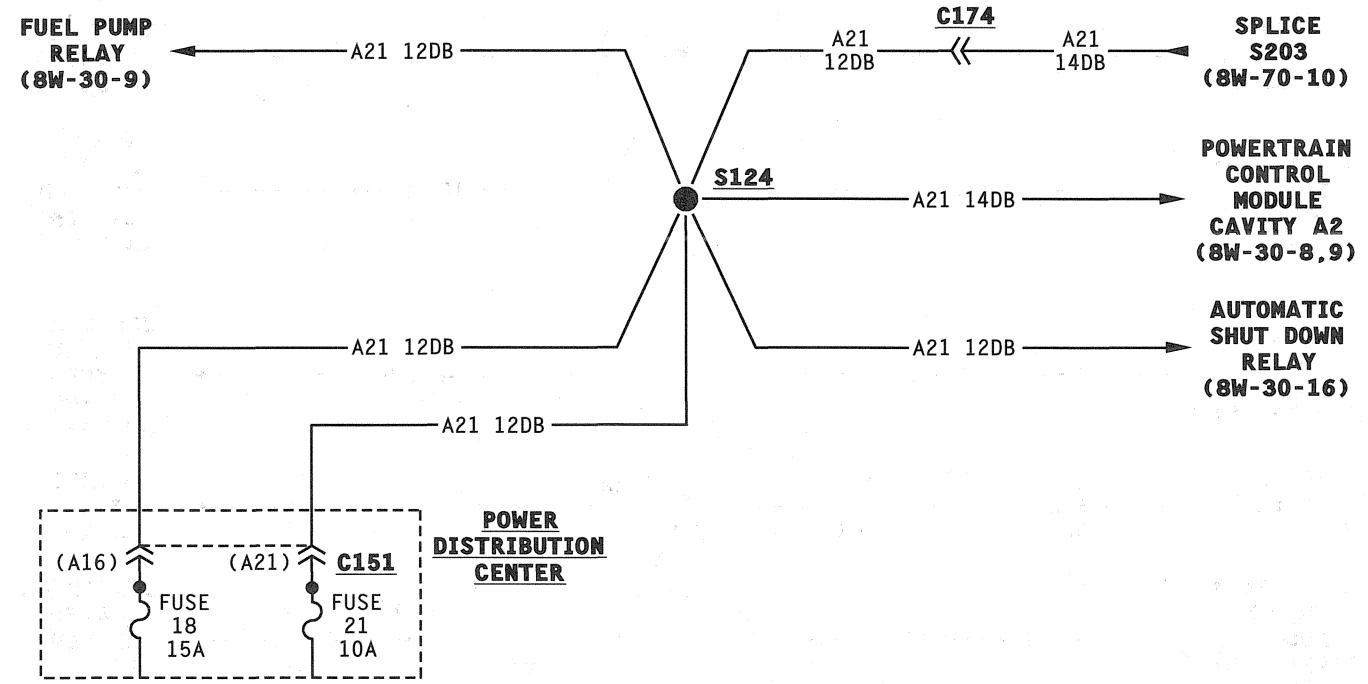


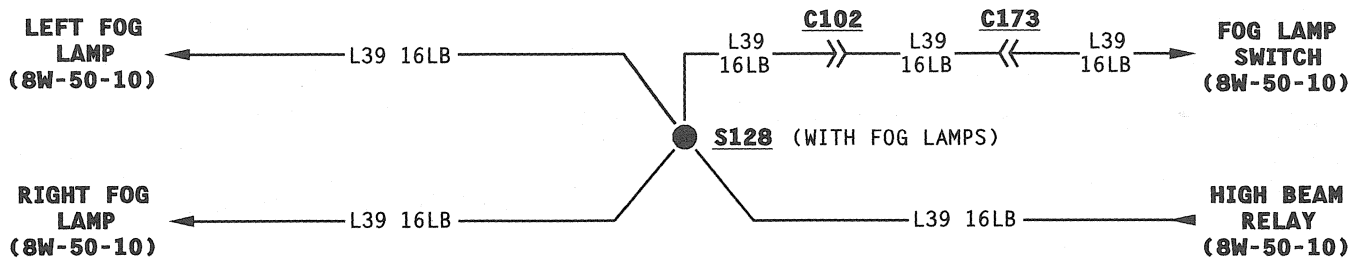
Mopar AUTHENTIC RESTORATION PRODUCT

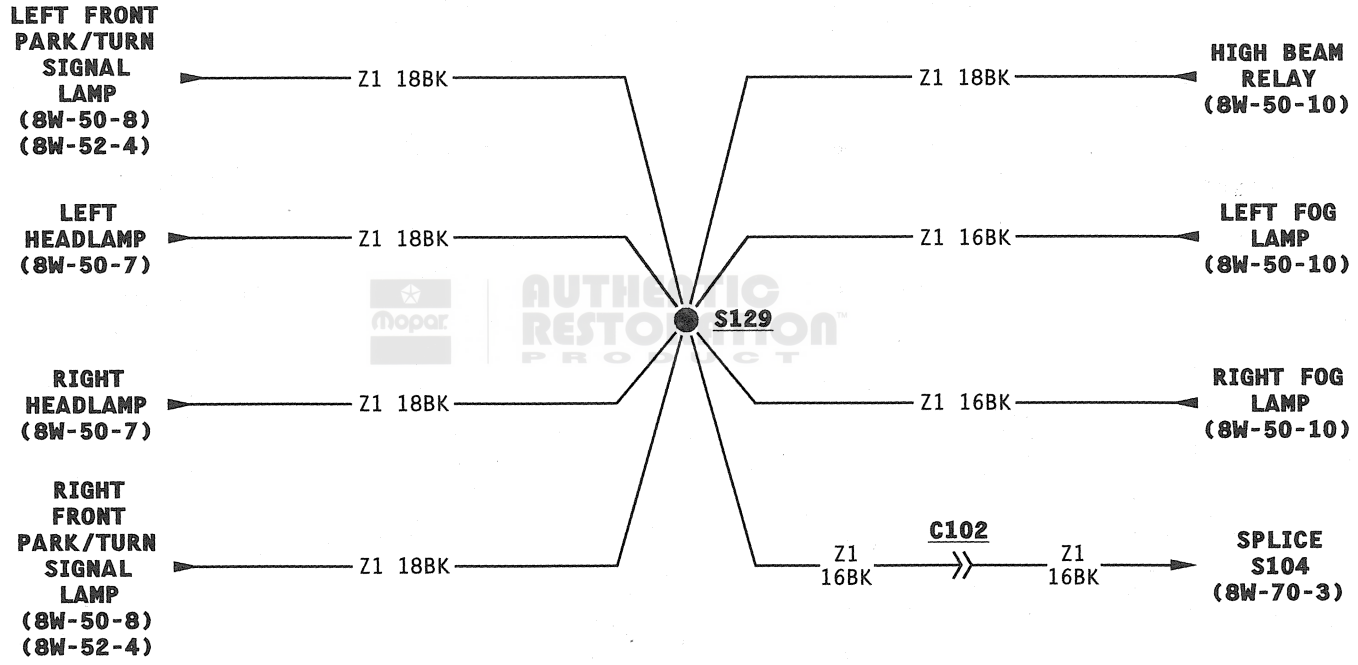


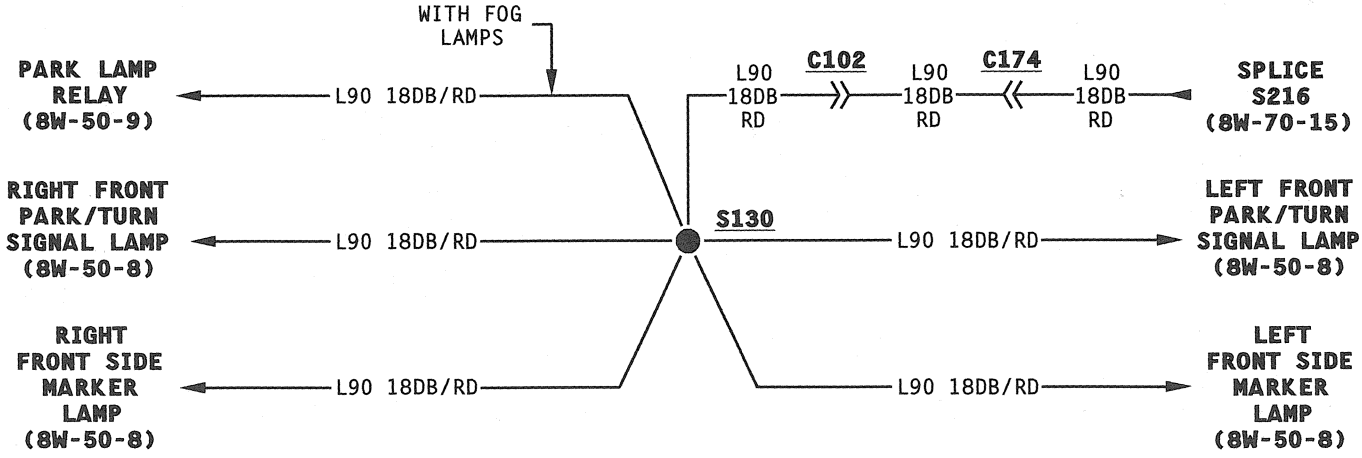
AUTHENTIC RESTORATION PRODUCT

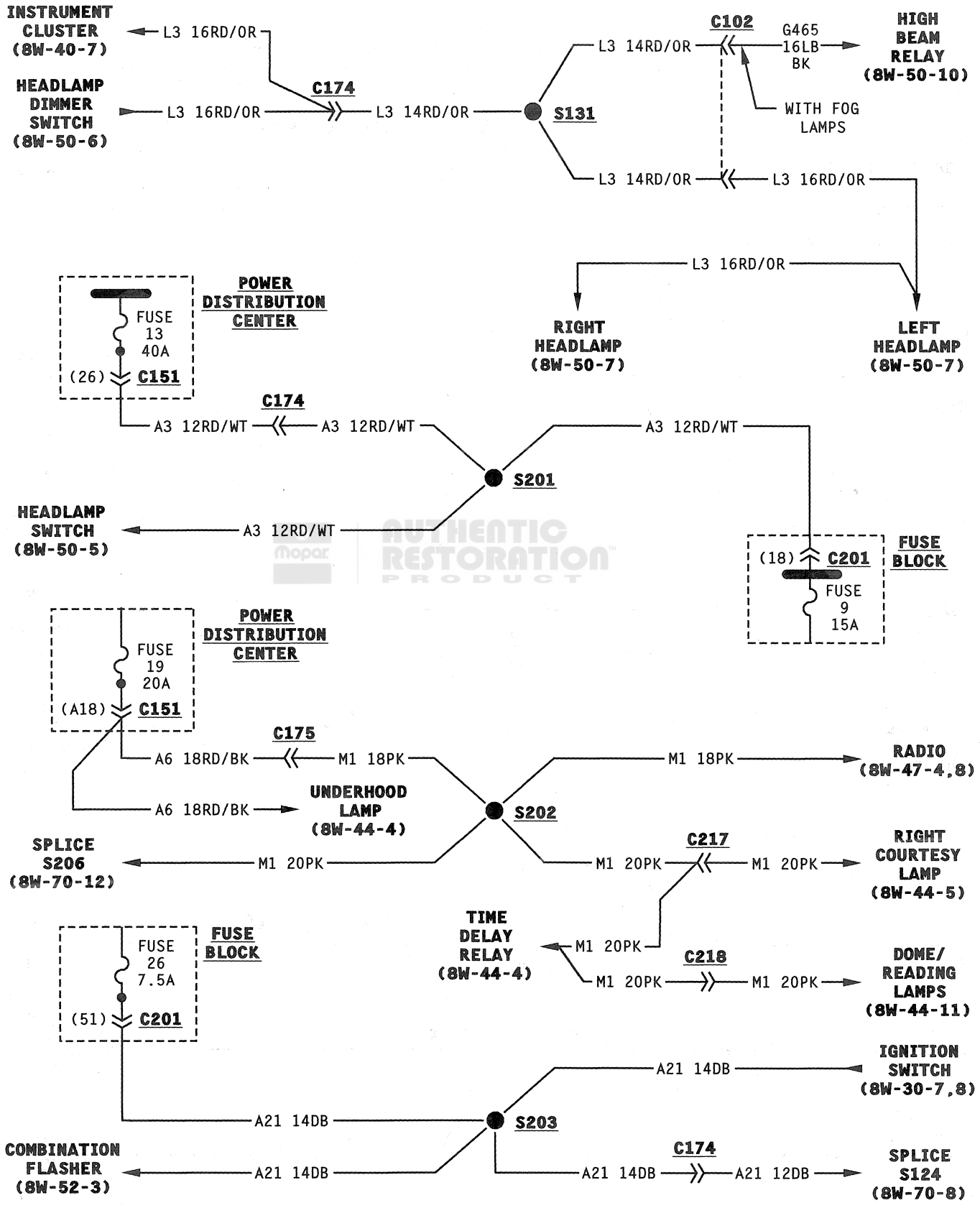

C134
Z1 18BK
Z1 18BK
4WD SWITCH (8W-31-7) (8W-40-11)
VEHICLE SPEED CONTROL SERVO (8W-33-3)
Z1 18BK
Z1 18BK
UNDERHOOD LAMP (8W-44-4)
S123
VALVE BODY SOLENOIDS (8W-31-7)
Z1 18BK
Z1 18BK
TRANSMISSION CONTROL MODULE CAVITY D7 (8W-31-7)
A/C-HEATER BLOWER MOTOR (8W-42-4,6)
Z1 12GY
Z1 18BK
PARK/ NEUTRAL POSITION SWITCH (8W-21-3)
Z1 12BK
G105
8W-15-4


FUEL PUMP RELAY (8W-30-9)
A21 12DB
C174
A21 12DB
A21 14DB
SPLICE S203 (8W-70-10)
S124
A21 14DB
POWERTRAIN CONTROL MODULE CAVITY A2 (8W-30-8,9)
A21 12DB
A21 12DB
AUTOMATIC SHUT DOWN RELAY (8W-30-16)
A21 12DB
POWER DISTRIBUTION CENTER
(A16)
(A21)
C151
FUSE 18 15A
FUSE 21 10A

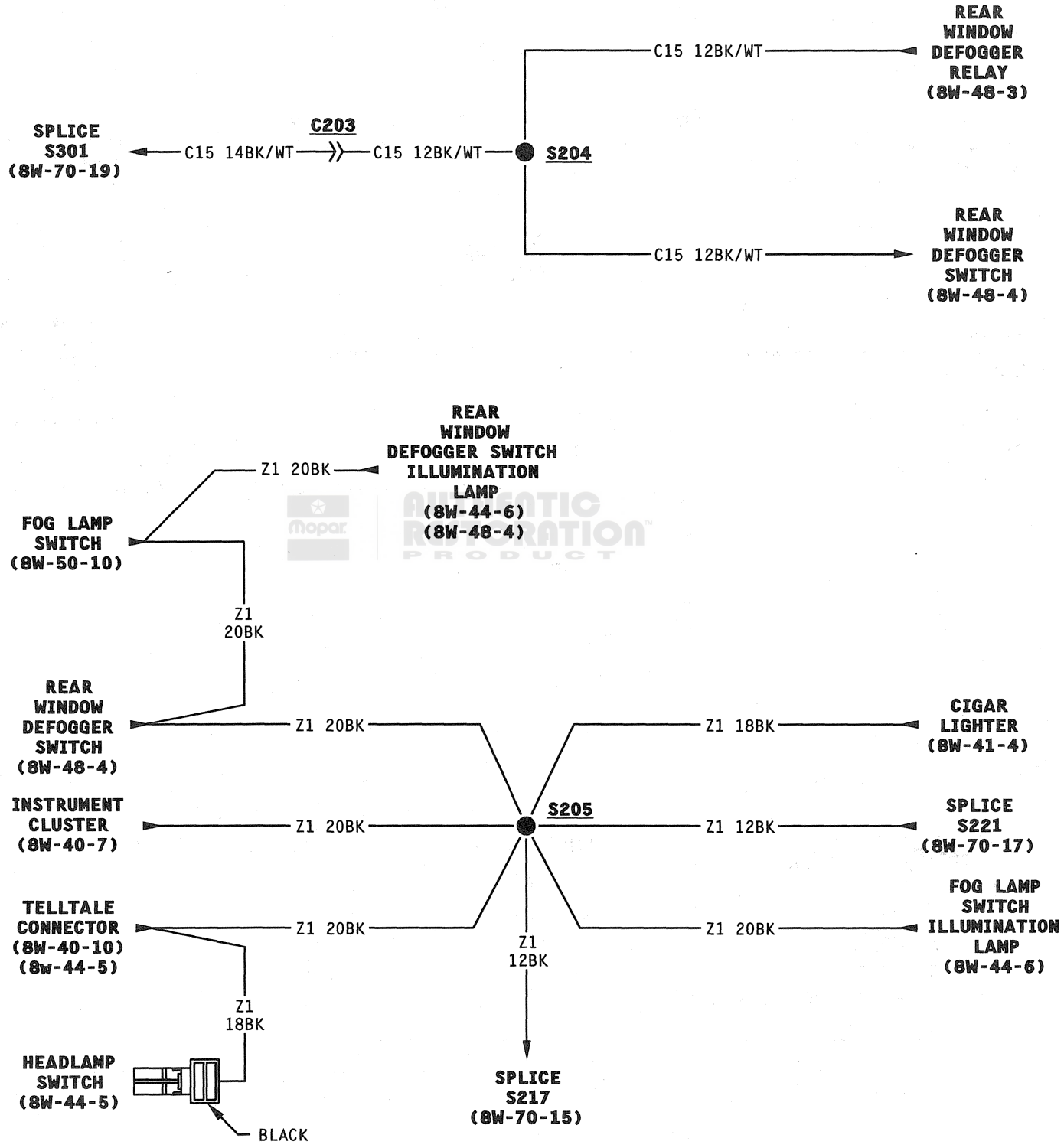

LEFT FOG LAMP (8W-50-10)
L39 16LB
C102
L39 16LB
L39 16LB
C173
L39 16LB
FOG LAMP SWITCH (8W-50-10)
S128 (WITH FOG LAMPS)
RIGHT FOG LAMP (8W-50-10)
L39 16LB
L39 16LB
HIGH BEAM RELAY (8W-50-10)

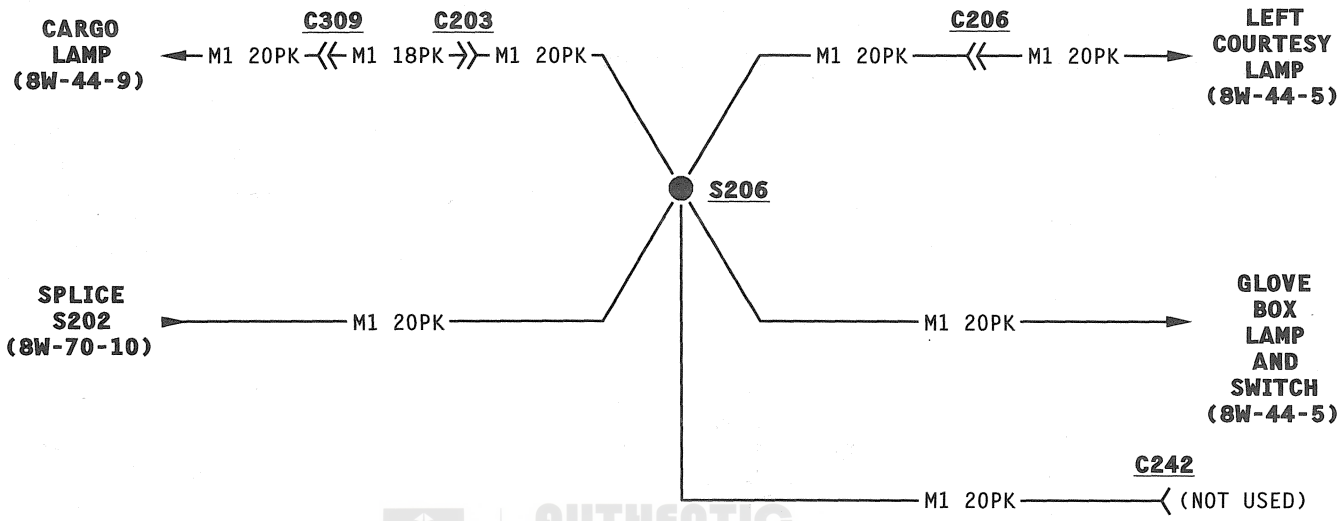

LEFT FRONT PARK/TURN SIGNAL LAMP (8W-50-8) (8W-52-4)
Z1 18BK
Z1 18BK
HIGH BEAM RELAY (8W-50-10)
LEFT HEADLAMP (8W-50-7)
Z1 18BK
Z1 16BK
LEFT FOG LAMP (8W-50-10)
S129
RIGHT HEADLAMP (8W-50-7)
Z1 18BK
Z1 16BK
RIGHT FOG LAMP (8W-50-10)
RIGHT FRONT PARK/TURN SIGNAL LAMP (8W-50-8) (8W-52-4)
Z1 18BK
C102
Z1 16BK
Z1 16BK
SPLICE S104 (8W-70-3)

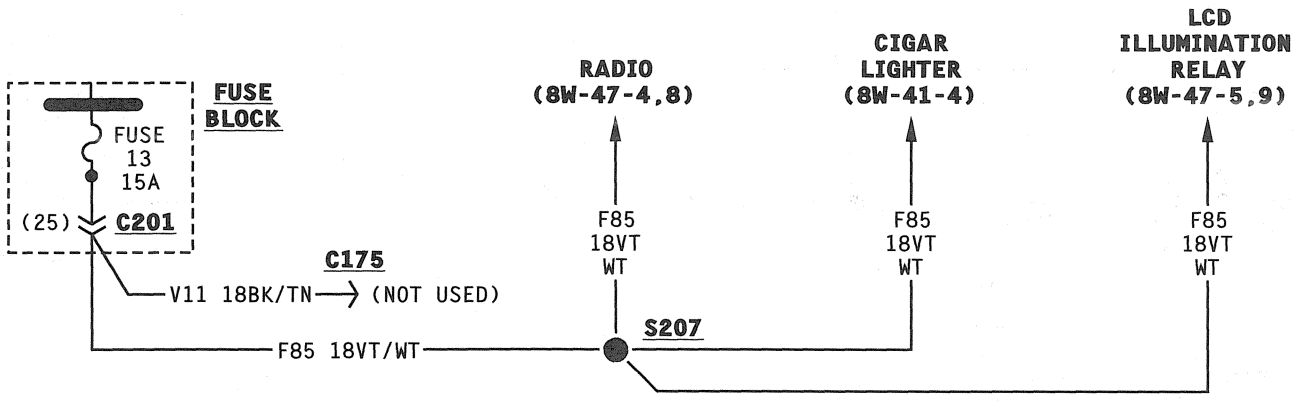

WITH FOG LAMPS
PARK LAMP RELAY (8W-50-9)
L90 18DB/RD
L90 18DB RD
C102
L90 18DB RD
C174
L90 18DB RD
SPLICE S216 (8W-70-15)
RIGHT FRONT PARK/TURN SIGNAL LAMP (8W-50-8)
L90 18DB/RD
S130
L90 18DB/RD
LEFT FRONT PARK/TURN SIGNAL LAMP (8W-50-8)
RIGHT FRONT SIDE MARKER LAMP (8W-50-8)
L90 18DB/RD
L90 18DB/RD
LEFT FRONT SIDE MARKER LAMP (8W-50-8)

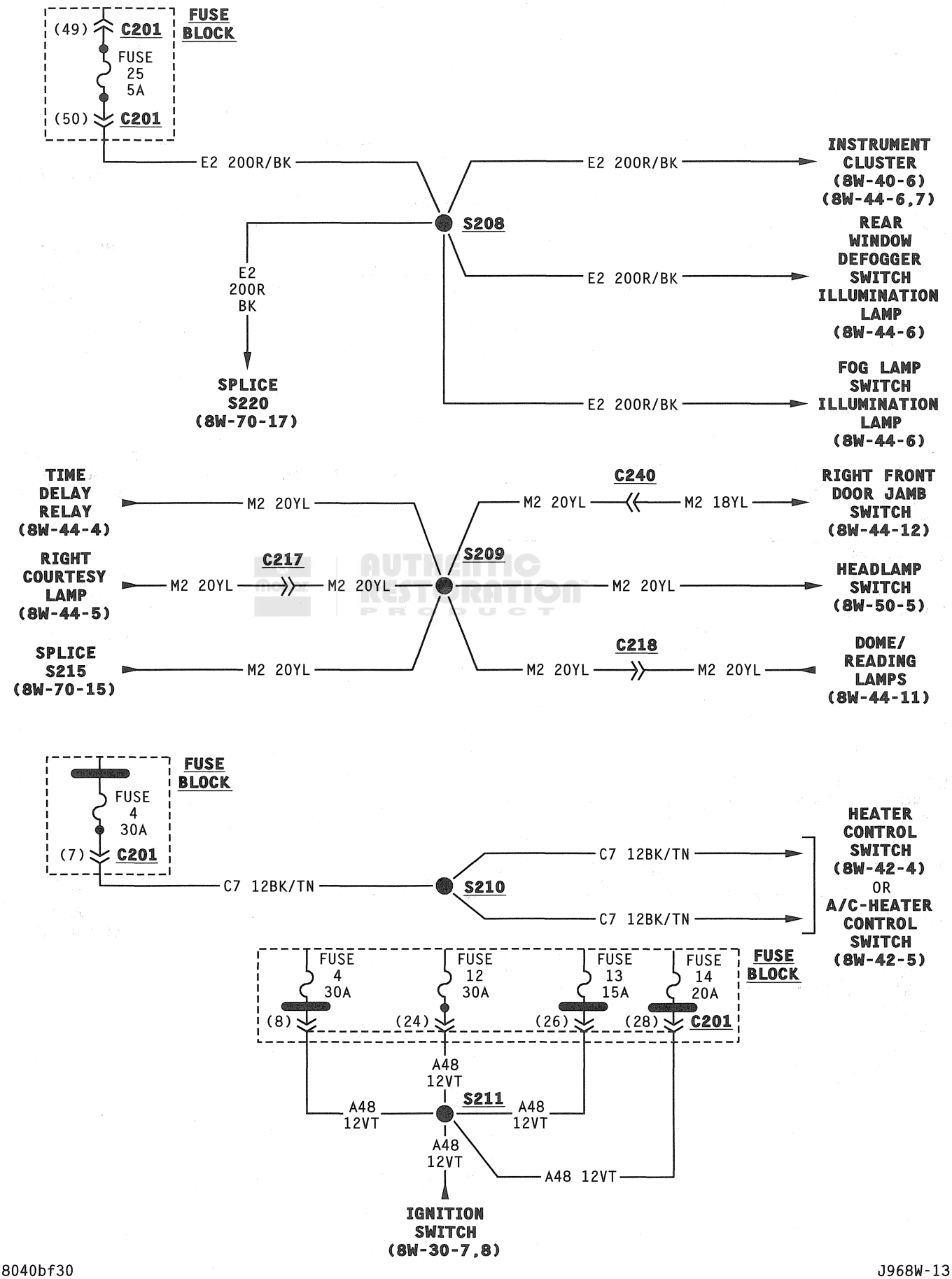


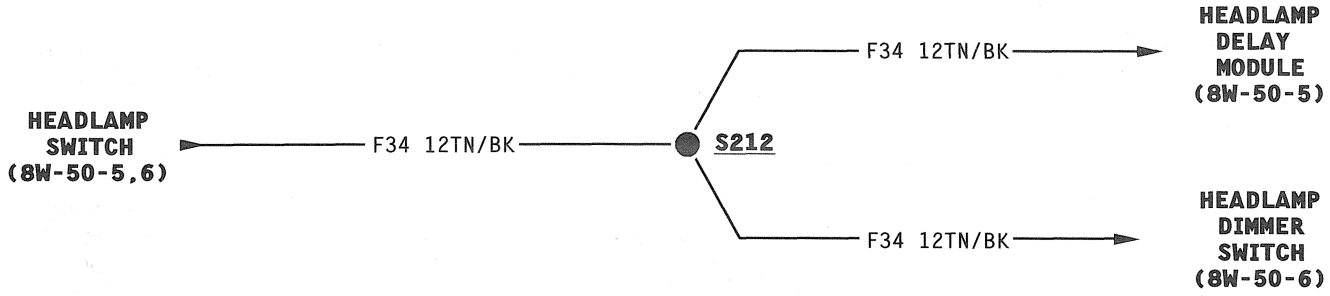
Mopar AUTHENTIC RESTORATION PRODUCT

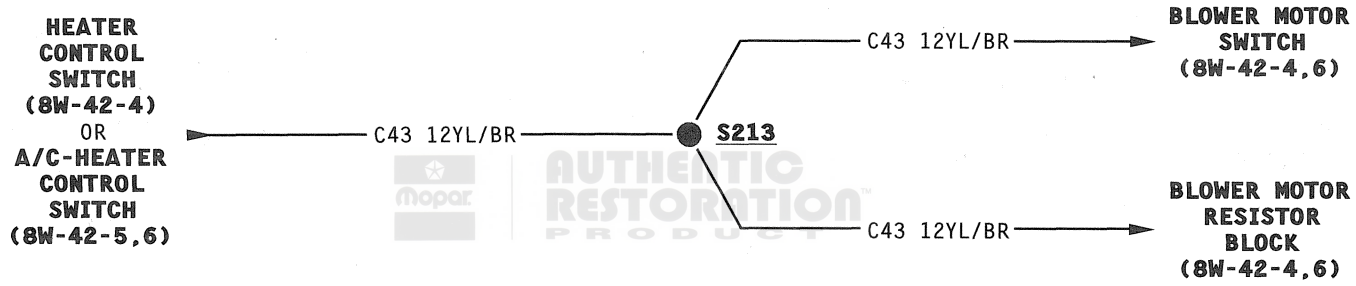

REAR WINDOW DEFOGGER RELAY (8W-48-3)
C15 12BK/WT
SPLICE S301 (8W-70-19)
C203
C15 14BK/WT
C15 12BK/WT
S204
REAR WINDOW DEFOGGER SWITCH (8W-48-4)
C15 12BK/WT
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6) (8W-48-4)
Z1 20BK
FOG LAMP SWITCH (8W-50-10)
Z1 20BK
REAR WINDOW DEFOGGER SWITCH (8W-48-4)
Z1 20BK
Z1 18BK
CIGAR LIGHTER (8W-41-4)
INSTRUMENT CLUSTER (8W-40-7)
Z1 20BK
S205
Z1 12BK
SPLICE S221 (8W-70-17)
TELLTALE CONNECTOR (8W-40-10) (8w-44-5)
Z1 20BK
Z1 20BK
FOG LAMP SWITCH ILLUMINATION LAMP (8W-44-6)
Z1 12BK
Z1 18BK
HEADLAMP SWITCH (8W-44-5)
BLACK
SPLICE S217 (8W-70-15)

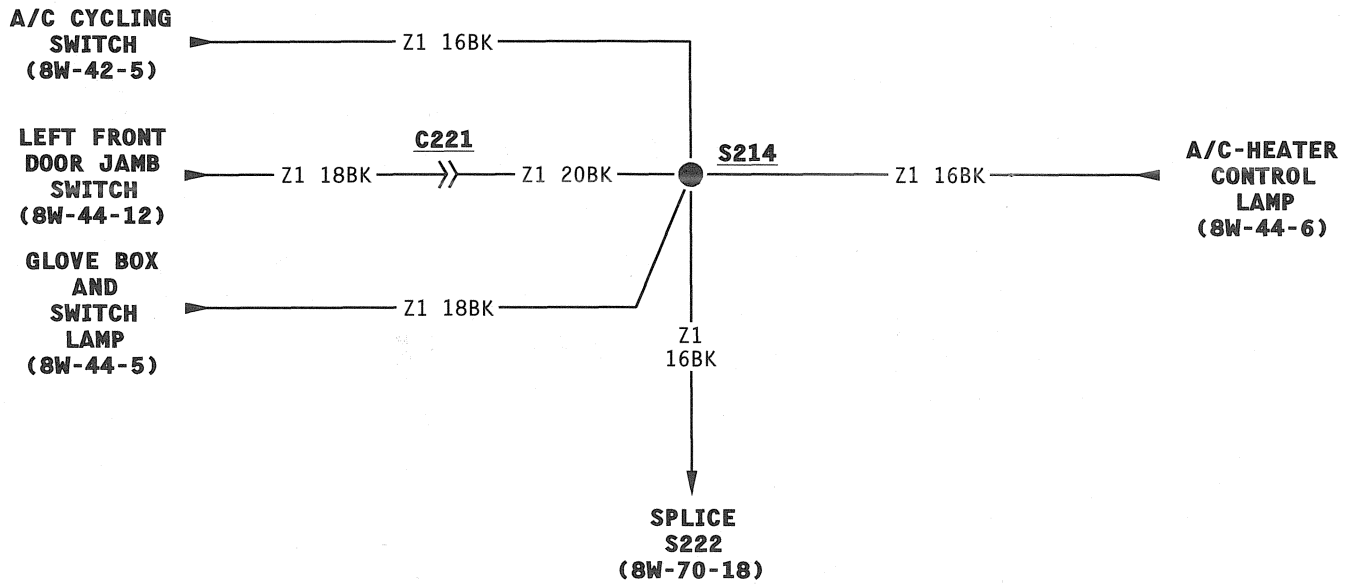

CARGO LAMP (8W-44-9)
C309
C203
M1 20PK
M1 18PK
M1 20PK
C206
M1 20PK
M1 20PK
LEFT COURTESY LAMP (8W-44-5)
S206
SPLICE S202 (8W-70-10)
M1 20PK
M1 20PK
GLOVE BOX LAMP AND SWITCH (8W-44-5)
C242
M1 20PK
(NOT USED)

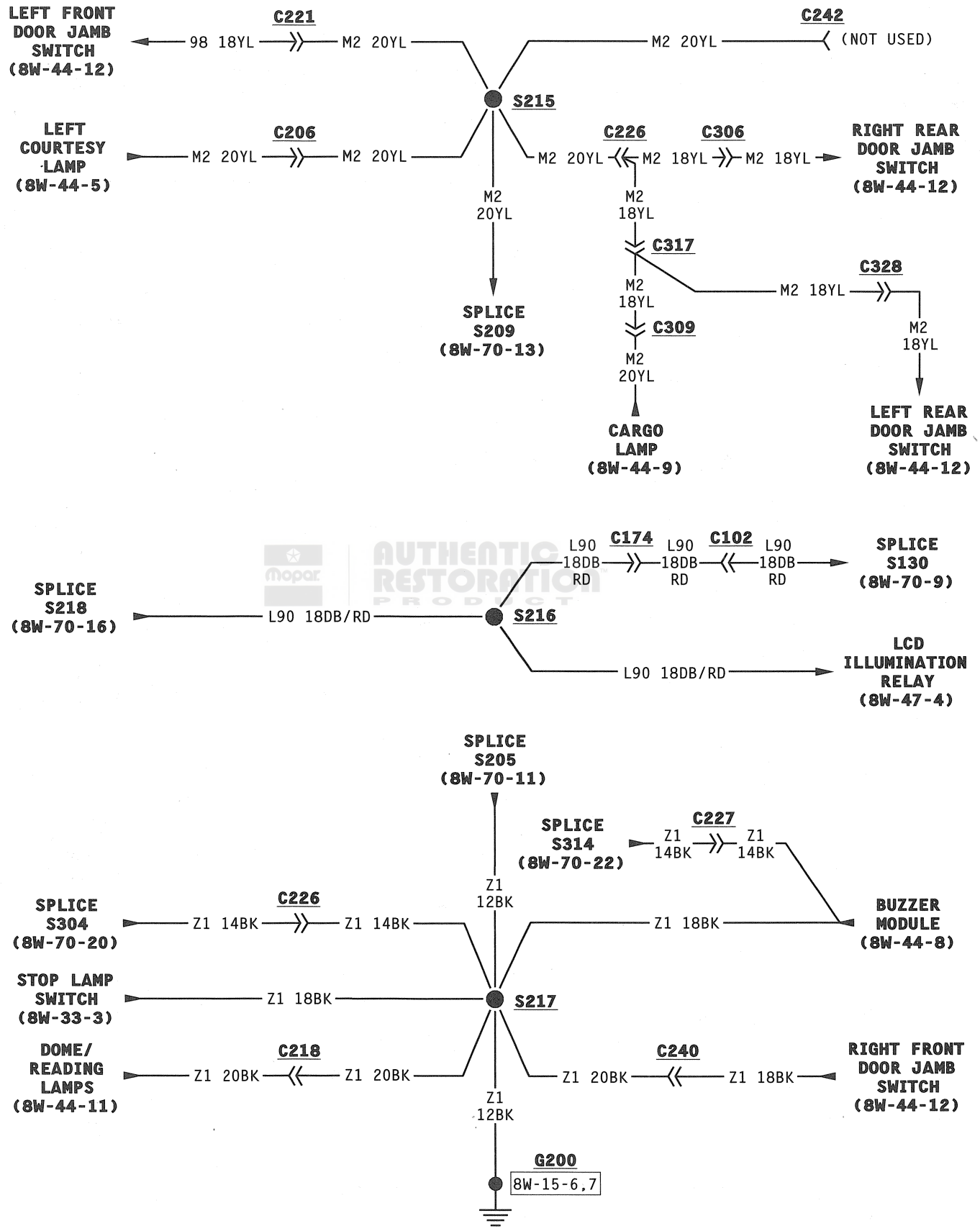

FUSE BLOCK
FUSE 13 15A
(25)
C201
C175
V11 18BK/TN
(NOT USED)
F85 18VT/WT
S207
RADIO (8W-47-4,8)
F85 18VT WT
CIGAR LIGHTER (8W-41-4)
F85 18VT WT
LCD ILLUMINATION RELAY (8W-47-5,9)
F85 18VT WT


FUSE BLOCK
(49) C201
FUSE 25 5A
(50) C201
E2 200R/BK
INSTRUMENT CLUSTER (8W-40-6) (8W-44-6,7)
S208
REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP (8W-44-6)
E2 200R BK
SPLICE S220 (8W-70-17)
FOG LAMP SWITCH ILLUMINATION LAMP (8W-44-6)
TIME DELAY RELAY (8W-44-4)
M2 20YL
C240
M2 18YL
RIGHT FRONT DOOR JAMB SWITCH (8W-44-12)
RIGHT COURTESY LAMP (8W-44-5)
C217
S209
HEADLAMP SWITCH (8W-50-5)
SPLICE S215 (8W-70-15)
C218
DOME/ READING LAMPS (8W-44-11)
FUSE BLOCK
FUSE 4 30A
(7) C201
C7 12BK/TN
S210
HEATER CONTROL SWITCH (8W-42-4) OR A/C-HEATER CONTROL SWITCH (8W-42-5)
FUSE 4 30A
FUSE 12 30A
FUSE 13 15A
FUSE 14 20A
(8)
(24)
(26)
(28) C201
FUSE BLOCK
A48 12VT
S211
IGNITION SWITCH (8W-30-7,8)

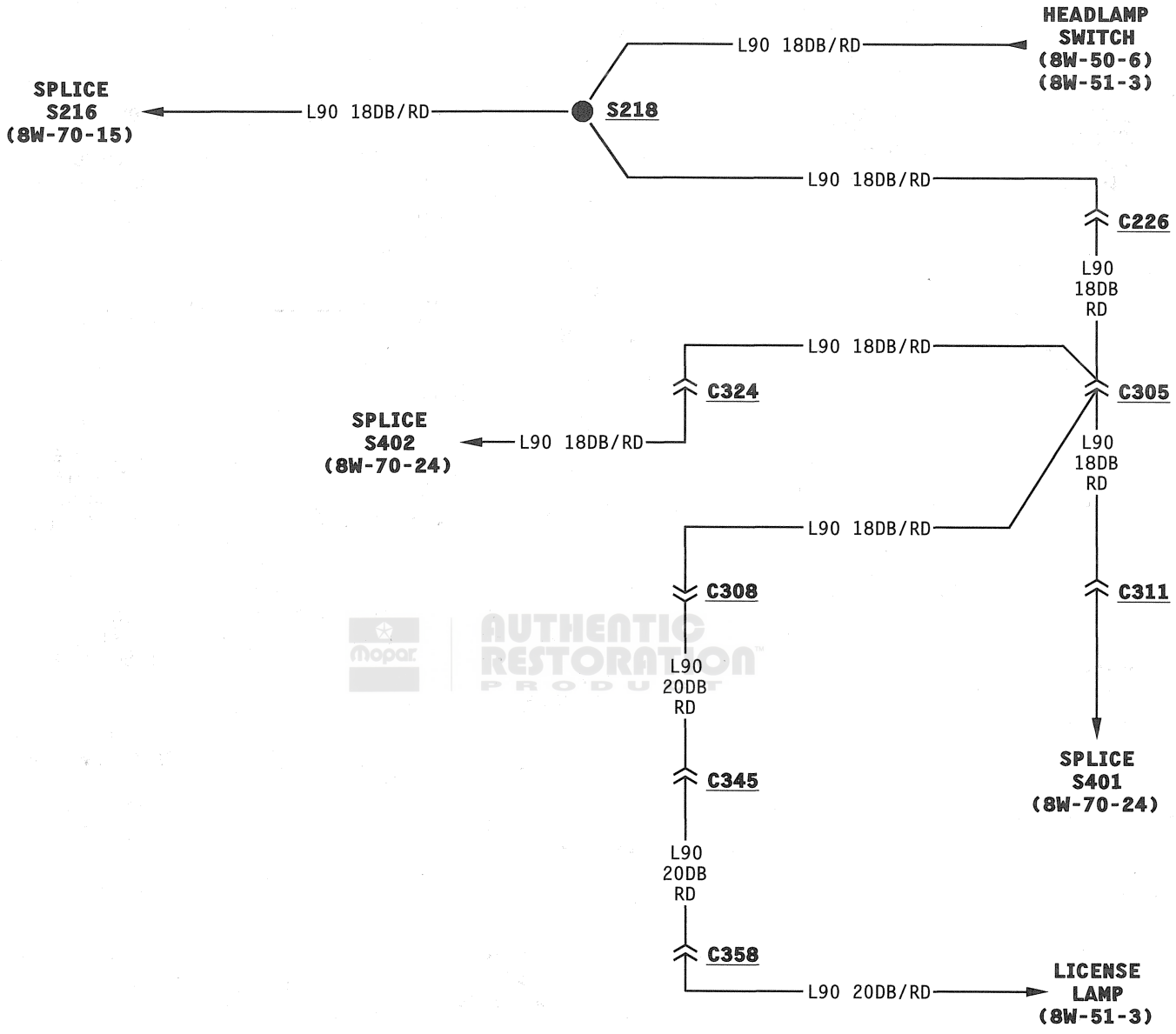

HEADLAMP SWITCH (8W-50-5,6)
F34 12TN/BK
S212
F34 12TN/BK
HEADLAMP DELAY MODULE (8W-50-5)
F34 12TN/BK
HEADLAMP DIMMER SWITCH (8W-50-6)

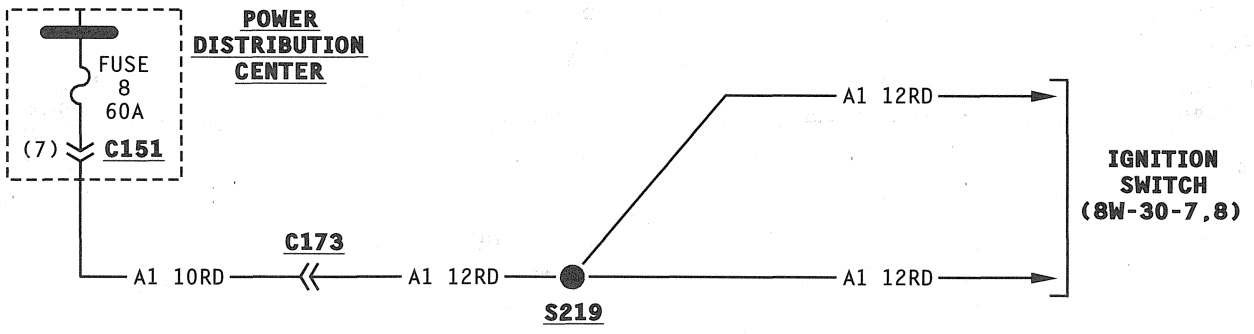

HEATER CONTROL SWITCH (8W-42-4)
OR
A/C-HEATER CONTROL SWITCH (8W-42-5,6)
C43 12YL/BR
S213
C43 12YL/BR
BLOWER MOTOR SWITCH (8W-42-4,6)
C43 12YL/BR
BLOWER MOTOR RESISTOR BLOCK (8W-42-4,6)

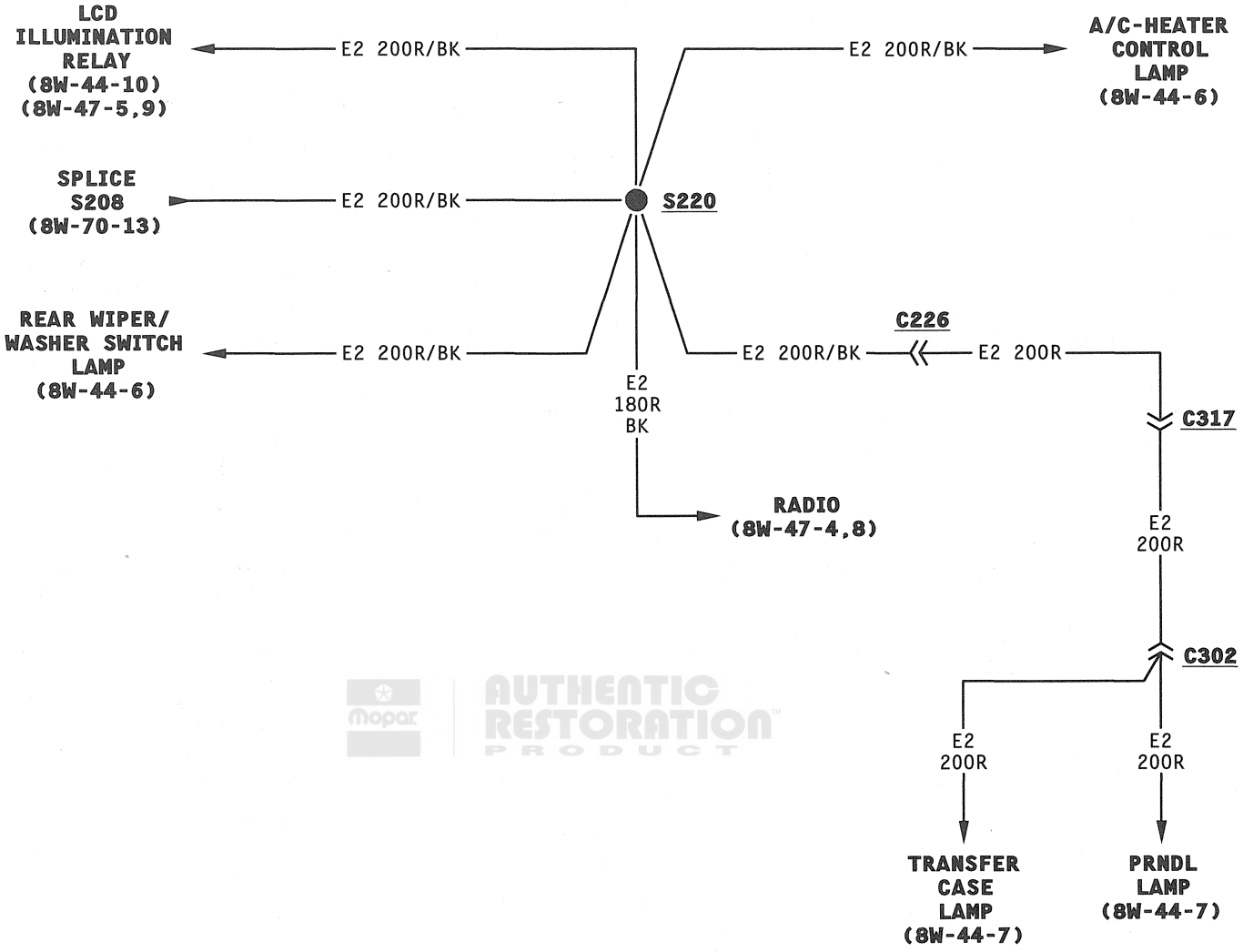

A/C CYCLING SWITCH (8W-42-5)
Z1 16BK
LEFT FRONT DOOR JAMB SWITCH (8W-44-12)
Z1 18BK
C221
Z1 20BK
S214
Z1 16BK
A/C-HEATER CONTROL LAMP (8W-44-6)
GLOVE BOX AND SWITCH LAMP (8W-44-5)
Z1 18BK
Z1 16BK
SPLICE S222 (8W-70-18)

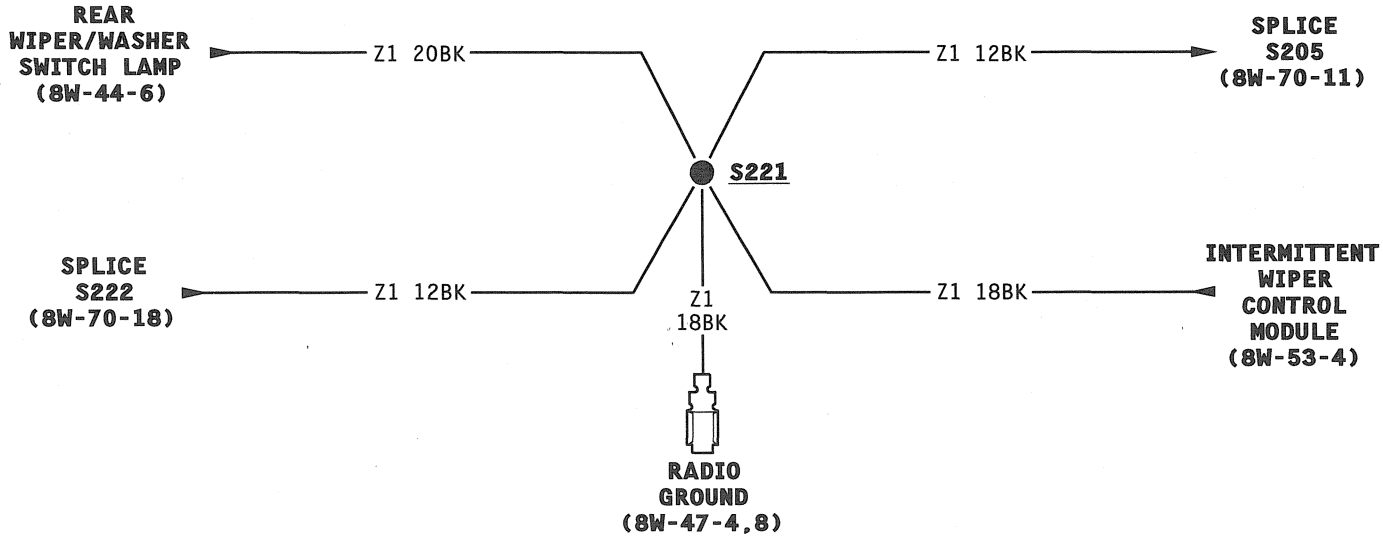


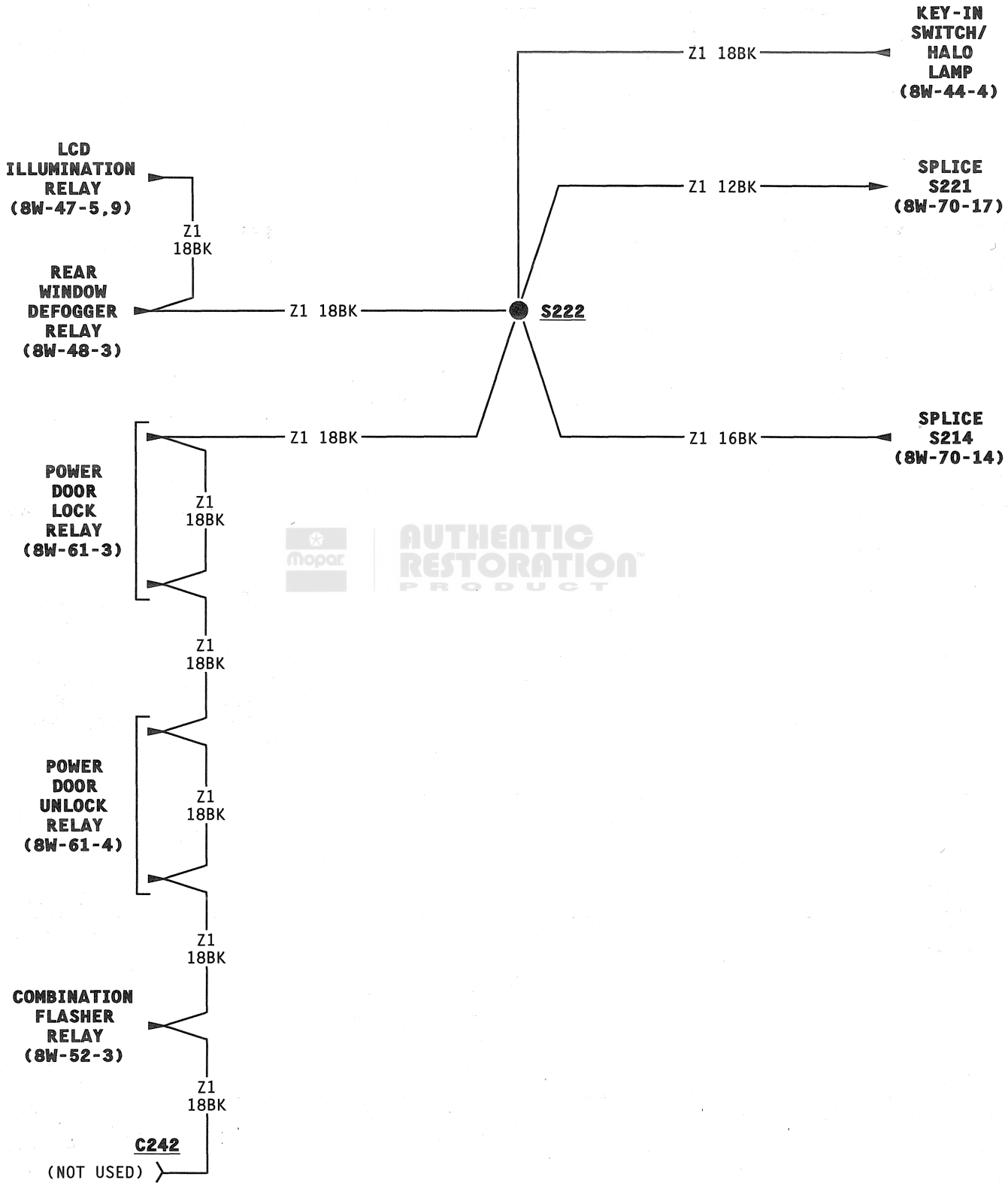
Mopar AUTHENTIC RESTORATION PRODUCT


HEADLAMP SWITCH (8W-50-6) (8W-51-3)
L90 18DB/RD
SPLICE S216 (8W-70-15)
L90 18DB/RD
S218
L90 18DB/RD
C226
L90 18DB RD
L90 18DB/RD
C324
C305
SPLICE S402 (8W-70-24)
L90 18DB/RD
L90 18DB RD
L90 18DB/RD
C308
C311
L90 20DB RD
SPLICE S401 (8W-70-24)
C345
L90 20DB RD
C358
L90 20DB/RD
LICENSE LAMP (8W-51-3)

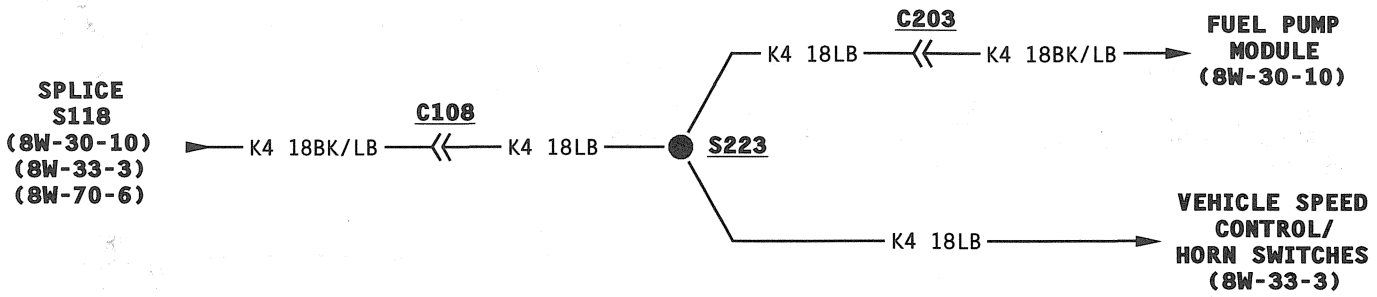

POWER DISTRIBUTION CENTER
FUSE 8 60A
(7)
C151
A1 12RD
IGNITION SWITCH (8W-30-7,8)
C173
A1 10RD
A1 12RD
A1 12RD
S219

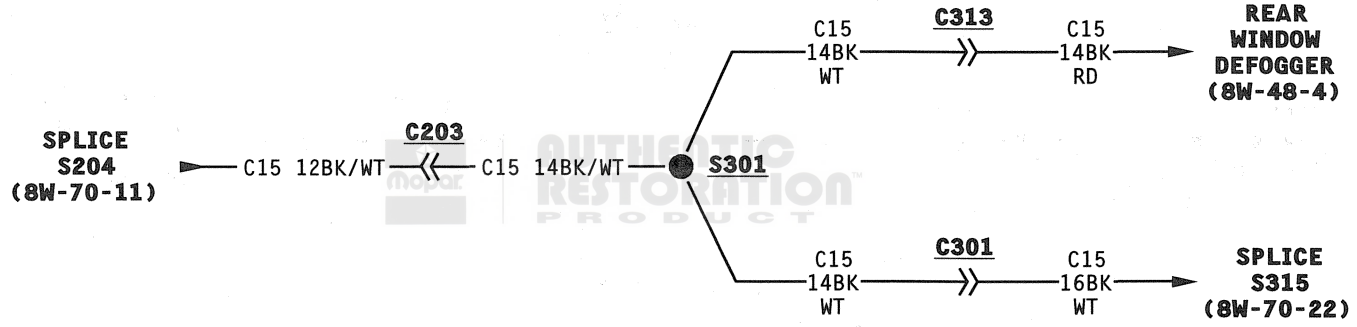

LCD ILLUMINATION RELAY (8W-44-10) (8W-47-5,9)
E2 200R/BK
E2 200R/BK
A/C-HEATER CONTROL LAMP (8W-44-6)
SPLICE S208 (8W-70-13)
E2 200R/BK
S220
REAR WIPER/ WASHER SWITCH LAMP (8W-44-6)
E2 200R/BK
E2 200R/BK
C226
E2 200R
C317
E2 180R BK
RADIO (8W-47-4,8)
E2 200R
C302
E2 200R
E2 200R
TRANSFER CASE LAMP (8W-44-7)
PRNDL LAMP (8W-44-7)

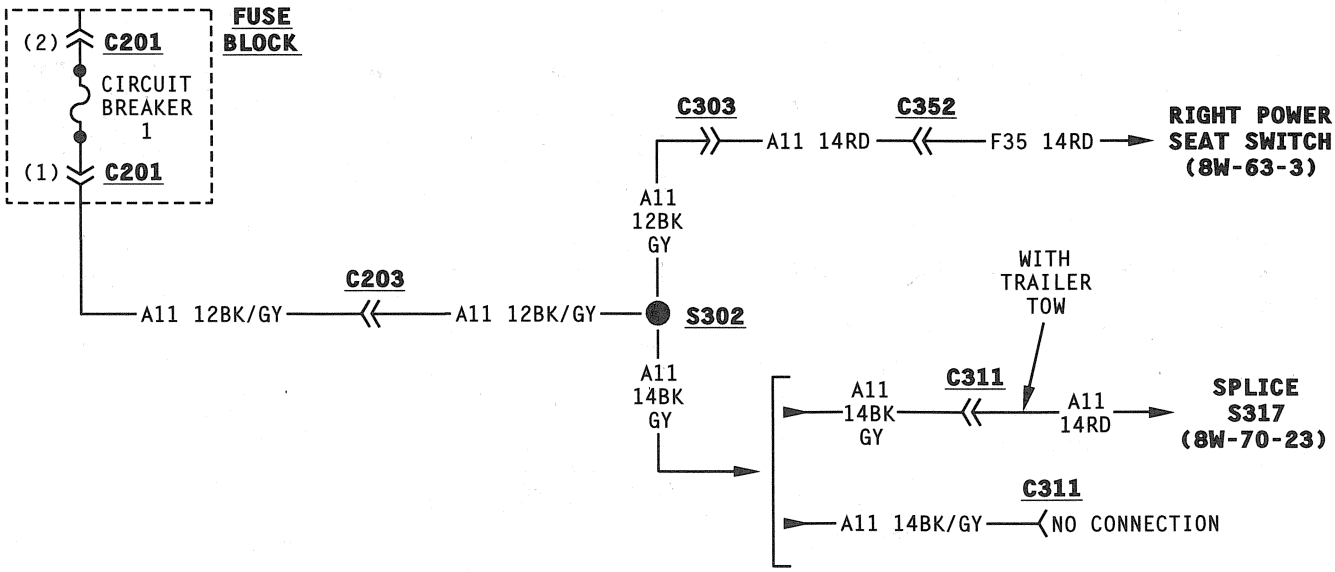

REAR WIPER/WASHER SWITCH LAMP (8W-44-6)
Z1 20BK
Z1 12BK
SPLICE S205 (8W-70-11)
S221
SPLICE S222 (8W-70-18)
Z1 12BK
Z1 18BK
INTERMITTENT WIPER CONTROL MODULE (8W-53-4)
Z1 18BK
RADIO GROUND (8W-47-4,8)

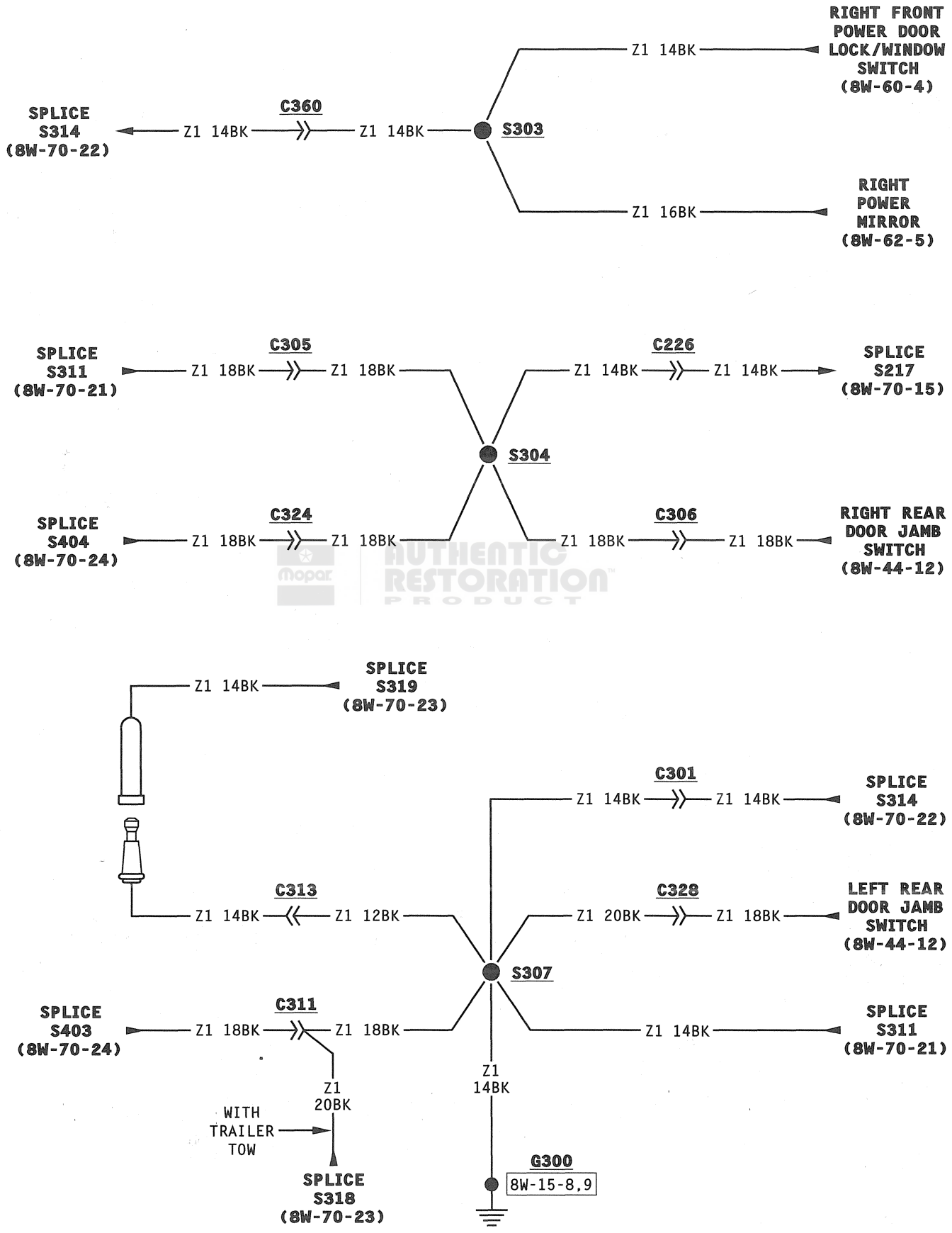


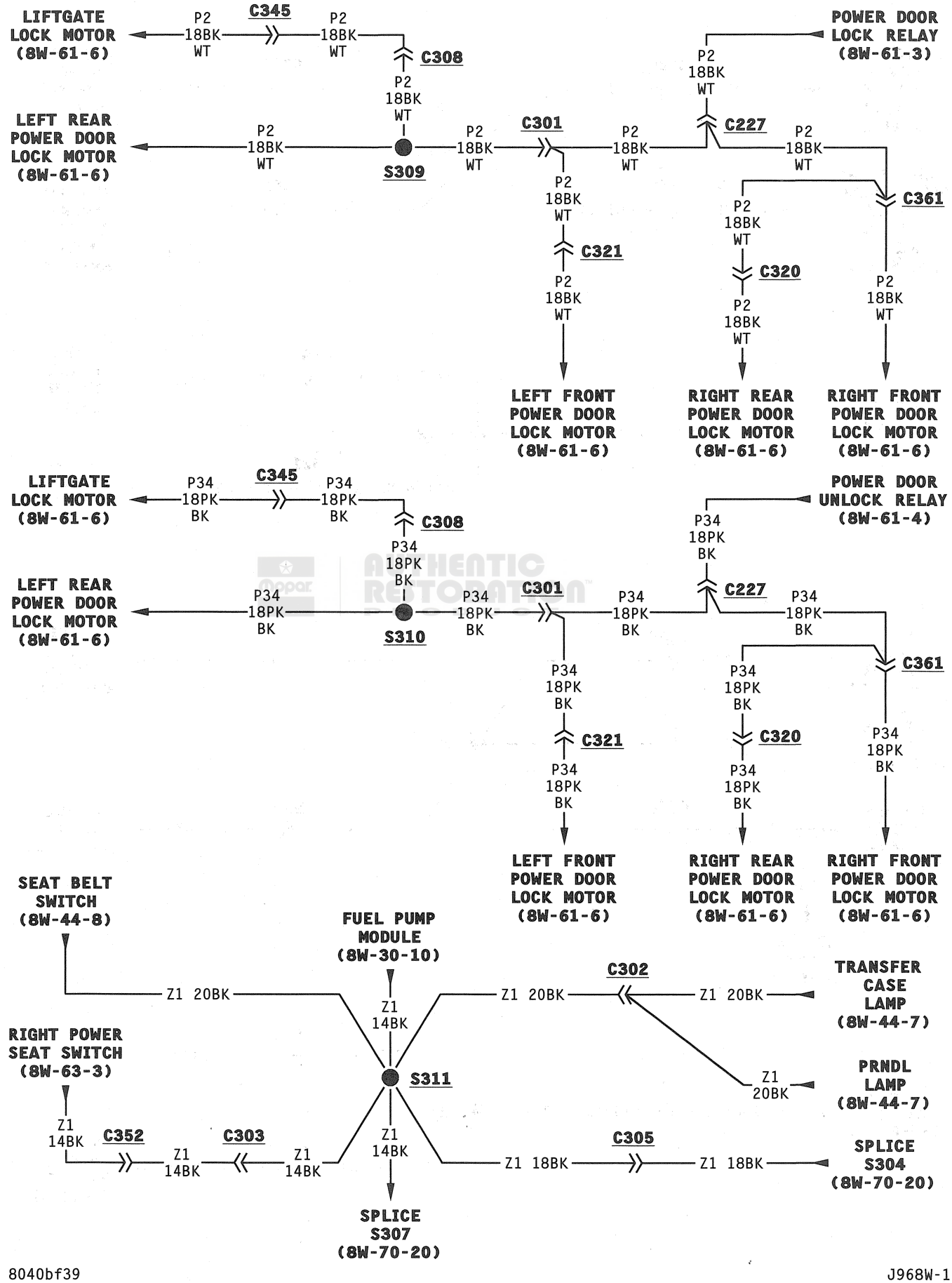
Mopar AUTHENTIC RESTORATION PRODUCT

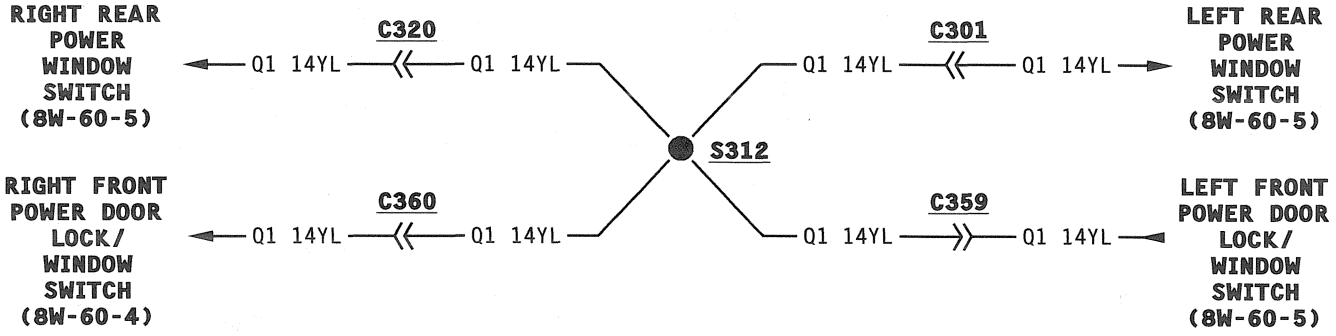

SPLICE
S118
(8W-30-10)
(8W-33-3)
(8W-70-6)
K4 18BK/LB
C108
K4 18LB
S223
K4 18LB
C203
K4 18BK/LB
FUEL PUMP
MODULE
(8W-30-10)
K4 18LB
VEHICLE SPEED
CONTROL/
HORN SWITCHES
(8W-33-3)

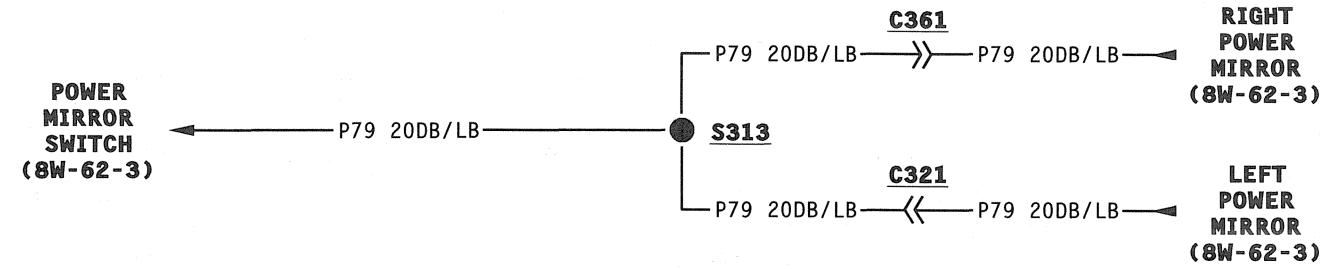

SPLICE
S204
(8W-70-11)
C15 12BK/WT
C203
C15 14BK/WT
S301
C15
14BK
WT
C313
C15
14BK
RD
REAR
WINDOW
DEFOGGER
(8W-48-4)
C15
14BK
WT
C301
C15
16BK
WT
SPLICE
S315
(8W-70-22)


(2)
C201
FUSE
BLOCK
CIRCUIT
BREAKER
1
(1)
C201
A11 12BK/GY
C203
A11 12BK/GY
S302
C303
A11 14RD
C352
F35 14RD
RIGHT POWER
SEAT SWITCH
(8W-63-3)
A11
12BK
GY
A11
14BK
GY
WITH
TRAILER
TOW
C311
A11
14BK
GY
A11
14RD
SPLICE
S317
(8W-70-23)
C311
A11 14BK/GY
NO CONNECTION

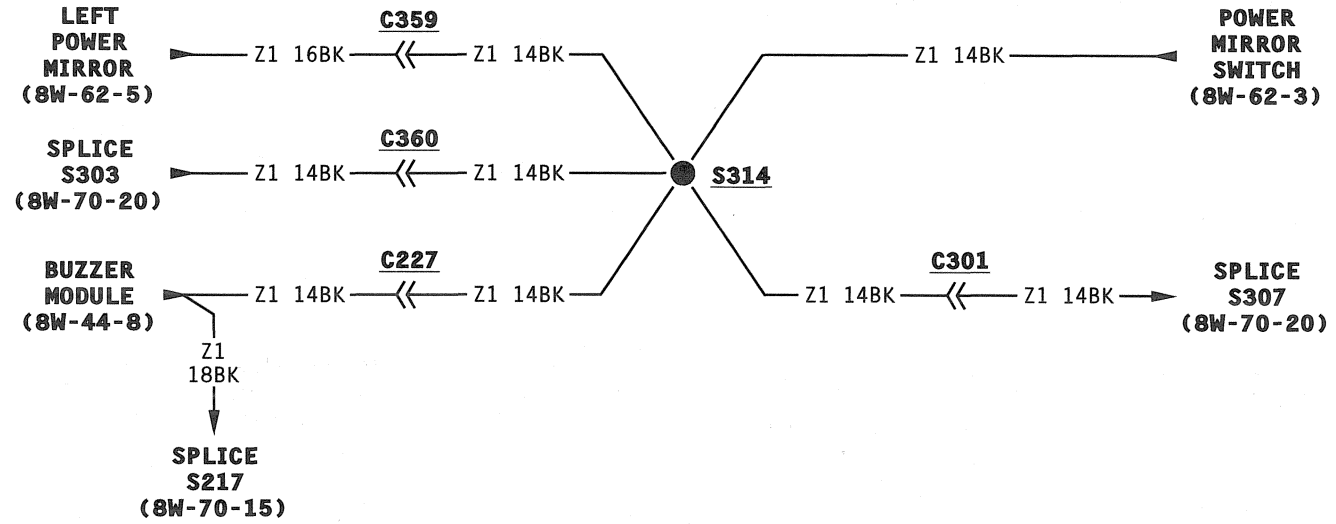

RIGHT FRONT POWER DOOR LOCK/WINDOW SWITCH (8W-60-4)
Z1 14BK
SPLICE S314 (8W-70-22)
C360
Z1 14BK
Z1 14BK
S303
Z1 16BK
RIGHT POWER MIRROR (8W-62-5)
SPLICE S311 (8W-70-21)
C305
Z1 18BK
Z1 18BK
C226
Z1 14BK
Z1 14BK
SPLICE S217 (8W-70-15)
S304
SPLICE S404 (8W-70-24)
C324
Z1 18BK
Z1 18BK
C306
Z1 18BK
Z1 18BK
RIGHT REAR DOOR JAMB SWITCH (8W-44-12)
Z1 14BK
SPLICE S319 (8W-70-23)
C301
Z1 14BK
Z1 14BK
SPLICE S314 (8W-70-22)
C313
Z1 14BK
Z1 12BK
C328
Z1 20BK
Z1 18BK
LEFT REAR DOOR JAMB SWITCH (8W-44-12)
S307
SPLICE S403 (8W-70-24)
C311
Z1 18BK
Z1 18BK
Z1 14BK
SPLICE S311 (8W-70-21)
Z1 20BK
Z1 14BK
WITH TRAILER TOW
SPLICE S318 (8W-70-23)
G300
8W-15-8,9

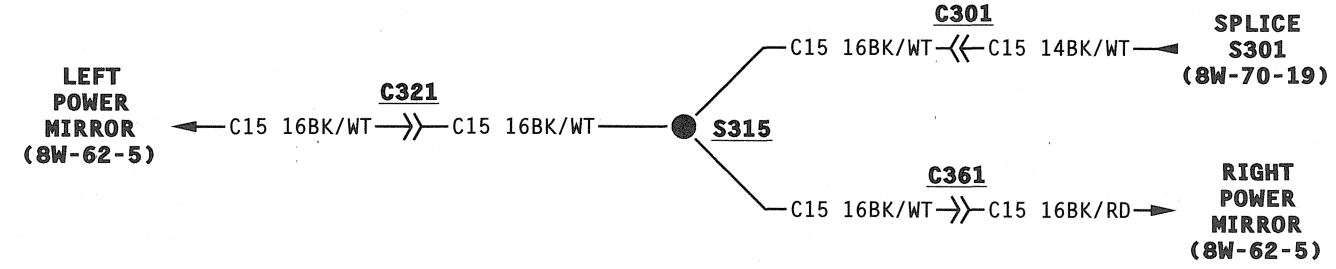

LIFTGATE LOCK MOTOR (8W-61-6)
P2 18BK WT
C345
P2 18BK WT
C308
POWER DOOR LOCK RELAY (8W-61-3)
P2 18BK WT
C227
LEFT REAR POWER DOOR LOCK MOTOR (8W-61-6)
P2 18BK WT
S309
P2 18BK WT
C301
P2 18BK WT
P2 18BK WT
C361
C321
C320
P2 18BK WT
LEFT FRONT POWER DOOR LOCK MOTOR (8W-61-6)
RIGHT REAR POWER DOOR LOCK MOTOR (8W-61-6)
RIGHT FRONT POWER DOOR LOCK MOTOR (8W-61-6)
LIFTGATE LOCK MOTOR (8W-61-6)
P34 18PK BK
C345
P34 18PK BK
C308
POWER DOOR UNLOCK RELAY (8W-61-4)
P34 18PK BK
C227
LEFT REAR POWER DOOR LOCK MOTOR (8W-61-6)
P34 18PK BK
S310
P34 18PK BK
C301
P34 18PK BK
C361
C321
C320
P34 18PK BK
LEFT FRONT POWER DOOR LOCK MOTOR (8W-61-6)
RIGHT REAR POWER DOOR LOCK MOTOR (8W-61-6)
RIGHT FRONT POWER DOOR LOCK MOTOR (8W-61-6)
SEAT BELT SWITCH (8W-44-8)
Z1 20BK
FUEL PUMP MODULE (8W-30-10)
Z1 14BK
Z1 20BK
C302
Z1 20BK
TRANSFER CASE LAMP (8W-44-7)
Z1 20BK
PRNDL LAMP (8W-44-7)
RIGHT POWER SEAT SWITCH (8W-63-3)
S311
Z1 14BK
C352
Z1 14BK
C303
Z1 14BK
Z1 14BK
Z1 18BK
C305
Z1 18BK
SPLICE S304 (8W-70-20)
SPLICE S307 (8W-70-20)

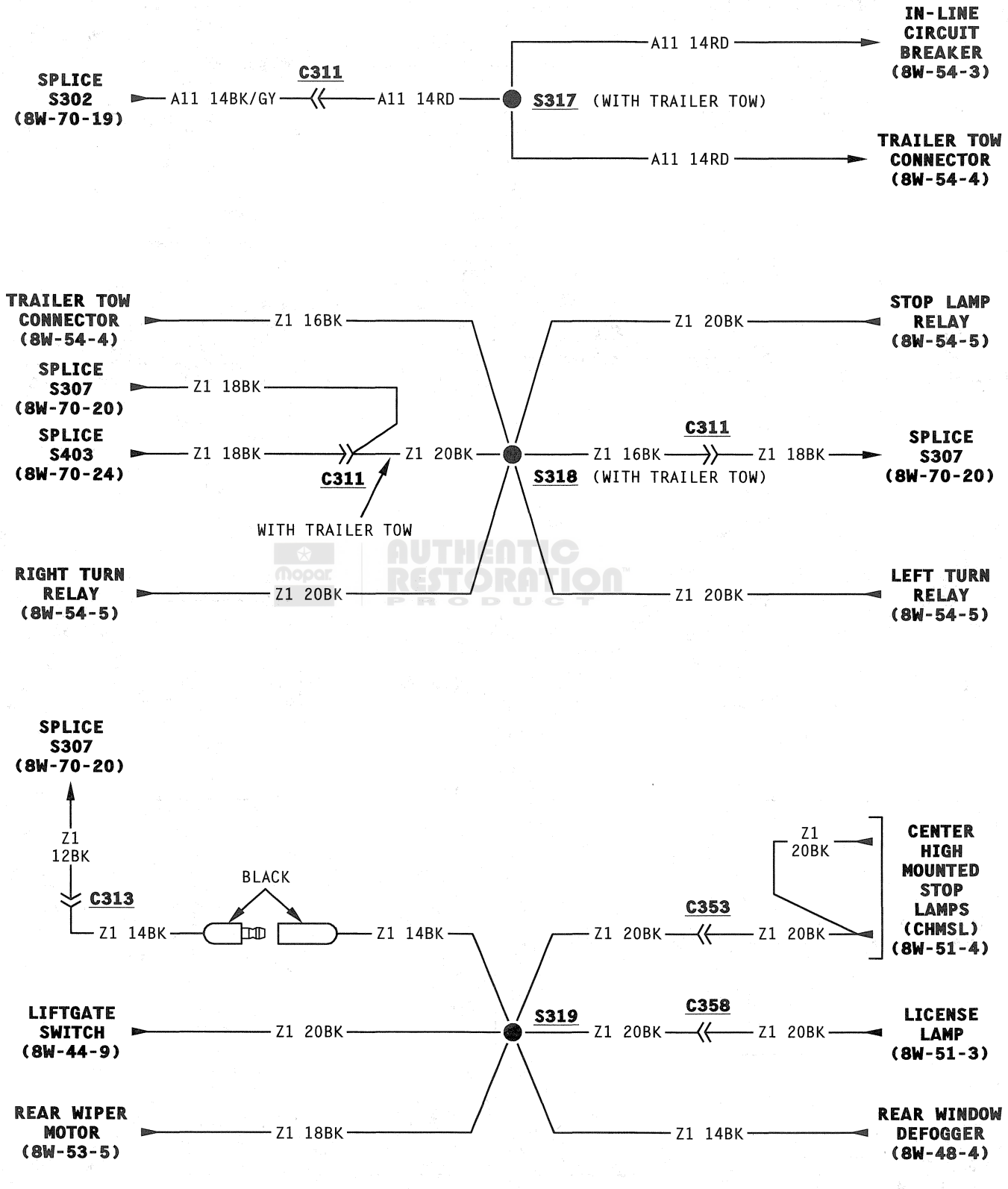


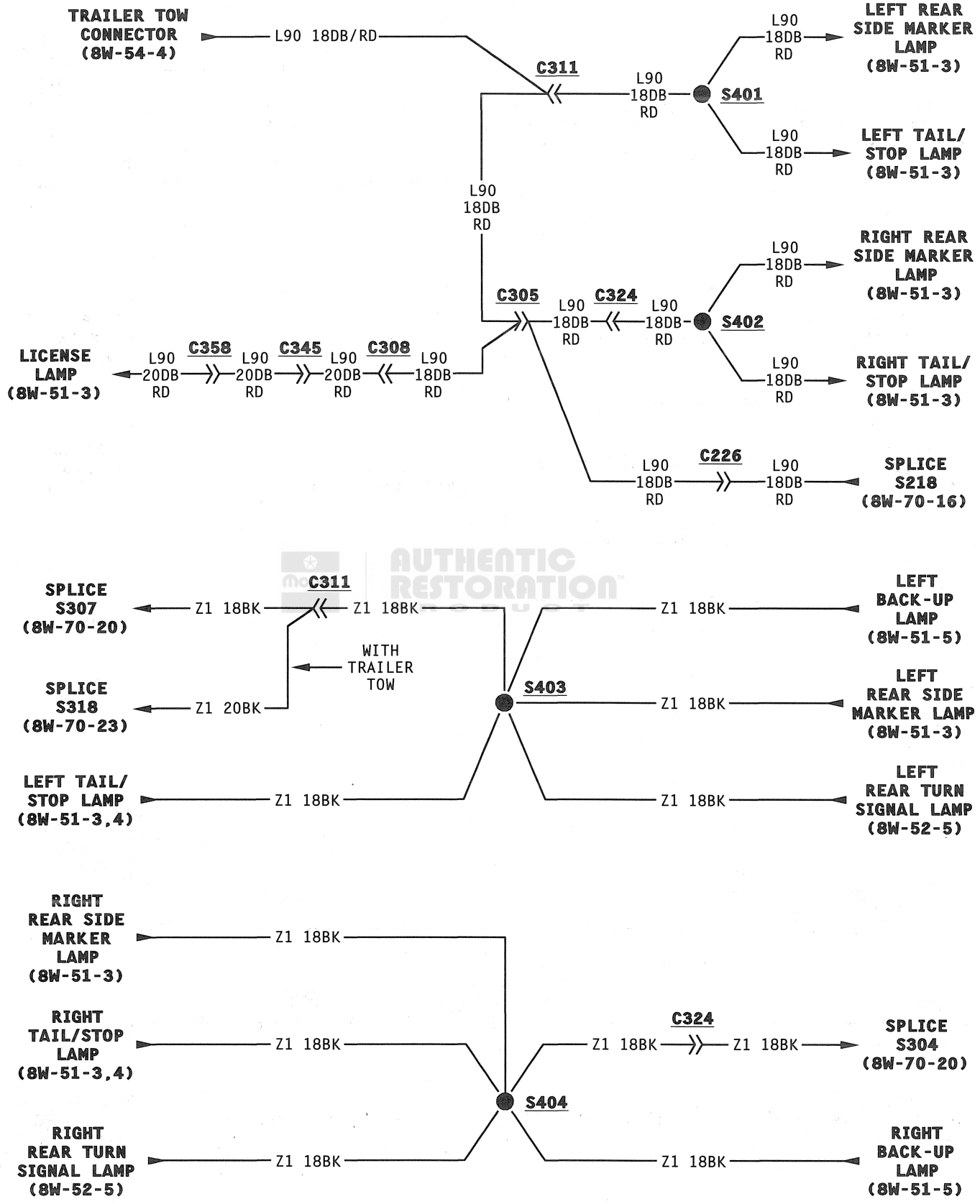


Mopar AUTHENTIC RESTORATION PRODUCT






SPLICE S302 (8W-70-19)
A11 14BK/GY
C311
A11 14RD
S317 (WITH TRAILER TOW)
A11 14RD
IN-LINE CIRCUIT BREAKER (8W-54-3)
A11 14RD
TRAILER TOW CONNECTOR (8W-54-4)
TRAILER TOW CONNECTOR (8W-54-4)
Z1 16BK
Z1 20BK
STOP LAMP RELAY (8W-54-5)
SPLICE S307 (8W-70-20)
Z1 18BK
SPLICE S403 (8W-70-24)
Z1 18BK
C311
Z1 20BK
WITH TRAILER TOW
S318 (WITH TRAILER TOW)
C311
Z1 16BK
Z1 18BK
SPLICE S307 (8W-70-20)
RIGHT TURN RELAY (8W-54-5)
Z1 20BK
Z1 20BK
LEFT TURN RELAY (8W-54-5)
SPLICE S307 (8W-70-20)
Z1 12BK
C313
BLACK
Z1 14BK
Z1 14BK
Z1 20BK
C353
Z1 20BK
Z1 20BK
CENTER HIGH MOUNTED STOP LAMPS (CHMSL) (8W-51-4)
LIFTGATE SWITCH (8W-44-9)
Z1 20BK
S319
Z1 20BK
C358
Z1 20BK
LICENSE LAMP (8W-51-3)
REAR WIPER MOTOR (8W-53-5)
Z1 18BK
Z1 14BK
REAR WINDOW DEFOGGER (8W-48-4)


TRAILER TOW CONNECTOR (8W-54-4)
L90 18DB/RD
C311
L90 18DB RD
S401
L90 18DB RD
LEFT REAR SIDE MARKER LAMP (8W-51-3)
L90 18DB RD
LEFT TAIL/ STOP LAMP (8W-51-3)
L90 18DB RD
C305
C324
L90 18DB RD
S402
L90 18DB RD
RIGHT REAR SIDE MARKER LAMP (8W-51-3)
L90 18DB RD
RIGHT TAIL/ STOP LAMP (8W-51-3)
LICENSE LAMP (8W-51-3)
L90 20DB RD
C358
L90 20DB RD
C345
L90 20DB RD
C308
L90 18DB RD
C226
L90 18DB RD
L90 18DB RD
SPLICE S218 (8W-70-16)
C311
SPLICE S307 (8W-70-20)
Z1 18BK
Z1 18BK
Z1 18BK
LEFT BACK-UP LAMP (8W-51-5)
WITH TRAILER TOW
SPLICE S318 (8W-70-23)
Z1 20BK
S403
Z1 18BK
LEFT REAR SIDE MARKER LAMP (8W-51-3)
LEFT TAIL/ STOP LAMP (8W-51-3,4)
Z1 18BK
Z1 18BK
LEFT REAR TURN SIGNAL LAMP (8W-52-5)
RIGHT REAR SIDE MARKER LAMP (8W-51-3)
Z1 18BK
RIGHT TAIL/STOP LAMP (8W-51-3,4)
Z1 18BK
C324
Z1 18BK
Z1 18BK
SPLICE S304 (8W-70-20)
S404
RIGHT REAR TURN SIGNAL LAMP (8W-52-5)
Z1 18BK
Z1 18BK
RIGHT BACK-UP LAMP (8W-51-5)

8W-80 CONNECTOR PIN-OUTS

DESCRIPTION AND OPERATION

INTRODUCTION

The pages referenced in this section show the connector, the circuits in the connector, and the pin that circuit occupies. Individual connector numbers are referenced on diagram pages throughout Group 8W.

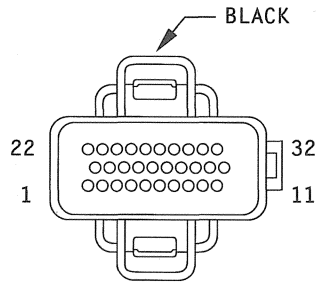
Mopar | AUTHENTIC RESTORATION PRODUCT

DIAGRAM INDEX

Connector	Page
C100	8W-80-4
C101	8W-80-5
C102	8W-80-6
C103	8W-80-6
C104	8W-80-6
C105	8W-80-6
C106	8W-80-7
C107	8W-80-7
C108	8W-80-7
C109	8W-80-8
C110	8W-80-8
C112	8W-80-8
C113	8W-80-8
C117	8W-80-9
C118	8W-80-9
C119	8W-80-9
C120	8W-80-9
C121	8W-80-10
C122	8W-80-10
C123	8W-80-10
C124	8W-80-10
C125	8W-80-10
C126	8W-80-11
C127	8W-80-11
C128	8W-80-11
C129	8W-80-11
C130	8W-80-11
C131	8W-80-12
C132	8W-80-12
C133	8W-80-13
C134	8W-80-13
C135	8W-80-13
C136	8W-80-13
C137	8W-80-14
C138	8W-80-14
C139	8W-80-14
C140	8W-80-14
C141	8W-80-14
C143	8W-80-15
C144	8W-80-15
C145	8W-80-15
C146	8W-80-15
C147	8W-80-15
C148	8W-80-16
C149	8W-80-16
C150	8W-80-16
C151	8W-80-16
C154	8W-80-17
C155	8W-80-17
C156	8W-80-17
C157	8W-80-17
C158	8W-80-18
C159	8W-80-18
C160	8W-80-18
C161	8W-80-18
C162	8W-80-18
C163	8W-80-19
C165	8W-80-19
C168	8W-80-19
C169	8W-80-20
C170	8W-80-20
C171	8W-80-20
C172	8W-80-21
C173	8W-80-21
C174	8W-80-21
C175	8W-80-22
C201	8W-80-22
C202	8W-80-22
C203	8W-80-23
C205	8W-80-23
C206	8W-80-23
C207	8W-80-24
C209	8W-80-24
C210	8W-80-24
C211	8W-80-24
C212	8W-80-25
C213	8W-80-25
C214	8W-80-25
C215	8W-80-25
C216	8W-80-25
C217	8W-80-26
C218	8W-80-26
C219	8W-80-26
C220	8W-80-26
C221	8W-80-26
C222	8W-80-27
C223	8W-80-27
C224	8W-80-27
C225	8W-80-27
C226	8W-80-28
C227	8W-80-28
C228	8W-80-29
C229	8W-80-29
C230	8W-80-30
C231	8W-80-30
C232	8W-80-30
C233	8W-80-30
C234	8W-80-31
C235	8W-80-31
C236	8W-80-31
C237	8W-80-32
C238	8W-80-32

DIAGRAM INDEX

Connector	Page
C239	8W-80-32
C240	8W-80-32
C241	8W-80-32
C242	8W-80-33
C243	8W-80-33
C244	8W-80-33
C301	8W-80-33
C302	8W-80-33
C303	8W-80-34
C304	8W-80-34
C305	8W-80-34
C306	8W-80-34
C307	8W-80-34
C308	8W-80-35
C309	8W-80-35
C310	8W-80-35
C311	8W-80-35
C312	8W-80-35
C313	8W-80-36
C314	8W-80-36
C315	8W-80-36
C316	8W-80-36
C317	8W-80-36
C319	8W-80-37
C320	8W-80-37
C321	8W-80-37
C322	8W-80-38
C323	8W-80-38
C324	8W-80-38
C325	8W-80-38
C326	8W-80-39
C327	8W-80-39
C328	8W-80-39
C329	8W-80-39
C331	8W-80-39
C332	8W-80-39
C333	8W-80-40
C334	8W-80-40
C335	8W-80-40
C336	8W-80-40
C338	8W-80-40
C339	8W-80-41
C340	8W-80-41
C341	8W-80-42
C344	8W-80-42
C345	8W-80-42
C346	8W-80-43
C347	8W-80-43
C348	8W-80-43
C349	8W-80-43
C350	8W-80-44
C351	8W-80-44
C352	8W-80-44
C353	8W-80-44
C354	8W-80-45
C355	8W-80-45
C356	8W-80-45
C357	8W-80-45
C358	8W-80-45
C359	8W-80-46
C360	8W-80-46
C361	8W-80-46
C362	8W-80-47
C365	8W-80-47
C401	8W-80-47
C402	8W-80-47
C403	8W-80-48
C404	8W-80-48
C405	8W-80-48
C406	8W-80-49
C407	8W-80-49
C410	8W-80-49
C411	8W-80-49
C412	8W-80-50
C413	8W-80-50
C414	8W-80-50
C416	8W-80-50
C417	8W-80-50
C418	8W-80-51
C419	8W-80-51
C420	8W-80-51
C421	8W-80-51
C422	8W-80-51
C423	8W-80-51
C424	8W-80-52
C426	8W-80-52
C427	8W-80-52
C429	8W-80-52
C430	8W-80-52
C432	8W-80-53
C433	8W-80-53
C434	8W-80-53
C435	8W-80-53
C436	8W-80-53
C437	8W-80-53

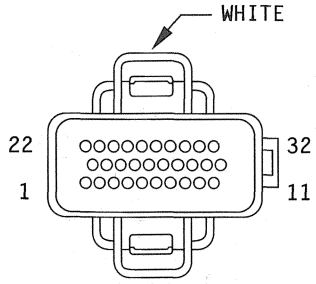


POWERTRAIN
CONTROL MODULE
(CONNECTOR A)

C100

CAV	CIRCUIT	FUNCTION
A1	–	–
A2	A21 14DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
A3	–	–
A4	K4 18BK/LB	SENSOR GROUND
A5	–	–
A6	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE
A7	K19 18GY	IGNITION COIL DRIVER
A8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
A9	–	–
A10	K60 18YL/BK	IDLE AIR CONTROL MOTOR NO. 2 DRIVER
A11	K40 18BR/WT	IDLE AIR CONTROL MOTOR NO. 3 DRIVER
A12	–	–
A13	–	–
A14	–	–
A15	K21 16BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
A16	K2 16TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
A17	K6 20VT/WT	5 VOLT SUPPLY
A18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
A19	K39 18GY/RD	IDLE AIR CONTROL MOTOR NO. 1 DRIVER
A20	K59 18VT/BK	IDLE AIR CONTROL MOTOR NO. 4 DRIVER
A21	–	–
A22	A14 14RD	FUSED B(+)
A23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
A24	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL
A25	K341 18TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL
A26	–	–
A27	K1 20DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
A28	–	–
A29	–	–
A30	–	–
A31	Z12 14BK/TN	GROUND
A32	Z12 14BK/TN	GROUND

mopar AUTHENTIC REPRINT



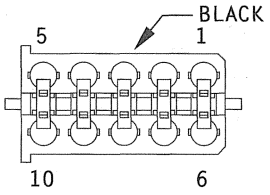
POWERTRAIN
CONTROL MODULE
(CONNECTOR B)

C101

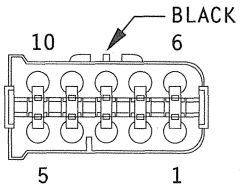
CAV	CIRCUIT	FUNCTION
B1	–	–
B2	–	–
B3	–	–
B4	K11 18WT/DB	INJECTOR NO. 1 DRIVER
B5	K13 18YL/WT	INJECTOR NO. 3 DRIVER
B6	K38 18GY	INJECTOR NO. 5 DRIVER
B7	–	–
B8	–	–
B9	–	–
B10	K20 18DG	GENERATOR FIELD DRIVER
B11	K54 20OR/BK	UP-SHIFT LAMP DRIVER
B12	K58 18BR/DB	INJECTOR NO. 6 DRIVER
B13	–	–
B14	–	–
B15	K12 18TN	INJECTOR NO. 2 DRIVER
B16	K14 18LB/BR	INJECTOR NO. 4 DRIVER
B17	–	–
B18	–	–
B19	–	–
B20	–	–
B21	–	–
B22	–	–
B23	–	–
B24	–	–
B25	–	–
B26	–	–
B27	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL
B28	–	–
B29	–	–
B30	–	–
B31	K7 18OR	5 VOLT SUPPLY

Mopar AUTHENTIC RESTORATION

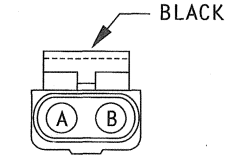
C102



CAV	CIRCUIT
1	L3 14RD/OR
2	L3 14RD/OR
3	L61 18LG
4	L90 18DB/RD
5	Z1 16BK
6	F39 18PK/LG
7	L4 14VT/WT
8	L60 18TN
9	L39 16LB
10	L35 16BR/WT



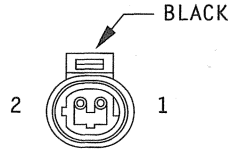
CAV	CIRCUIT
1	G465 16LB/BK*
2	L3 16RD/OR
3	L61 18LG L61 18LG
4	L90 18DB/RD
5	Z1 16BK
6	F39 16PK/LG*
7	L4 16VT/WT
8	L60 18TN L60 18TN
9	L39 16LB*
10	L35 18BR/WT*



RADIATOR FAN MOTOR

C103

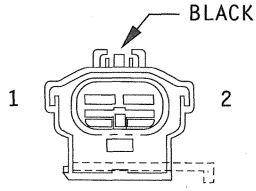
CAV	CIRCUIT	FUNCTION
A	C25 14LG	RADIATOR FAN RELAY OUTPUT
B	Z1 14BK	GROUND



LEFT FRONT WHEEL SPEED SENSOR

C104

CAV	CIRCUIT	FUNCTION
1	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
2	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR (+)

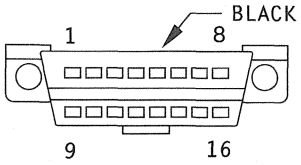


ABS PUMP MOTOR

C105

CAV	CIRCUIT	FUNCTION
1	B233 12TN/BK	ABS PUMP MOTOR RELAY OUTPUT
2	Z12 12BK/TN	GROUND

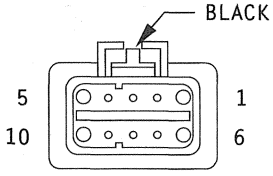
* WITH FOG LAMPS



DATA LINK CONNECTOR

C106

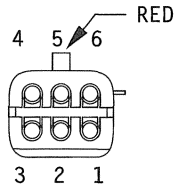
CAV	CIRCUIT	FUNCTION
1	–	–
2	–	–
3	D1 18VT/BR	CCD BUS (+)
4	Z12 16BK/TN	GROUND
5	Z11 16BK/WT	GROUND
6	D20 20LG	SCI RECEIVE
7	D21 20PK	SCI TRANSMIT
	D21 20PK	SCI TRANSMIT*
8	–	–
9	–	–
10	–	–
11	D2 18WT/BK	CCD BUS (-)
12	–	–
13	–	–
14	–	–
15	T137 16YL/BK	AUTOMATIC TRANSMISSION DIAG SIGNAL
16	F39 18PK/LG	FUSED B(+)



HYDRAULIC CONTROL UNIT

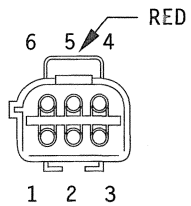
C107

CAV	CIRCUIT	FUNCTION
1	B235 14GY/YL	ABS MAIN RELAY OUTPUT
2	B251 16WT/BK	REAR ISOLATION VALVE CONTROL
3	B249 16WT/TN	RIGHT FRONT ISOLATION VALVE CONTROL
4	B245 16WT/LG	LEFT FRONT ISOLATION VALVE CONTROL
5	–	–
6	–	–
7	B254 16DG/OR	REAR DUMP VALVE CONTROL
8	B248 16DG/WT	RIGHT FRONT DUMP VALVE CONTROL
9	B243 16DG/BK	LEFT FRONT DUMP VALVE CONTROL
10	B235 14GY/YL	ABS MAIN RELAY OUTPUT



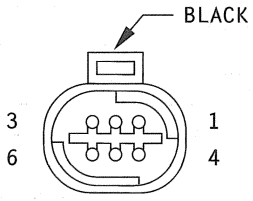
C108

CAV	CIRCUIT
1	G31 18VT/LG
2	V32 20YL/RD
3	V33 20WT/LG
4	G32 18BK/LB
5	G4 18DB
6	K4 18BK/LB



CAV	CIRCUIT
1	–
2	V32 20YL/RD
3	V33 20WT/LG
4	–
5	G4 18DB
6	K4 18LB

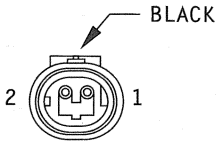
* WITH ABS



FRONT WIPER MOTOR

C109

CAV	CIRCUIT	FUNCTION
1	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
2	V55 18TN/RD	WIPER PARK SWITCH SENSE
3	–	–
4	Z1 16BK	GROUND
5	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
6	V4 18RD/YL	WIPER SWITCH HIGH SPEED OUTPUT

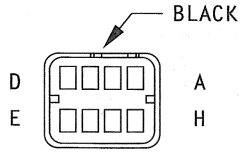


EVAP/PURGE SOLENOID

C110

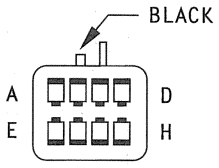
CAV	CIRCUIT	FUNCTION
1	K52 20PK/BK	EVAP/PURGE SOLENOID CONTROL
2	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)

Mopar AUTHENTIC RESTORATION PRODUCT

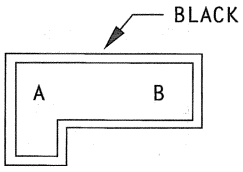


C112

CAV	CIRCUIT
A	B515 18YL/VT
B	B516 18TN/WT
C	B517 18PK/OR
D	B1 18YL/DB
E	B2 18YL
F	B3 18LG/DB
G	B4 18LG
H	–



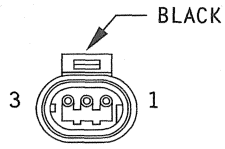
CAV	CIRCUIT
A	B515 18YL/VT
B	B516 18TN/WT
C	B517 18PK/OR
D	B1 18YL/DB
E	B2 18YL
F	B3 18LG/DB
G	B4 18LG
H	–



ABS DIODE

C113

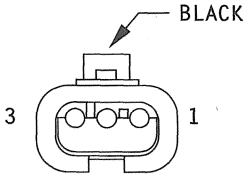
CAV	CIRCUIT	FUNCTION
A	B235 14GY/YL	ABS MAIN RELAY OUTPUT
B	B205 18VT	ABS LAMP DRIVER



CRANKSHAFT POSITION SENSOR

C117

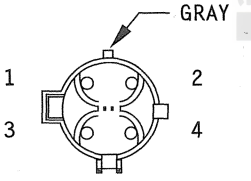
CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL



THROTTLE POSITION SENSOR

C118

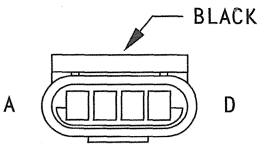
CAV	CIRCUIT	FUNCTION
1	K6 20VT/WT	5 VOLT SUPPLY
2	K22 180R/DB	THROTTLE POSITION SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



UPSTREAM HEATED OXYGEN SENSOR

C119

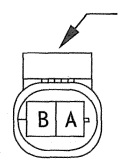
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	FUEL PUMP RELAY OUTPUT
2	Z11 16BK/WT	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	UPSTREAM HEATED OXYGEN SENSOR SIGNAL



IDLE AIR CONTROL MOTOR

C120

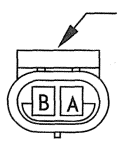
CAV	CIRCUIT	FUNCTION
A	K59 18VT/BK	IDLE AIR CONTROL MOTOR DRIVER NO. 4
B	K40 18BR/WT	IDLE AIR CONTROL MOTOR DRIVER NO. 3
C	K60 18YL/BK	IDLE AIR CONTROL MOTOR DRIVER NO. 2
D	K39 18GY/RD	IDLE AIR CONTROL MOTOR DRIVER NO. 1



INTAKE AIR TEMPERATURE SENSOR

C121

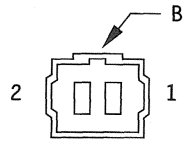
CAV	CIRCUIT	FUNCTION
A	K4 16BK/LB	SENSOR GROUND
B	K21 16BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL



ENGINE COOLANT TEMPERATURE SENSOR

C122

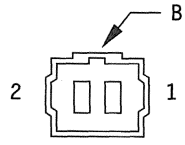
CAV	CIRCUIT	FUNCTION
A	K4 16BK/LB	SENSOR GROUND
B	K2 16TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



INJECTOR NO. 1

C123

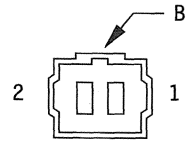
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	INJECTOR NO. 1 DRIVER



INJECTOR NO. 2

C124

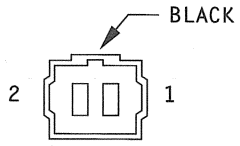
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	INJECTOR NO. 2 DRIVER



INJECTOR NO. 3

C125

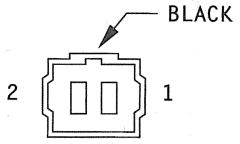
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	INJECTOR NO. 3 DRIVER



INJECTOR NO. 4

C126

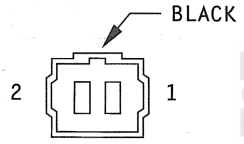
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	INJECTOR NO. 4 DRIVER



INJECTOR NO. 5

C127

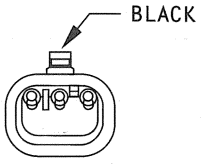
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K38 18GY	INJECTOR NO. 5 DRIVER



INJECTOR NO. 6

C128

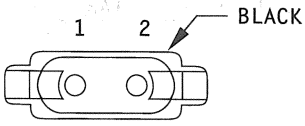
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K58 18BR/DB	INJECTOR NO. 6 DRIVER



MAP SENSOR

C129

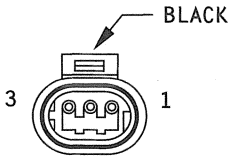
CAV	CIRCUIT	FUNCTION
1	K6 20VT/WT	5 VOLT SUPPLY
2	K1 20DG/RD	MAP SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



BRAKE PRESSURE SWITCH

C130

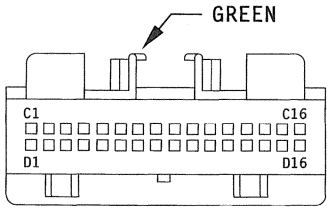
CAV	CIRCUIT	FUNCTION
1	G9 20GY/BK	BRAKE WARNING LAMP DRIVER
2	G9 20GY/WT	BRAKE WARNING LAMP DRIVER



CAMSHAFT
POSITION
SENSOR

C131

CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL

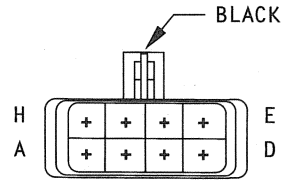


TRANSMISSION
CONTROL
MODULE

C132

CAV	CIRCUIT	FUNCTION
C1	–	–
C2	–	–
C3	T505 18TN/BK	TRANS SPEED SENSOR SIGNAL
C4	T137 16YL/BK	AUTOMATIC TRANSMISSION DIAG SIGNAL
C5	–	–
C6	–	–
C7	–	–
C8	T506 18LG/BK	1-2 GEAR SENSE
C9	T507 18GY/BK	DRIVE GEAR SENSE
C10	K29 18WT/PK	STOP LAMP SWITCH SENSE
C11	–	–
C12	–	–
C13	–	–
C14	T508 18WT/BK	SOLENOID S3 CONTROL
C15	T509 18VT/BK	SOLENOID S2 CONTROL
C16	T510 18DB/WT	SOLENOID S1 CONTROL
D1	–	–
D2	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
D3	K4 18BK/LB	SENSOR GROUND
D4	–	–
D5	–	–
D6	–	–
D7	Z1 18BK	GROUND
D8	–	–
D9	–	–
D10	–	–
D11	–	–
D12	–	–
D13	–	–
D14	A14 14RD	FUSED B(+)
D15	–	–
D16	T17 18YL	FUSED IGNITION SW OUTPUT (RUN/START)

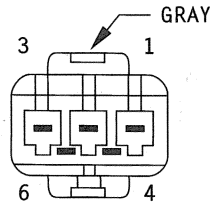
Mopar AUTHENTIC RESTORATION



PARK/NEUTRAL POSITION SWITCH

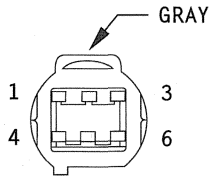
C133

CAV	CIRCUIT	FUNCTION
A	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE
C	Z1 18BK	GROUND
D	–	–
E	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT
F	–	–
G	T507 18GY/BK	DRIVE GEAR SENSE
H	T506 18LG/BK	1-2 GEAR SENSE

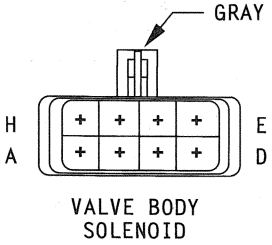


C134

CAV	CIRCUIT
1	G7 20WT/OR
2	K4 18BK/LB
3	G107 20BK/RD
4	Z1 18BK
5	–
6	K7 180R



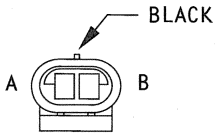
CAV	CIRCUIT
1	G7 18WT/OR
2	K4 18BK/LB
3	G107 18BK/RD*
4	Z1 18BK*
5	–
6	K7 180R



VALVE BODY SOLENOID

C135

CAV	CIRCUIT	FUNCTION
A	G106 20BK/YL	4WD FULL TIME
B	Z1 18BK	GROUND
C	T505 18TN/BK	TRANSMISSION SPEED SENSOR SIGNAL
D	–	–
E	T508 18WT/BK	SOLENOID S3 CONTROL
F	T509 18VT/BK	SOLENOID S2 CONTROL
G	T510 18DB/WT	SOLENOID S1 CONTROL
H	G107 20BK/RD	4WD LOCK

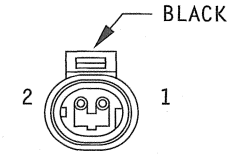


LOW WASHER FLUID LEVEL SWITCH

C136

CAV	CIRCUIT	FUNCTION
A	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN/START)
B	G29 20BK/TN	WASHER FLUID SWITCH SENSE

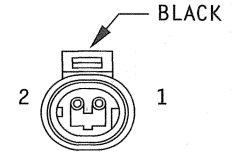
* WITH 231 TRANSFER CASE



UNDERHOOD LAMP

C137

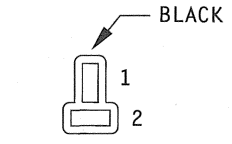
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	A6 18RD/BK	FUSED B(+)



RIGHT FRONT WHEEL SPEED SENSOR

C138

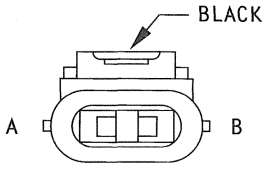
CAV	CIRCUIT	FUNCTION
1	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR (+)



REAR WASHER PUMP MOTOR

C139

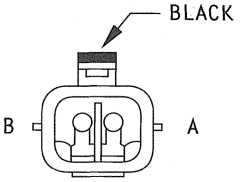
CAV	CIRCUIT	FUNCTION
1	V20 18BK/WT	REAR WASHER PUMP MOTOR CONTROL
2	Z1 18BK	GROUND
	Z1 18BK	GROUND



FRONT WASHER PUMP MOTOR

C140

CAV	CIRCUIT	FUNCTION
A	V10 20BR	WINDSHIELD WASHER SWITCH OUTPUT
B	Z1 18BK	GROUND

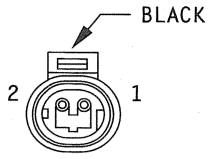


A/C HEATER BLOWER MOTOR

C141

CAV	CIRCUIT	FUNCTION
A	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
B	Z1 12GY	GROUND

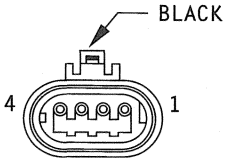
Mopar AUTHENTIC RESTORATION PRODUCT



A/C LOW PRESSURE SWITCH

C143

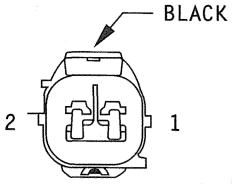
CAV	CIRCUIT	FUNCTION
1	C21 14DB/OR	A/C SWITCH SENSE
2	C21 14DB/OR	A/C LOW PRESSURE SWITCH OUTPUT



VEHICLE SPEED CONTROL SERVO

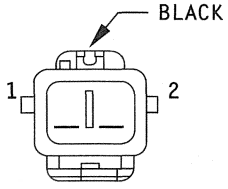
C144

CAV	CIRCUIT	FUNCTION
1	V36 20TN/RD	VEHICLE SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 20LG/RD	VEHICLE SPEED CONTROL VENT SOLENOID CONTROL
3	V30 20DB/RD	VEHICLE SPEED CONTROL STOP LAMP SW OUTPUT
4	Z1 18BK	GROUND



C145

CAV	CIRCUIT
1	G31 18VT/LG
2	G32 18BK/LB

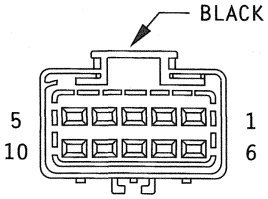


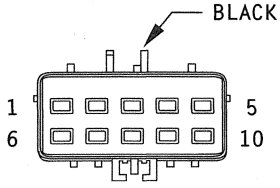
CAV	CIRCUIT
1	G31 18VT/LG
2	G32 18BK/LB

Mopar AUTHENTIC RESTORATION PRODUCT

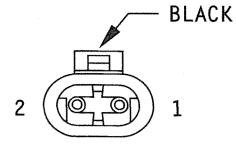
C146

CAV	CIRCUIT
1	–
2	K19 18GY
3	–
4	–
5	–
6	–
7	G6 20GY
8	–
9	K20 18DG
10	A142 16DG/OR





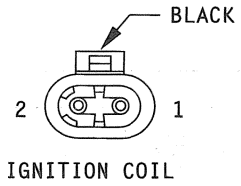
CAV	CIRCUIT
1	–
2	K19 18BK/GY
3	–
4	–
5	C3 14DB/BK
6	–
7	G6 18GY
8	–
9	K20 18DG
10	A142 16DG/OR



ENGINE OIL PRESSURE SWITCH

C147

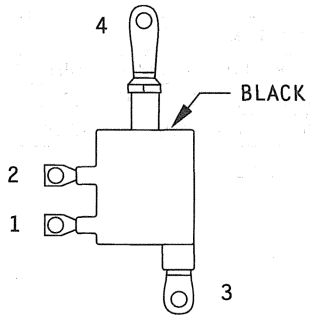
CAV	CIRCUIT	FUNCTION
1	G6 18GY	ENGINE OIL PRESSURE SWITCH SENSE
2	–	–



IGNITION COIL

C148

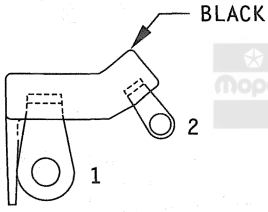
CAV	CIRCUIT	FUNCTION
1	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
2	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



GENERATOR

C149

CAV	CIRCUIT	FUNCTION
1	K20 18DG	GENERATOR FIELD DRIVER
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	–	–
4	Z0 8BK	GROUND

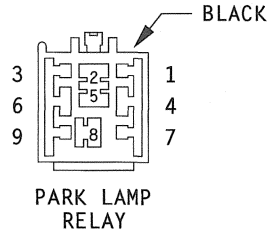


ENGINE STARTER MOTOR

C150

CAV	CIRCUIT	FUNCTION
1	A0 6RD	B(+)
2	T40 14LG/BK	ENGINE STARTER MOTOR RELAY OUTPUT

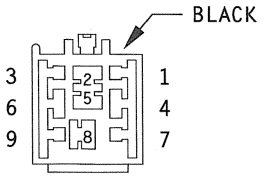
C151
POWER DISTRIBUTION CENTER
(8W-11-2)



PARK LAMP RELAY

C154 (WITH FOG LAMPS)

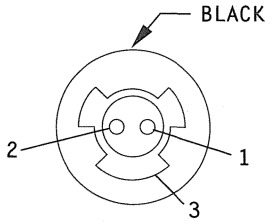
CAV	CIRCUIT	FUNCTION
1	–	–
2	F39 16PK/LG	FUSED B(+)
3	–	–
4	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
5	–	–
6	L35 18BR/WT	PARK LAMP RELAY CONTROL
7	–	–
8	F39 16PK/LG	FUSED B(+)
9	–	–



HIGH BEAM RELAY

C155 (WITH FOG LAMPS)

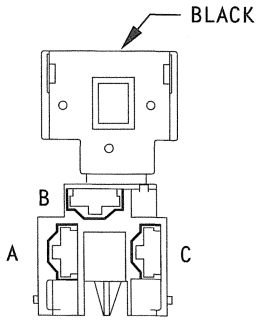
CAV	CIRCUIT	FUNCTION
1	–	–
2	–	–
3	–	–
4	G465 16LB/BK	HIGH BEAM INDICATOR DRIVER
5	L39 16LB	HIGH BEAM RELAY OUTPUT
6	Z1 18BK	GROUND
7	–	–
8	F39 16PK/LG	FUSED B(+)
9	–	–



LEFT FRONT PARK/ TURN SIGNAL LAMP

C156

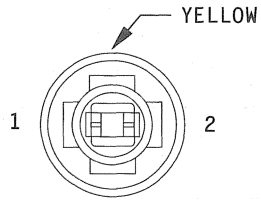
CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



LEFT HEADLAMP

C157

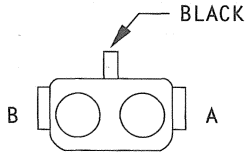
CAV	CIRCUIT	FUNCTION
A	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
B	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
C	Z1 18BK	GROUND



LEFT FRONT SIDE
MARKER LAMP

C158

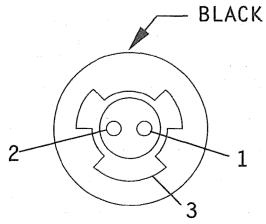
CAV	CIRCUIT	FUNCTION
1	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
2	L61 18LG	LEFT TURN SIGNAL



LEFT
FOG LAMP

C159

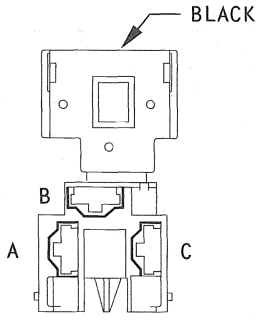
CAV	CIRCUIT	FUNCTION
A	Z1 16BK	GROUND
B	L39 16LB	FOG LAMP SWITCH OUTPUT



RIGHT FRONT PARK/
TURN SIGNAL LAMP

C160

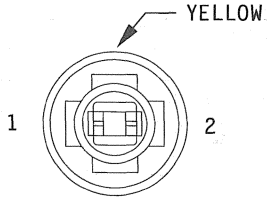
CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



RIGHT
HEADLAMP

C161

CAV	CIRCUIT	FUNCTION
A	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
B	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
C	Z1 18BK	GROUND

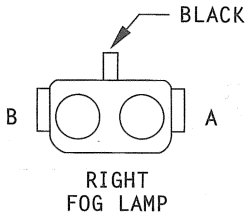


RIGHT FRONT SIDE
MARKER LAMP

C162

CAV	CIRCUIT	FUNCTION
1	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
2	L60 18TN	RIGHT TURN SIGNAL

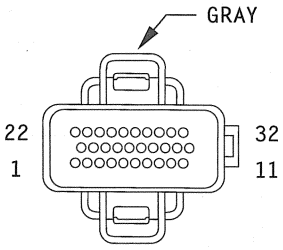
mopar RESTORATION PRODUCT



RIGHT
FOG LAMP

C163

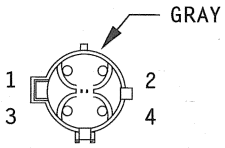
CAV	CIRCUIT	FUNCTION
A	Z1 16BK	GROUND
B	L39 16LB	FOG LAMP SWITCH OUTPUT



POWERTRAIN
CONTROL
MODULE
(CONNECTOR C)

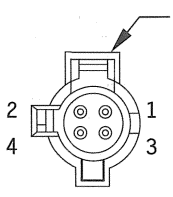
C165

CAV	CIRCUIT	FUNCTION
C1	C13 20DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
C2	C27 20DB/PK	RADIATOR FAN RELAY CONTROL
C3	K51 20DB/YL	AUTOMATIC SHUT DOWN RELAY CONTROL
C4	V36 20TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
C5	V35 20LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
C6	–	–
C7	–	–
C8	–	–
C9	–	–
C10	–	–
C11	V32 20YL/RD	12 VOLT SUPPLY
C12	A142 16DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
C13	–	–
C14	–	–
C15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
C16	G14 20PK/BK	GENERATOR LAMP DRIVER
C17	G3 20BK/PK	MALFUNCTION INDICATOR LAMP DRIVER
C18	–	–
C19	K31 20BR	FUEL PUMP RELAY CONTROL
C20	K52 20PK/BK	EVAP/PURGE SOLENOID CONTROL
C21	–	–
C22	C21 14DB/OR	A/C LOW PRESSURE SWITCH SIGNAL
C23	C90 14LG	A/C SELECT SIGNAL
C24	K29 18WT/PK	STOP LAMP SWITCH SENSE
C25	–	–
C26	G4 18DB	FUEL LEVEL SENSE
C27	D21 20PK	SCI TRANSMIT
C28	D2 18WT/BK	CCD BUS (-)
C29	D20 20LG	SCI RECEIVE
C30	D1 18VT/BR	CCD BUS (+)
C31	G21 20GY/LB	TACHOMETER SIGNAL
C32	V33 20WT/LG	SPEED CONTROL RESUME SWITCH SENSE

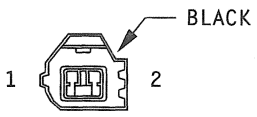


C168

CAV	CIRCUIT
1	A142 16DG/OR
2	Z11 16BK/WT
3	K4 18BK/LB
4	K341 18TN/WT



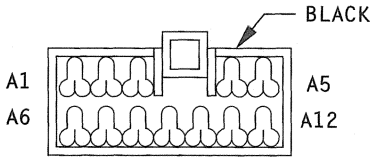
CAV	CIRCUIT
1	A142 18DG/OR
2	Z11 16BK/WT
3	K4 18BK/LB
4	K341 18TN/WT



BATTERY TEMPERATURE SENSOR

C169

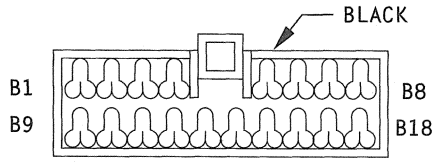
CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND



CONTROLLER ANTI-LOCK BRAKE

C170

CAV	CIRCUIT	FUNCTION
A1	B205 18VT	ABS WARNING LAMP DRIVER
A2	B517 18PK/OR	G-SWITCH GROUND
A3	D21 20PK	SCI TRANSMIT
A4	–	–
A5	B236 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
A6	B515 18YL/VT	G-SWITCH NO. 1 SENSE
A7	B516 18TN/WT	G-SWITCH NO. 2 SENSE
A8	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
A9	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
A10	B4 18LG	LEFT REAR WHEEL SPEED SENSOR (+)
A11	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR (+)
A12	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)

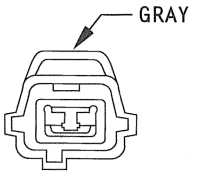


CONTROLLER ANTI-LOCK BRAKE

C171

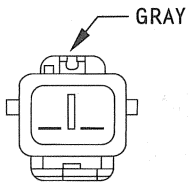
CAV	CIRCUIT	FUNCTION
B1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR (+)
B2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
B3	B233 14TN/BK	ABS PUMP RELAY OUTPUT
B4	B251 16WT/BK	REAR ISOLATION VALVE CONTROL
B5	B235 14GY/YL	ABS MAIN RELAY OUTPUT
B6	B248 16DG/WT	RIGHT FRONT DUMP VALVE CONTROL
B7	B116 18GY	ABS MAIN RELAY CONTROL
B8	B243 16DG/BK	LEFT FRONT DUMP VALVE CONTROL
B9	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR (+)
B10	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
B11	B207 18PK	ABS MAIN RELAY CONTROL
B12	B254 16DG/OR	REAR DUMP VALVE CONTROL
B13	Z1 14BK	GROUND
B14	Z1 14BK	GROUND
B15	B249 16WT/TN	RIGHT FRONT ISOLATION VALVE CONTROL
B16	–	–
B17	–	–
B18	B245 16WT/LG	LEFT FRONT ISOLATION VALVE CONTROL

Mopar AUTHENTIC RESTORATION PARTS



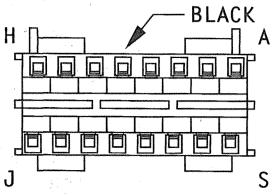
C172

CAV	CIRCUIT
1	T40 14LG/BK

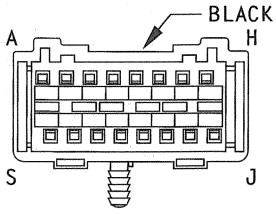


CAV	CIRCUIT
1	T40 14BR

C173



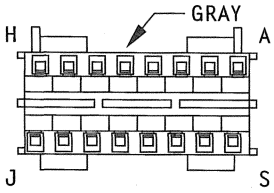
CAV	CIRCUIT
A	A7 12RD/YL
B	V4 18RD/YL
C	G20 18VT/YL
D	G6 20GY
E	F86 18LG/BK
F	L10 18BR/LG
G	G21 20GY/LB
H	C1 12DG
J	A1 10RD
K	L9 18BK/WT
L	V55 18TN/RD
M	V3 18BR/WT
N	L35 16BR/WT
P	G7 20WT/OR
R	L39 16LB
S	L4 14VT/WT



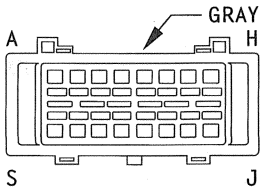
CAV	CIRCUIT
A	A7 12RD/YL
B	V4 18RD/YL
C	G20 18WT/TN
D	G6 20GY
E	F86 18LG/BK
F	L10 18BR/LG
G	G21 20GY/LB
H	C1 12DG
J	A1 12RD
K	L9 18BK/WT
L	V55 18TN/RD
M	V3 18BR/WT
N	L35 16BR
P	G7 20WT/OR
R	L39 16LB
S	L4 14VT/WT

Mopar AUTHENTIC RESTORATION PRODUCT

C174

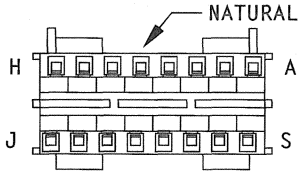


CAV	CIRCUIT
A	A21 12DB
B	–
C	C90 14LG
D	C21 14DB/OR
E	V10 20BR
F	L90 18DB/RD
G	V20 18BK/WT
H	A41 14YL
J	A3 12RD/WT
K	L60 18TN
L	L61 18LG
M	K54 200R/BK
N	X2 18DG/RD X2 18DG/RD
P	G9 20GY/BK
R	–
S	L3 14RD/OR

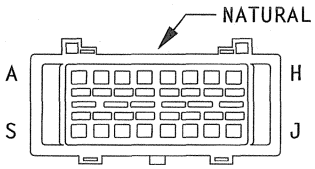


CAV	CIRCUIT
A	A21 14DB
B	–
C	C90 14LG
D	C21 14DB/OR
E	V10 20BK/RD
F	L90 18DB/RD
G	V20 18BK/WT V20 18BK/WT
H	A41 14YL/WT
J	A3 12RD/WT
K	L60 18TN L60 18TN
L	L61 18LG/RD L61 18LG/RD
M	K54 200R/BK
N	X2 18DG/RD
P	G9 20GY/BK
R	–
S	L3 16RD/OR L3 16RD/OR

C175



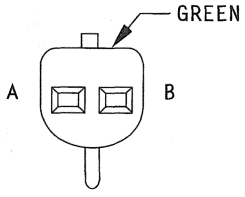
CAV	CIRCUIT
A	–
B	L50 18WT/TN
C	V30 20DB/RD
D	Z2 18BK/OR
E	G106 20BK/YL
F	G107 20BK/RD
F	G107 20BK/RD
G	B205 18VT
H	B236 18LG/YL
J	A4 12BK/RD
K	G9 20GY/WT
L	G29 20BK/TN
M	A6 18RD/BK
N	K29 18WT/PK
	K29 18WT/PK
P	G3 20BK/PK
R	G14 20PK/BK
S	A141 14DG/WT



CAV	CIRCUIT
A	V11 18BK/TN
B	L50 18WT/TN
	L50 18WT/TN
C	V30 20DB/RD
D	Z2 18BK/OR
E	G106 20BK/YL
F	G107 20BK/RD
G	B205 18VT
H	B236 18LG/YL
J	A4 12BK/RD
K	G9 18GY/BK
	G9 18GY/BK
L	G29 20TN
M	M1 18PK
N	K29 18WT/PK
P	G3 20BK/WT
R	G14 20PK/WT
S	A141 14DG/WT

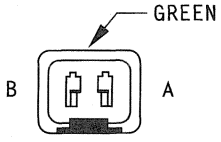
Mopar AUTHENTIC RESTORATION PRODUCT

C201
FUSE/FUSE BLOCK
(8W-10-2)



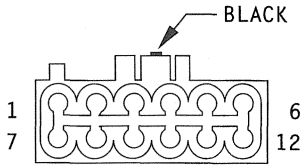
C202

CAV	CIRCUIT
A	X53 20DG
B	X55 20BR/RD

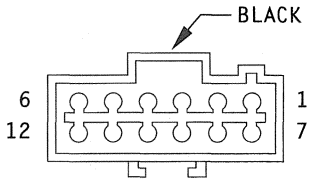


CAV	CIRCUIT
A	X53 20DG
B	X55 20BR/RD

C203



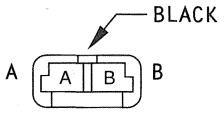
CAV	CIRCUIT
1	G4 18DB
2	K4 18LB
3	–
4	–
5	A11 12BK/GY
6	L61 18LG/RD
7	G10 18LG
8	V20 18BK/WT
9	V13 18BR/LG
10	F20 18WT
11	C15 12BK/WT
12	M1 20PK



CAV	CIRCUIT
1	G4 18DB
2	K4 18BK/LB
3	–
4	–
5	A11 12BK/GY
6	L61 18LG
7	G10 20LG/RD
8	V20 18BK/WT
9	V13 18BR/LG
10	F20 18WT
11	C15 14BK/WT
12	M1 18PK

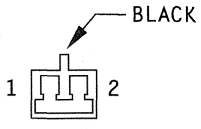
Mopar AUTHENTIC RESTORATION PRODUCT

C205



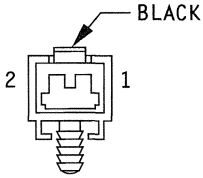
LEFT INSTRUMENT PANEL SPEAKER

CAV	CIRCUIT	FUNCTION
A	X53 20DG	LEFT FRONT SPEAKER (+)
	X53 18DG	LEFT FRONT SPEAKER (+)
B	X55 20BR/RD	LEFT FRONT SPEAKER (-)
	X55 18BR/RD	LEFT FRONT SPEAKER (-)

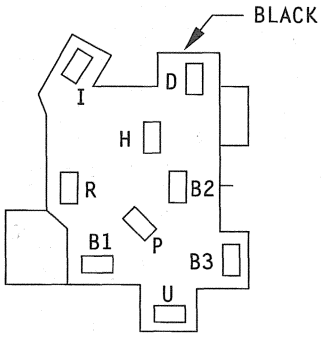


C206

CAV	CIRCUIT
1	M1 20PK
2	M2 20YL



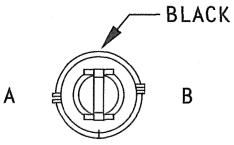
CAV	CIRCUIT
1	M1 20PK
2	M2 20YL



HEADLAMP SWITCH

C207

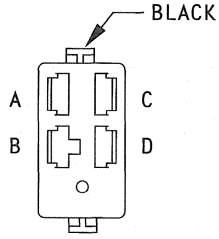
CAV	CIRCUIT	FUNCTION
B1	A3 12RD/WT	FUSED B(+)
B2	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
	L7 18BK/YL	PARK LAMP SWITCH OUTPUT
B3	G26 20LB	KEY-IN IGNITION SWITCH SENSE
D	M2 20YL	COURTESY LAMP DRIVER
H	F34 12TN/BK	FUSED B(+)
I	E2 200R/BK	FUSED PANEL LAMPS DIMMER SW SIGNAL
P	–	–
R	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
U	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT
	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT



REAR WIPER/WASHER SWITCH LAMP

C209

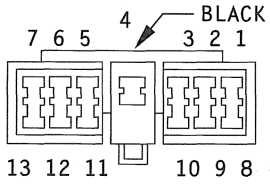
CAV	CIRCUIT	FUNCTION
A	E2 200R/BK	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
B	Z1 20BK	GROUND



REAR WIPER/ WASHER SWITCH

C210

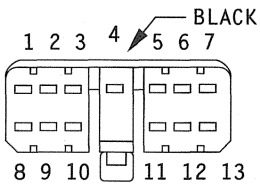
CAV	CIRCUIT	FUNCTION
A	V20 18BK/WT	REAR WASHER PUMP MOTOR CONTROL
B	V15 18LB/RD	FUSED IGNITION SWITCH OUTPUT (RUN)
C	V13 18BR/LG	REAR WIPER MOTOR CONTROL
D	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)



RADIO (FOR CIRCUIT/ FUNCTIONS SEE CONNECTOR C403) (6 SPEAKER SYSTEM)

C211

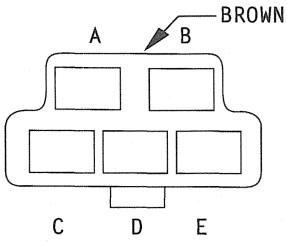
CAV	CIRCUIT
1	X51 20BR/YL
2	X53 18DG
3	–
4	M1 18PK
5	F85 18VT/WT
6	X54 18VT
7	X52 20DB/WT
8	X57 20BR/LB
9	X55 18BR/RD
10	X5 18LB/RD
11	E2 180R/BK
12	X56 18DB/RD
13	X58 20DB/OR



RADIO (2 AND 4 SPEAKER SYSTEM)

CAV	CIRCUIT
1	–
2	X51 18DG
	X53 18DG
3	–
4	M1 18PK
5	F85 18WT
6	X52 18VT
	X54 18VT
7	–
8	–
9	X55 18BR
	X57 18BR
10	X5 18LB
11	E2 180R
12	X56 18DB
	X58 18DB
13	–

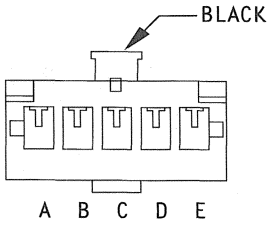
Mopar AUTHENTIC RESTORATION PRODUCT



BLOWER MOTOR SWTICH

C212

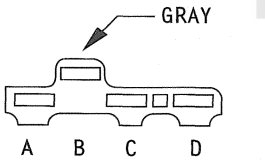
CAV	CIRCUIT	FUNCTION
A	C4 12TN	LOW MOTOR BLOWER DRIVER
B	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
C	C43 12YL/BR	A/C-HEATER CONTROL SWITCH SIGNAL
D	C6 12LB	M2 BLOWER MOTOR DRIVER
E	–	–



A/C HEATER CONTROL SWITCH

C213

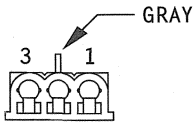
CAV	CIRCUIT	FUNCTION
A	C90 14LG	A/C SELECT SIGNAL
	C90 14LG	A/C SELECT SIGNAL
B	C7 12BK/TN	HIGH BLOWER MOTOR DRIVER
C	–	–
D	C7 12BK/TN	HIGH BLOWER MOTOR DRIVER
E	C43 12YL/BR	A/C-HEATER CONTROL SWITCH SIGNAL



BLOWER MOTOR RESISTOR BLOCK

C214

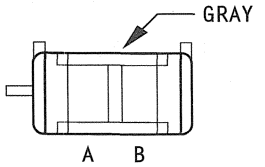
CAV	CIRCUIT	FUNCTION
A	C6 12LB	M2 BLOWER MOTOR DRIVER
B	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
	C1 12DG	BLOWER MOTOR SWITCH OUTPUT
C	C4 12TN	LOW BLOWER MOTOR DRIVER
D	C43 12YL/BR	A/C-HEATER CONTROL SWITCH SIGNAL



A/C CYCLING SWITCH

C215

CAV	CIRCUIT	FUNCTION
1	C21 14DB/OR	A/C SWITCH SENSE
2	C90 14LG	A/C SELECT SIGNAL
3	Z1 16BK	GROUND

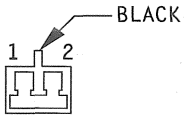


GLOVE BOX LAMP

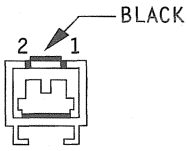
C216

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	Z1 18BK	GROUND

C217

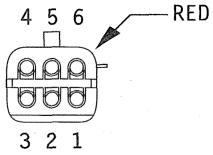


CAV	CIRCUIT
1	M1 20PK
	M1 20PK
2	M2 20YL

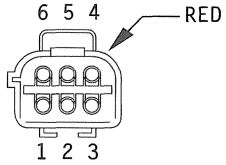


CAV	CIRCUIT
1	M1 20PK
2	M2 20YL

C218

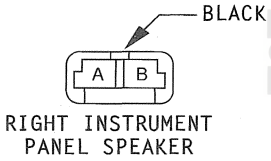


CAV	CIRCUIT
1	M2 20YL
2	M1 20PK
3	Z1 20BK
4	–
5	–
6	–



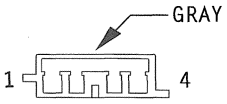
CAV	CIRCUIT
1	M2 20YL
2	M1 20PK
3	Z1 20BK
4	M9 20DB/OR
5	F87 20WT/BK
	F87 20WT/BK
6	–

C219

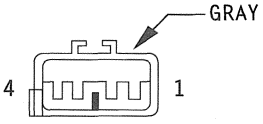


CAV	CIRCUIT	FUNCTION
A	X54 20VT	RIGHT FRONT SPEAKER (+)
	X54 18VT	RIGHT FRONT SPEAKER (+)
B	X56 20DB/RD	RIGHT FRONT SPEAKER (–)
	X56 18DB/RD	RIGHT FRONT SPEAKER (–)

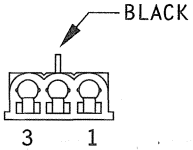
C220



CAV	CIRCUIT
1	X51 20BR/YL
2	X52 20DB/WT
3	X57 20BR/LB
4	X58 20DB/OR

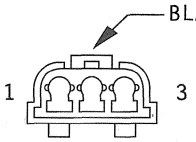


CAV	CIRCUIT
1	X51 20BR/YL
2	X52 20DB/WT
3	X57 20BR/LB
4	X58 20DB/OR

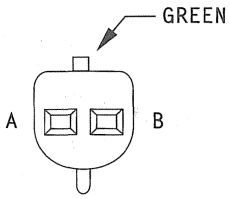


C221

CAV	CIRCUIT
1	M2 20YL
2	-
3	Z1 20BK

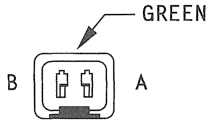


CAV	CIRCUIT
1	M2 18YL
2	-
3	Z1 18BK

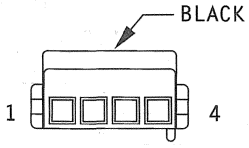


C222

CAV	CIRCUIT
A	X54 20VT
B	X56 20DB/RD



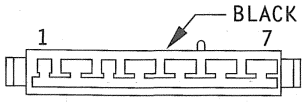
CAV	CIRCUIT
A	X54 20VT
B	X56 20DB/RD



KEY-IN SWITCH/HALO LAMP

C223

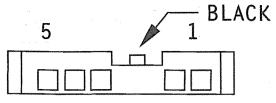
CAV	CIRCUIT	FUNCTION
1	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT
2	G26 20LB	KEY-IN IGNITION SWITCH SENSE
3	M50 20YL/RD	KEY-IN LAMP DRIVER
4	Z1 18BK	GROUND



IGNITION SWITCH

C224

CAV	CIRCUIT	FUNCTION
1	A41 14YL/WT	FUSED IGNITION SWITCH OUTPUT (START)
2	A21 14DB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
3	G9 20GY/BK	BRAKE WARNING LAMP DRIVER
4	A1 12RD	FUSED B(+)
5	A38 12OR	FUSED IGNITION SWITCH OUTPUT (RUN)
6	A48 12VT	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
7	A1 12RD	FUSED B(+)

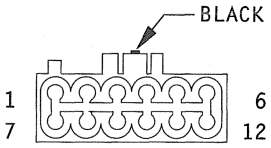


VEHICLE SPEED CONTROL/HORN SWITCHES

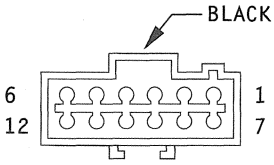
C225

CAV	CIRCUIT	FUNCTION
1	V32 20YL/RD	12 VOLT SUPPLY
2	–	–
3	K4 18LB	SENSOR GROUND
4	V33 20WT/LG	VEHICLE SPEED CONTROL RESUME SWITCH SENSE
5	X3 20BK/RD	HORN RELAY CONTROL

C226

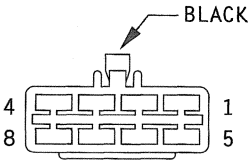


CAV	CIRCUIT
1	L60 18TN
2	L90 18DB/RD
3	L10 18BR/LG
4	M2 20YL
5	–
6	L50 18WT/TN
7	E2 200R/BK
8	Z1 14BK
9	G4 20DB
10	A141 14DG/WT
11	P38 180R/WT
12	G9 18GY/BK

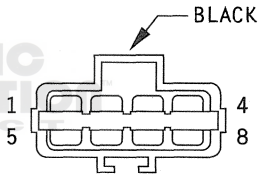


CAV	CIRCUIT
1	L60 18TN
2	L90 18DB/RD
3	L10 18BR/LG
4	M2 18YL
	M2 18YL
5	L35 18BR/WT
6	L50 18WT/TN
7	E2 200R
8	Z1 14BK
9	G4 20DB
10	A241 14DG/TN
11	P38 200R/WT
12	G9 20GY/BK

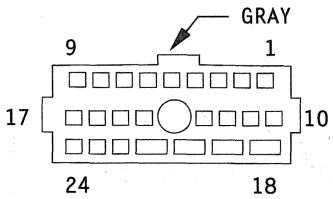
C227



CAV	CIRCUIT
1	P2 18BK/WT
2	P34 18PK/BK
3	P35 200R/VT
4	P36 20PK/VT
5	F81 12TN
6	P60 20BR/WT
7	Z1 14BK
8	–



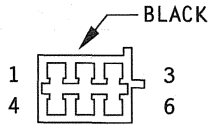
CAV	CIRCUIT
1	P2 18BK/WT
	P2 18BK/WT
2	P34 18PK/BK
	P34 18PK/BK
3	P35 200R/VT
	P35 200R/VT
4	P36 20PK/VT
	P36 20PK/VT
5	F81 12TN
6	P60 20BR/WT
7	Z1 14BK
8	G68 20PK/OR



MULTI-FUNCTION SWITCH

C228

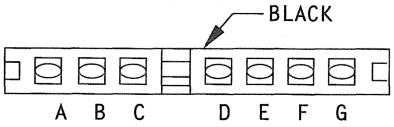
CAV	CIRCUIT	FUNCTION
1	V50 18LG	WIPER SWITCH DELAY OUTPUT
2	V51 18WT	INTERMITTENT WIPER DELAY
3	V11 18BK/TN	LOW WASHER FLUID SENSE
4	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
5	V4 16RD/YL	WIPER SWITCH HIGH SPEED OUTPUT
6	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
7	V6 18DB	WIPER MOTOR PARK SIGNAL
8	–	–
9	–	–
10	–	–
11	L60 18TN	RIGHT TURN SIGNAL
12	L60 18TN	RIGHT TURN SIGNAL
13	L12 18VT/TN	COMBINATION FLASHER OUTPUT (HAZARD SIGNAL)
14	–	–
15	L61 18LG/RD	LEFT TURN SIGNAL
16	L61 18LG/RD	LEFT TURN SIGNAL
17	L5 18BK/WT	COMBINATION FLASHER OUTPUT (TURN SIGNALS)
18	L4 14VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
19	F34 12TN/BK	FUSED B(+)
20	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
21	L11 16PK/LG	FLASH TO PASS



STOP LAMP SWITCH

C229

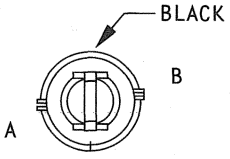
CAV	CIRCUIT	FUNCTION
1	V32 20YL/RD	12 VOLT SUPPLY
	V32 20YL/RD	12 VOLT SUPPLY
2	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
3	K29 18WT/PK	STOP LAMP SWITCH SENSE
	K29 18WT/PK	STOP LAMP SWITCH SENSE
4	V30 20DB/RD	VEHICLE SPEED CONTROL BRAKE SWITCH OUTPUT
5	L9 18BK/WT	FUSED B(+)
6	Z1 18BK	GROUND



INTERMITTENT WIPER CONTROL MODULE

C230

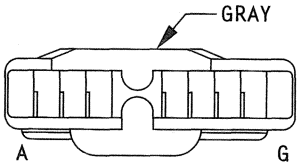
CAV	CIRCUIT	FUNCTION
A	V51 18WT	INTERMITTENT WIPER DELAY
B	V11 18BK/TN	LOW WASHER FLUID SENSE
C	V4 16RD/YL	WIPER SWITCH HIGH SPEED OUTPUT
D	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
E	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
F	V6 18DB	WIPER MOTOR PARK SIGNAL
G	V50 18LG	WIPER SWITCH DELAY OUTPUT



A/C-HEATER CONTROL ILLUMINATION LAMP

C231

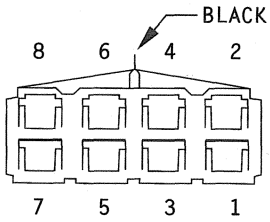
CAV	CIRCUIT	FUNCTION
A	E2 20OR/BK	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
B	Z1 16BK	GROUND



WIPER/WASHER SWITCH (STANDARD) OR INTERMITTENT WIPER CONTROL MODULE

C232

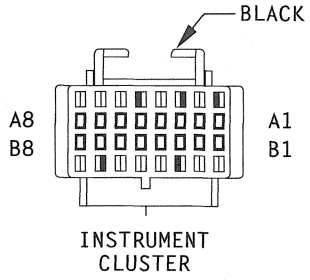
CAV	CIRCUIT	FUNCTION
A	–	–
B	V10 20BK/RD	LOW WASHER FLUID SENSE
C	V4 18RD/YL	WIPER SWITCH HIGH SPEED OUTPUT
D	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
	F86 18LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
E	V3 18BR/WT	WIPER SWITCH LOW SPEED OUTPUT
F	V55 18TN/RD	WIPER MOTOR PARK SIGNAL
G	Z1 18BK	GROUND



HEADLAMP DELAY MODULE

C233

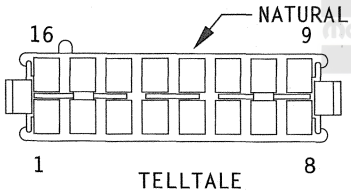
CAV	CIRCUIT	FUNCTION
1	–	–
2	X4 16GY/OR	FUSED B(+)
	X4 16GY/OR	FUSED B(+)
3	–	–
4	Z1 18BK	GROUND
5	–	–
6	F34 12TN/BK	HEADLAMP SWITCH OUTPUT
7	–	–
8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)



INSTRUMENT CLUSTER

C234

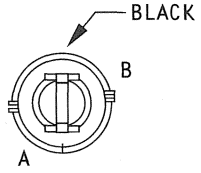
CAV	CIRCUIT	FUNCTION
A1	G20 18WT/TN	ECT GAUGE SENSOR SIGNAL
A2	L61 18LG/RD	LEFT TURN SIGNAL
A3	Z1 20BK	GROUND
A4	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
A5	G21 20GY/LB	TACHOMETER SIGNAL
A6	E2 200R/BK	FUSED PANEL LAMPS DIMMER SW SIGNAL
A7	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (START)
A8	–	–
B1	G4 20DB	FUEL LEVEL SENSOR SIGNAL
B2	Z2 18BK/OR	GROUND
B3	–	–
B4	–	–
B5	–	–
B6	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL
B7	L60 18TN	RIGHT TURN SIGNAL
B8	G6 20GY	ENGINE OIL PRESSURE SWITCH SENSE



TELLTALE CONNECTOR

C235

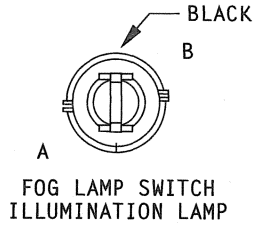
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
	Z1 18BK	GROUND
2	G11 20WT/OR	SEAT BELT WARNING LAMP DRIVER
3	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
4	G14 20PK/WT	GENERATOR LAMP DRIVER
5	G107 20BK/RD	4WD LOCK
6	G106 20BK/YL	4WD FULL TIME
7	–	–
8	–	–
9	G9 18GY/BK	BRAKE WARNING LAMP DRIVER
10	K54 200R/BK	NOT USED
11	B205 18VT	ABS WARNING LAMP DRIVER
13	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
14	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
15	G3 20BK/WT	MALFUNCTION INDICATOR LAMP DRIVER
16	G29 20TN	WASHER FLUID SWITCH SENSE



REAR WINDOW DEFOGGER SWITCH ILLUMINATION LAMP

C236

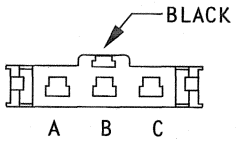
CAV	CIRCUIT	FUNCTION
A	E2 200R/BK	FUSED PANEL LAMPS DIMMER SIGNAL
B	Z1 20BK	GROUND



FOG LAMP SWITCH
ILLUMINATION LAMP

C237

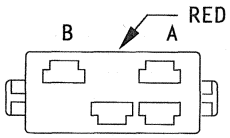
CAV	CIRCUIT	FUNCTION
A	E2 20OR/BK	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
B	Z1 20BK	GROUND



FOG LAMP
SWITCH

C238

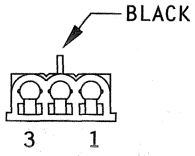
CAV	CIRCUIT	FUNCTION
A	L39 16LB	FOG LAMP SWITCH OUTPUT
B	L35 16BR	FOG LAMP SWITCH CONTROL
C	Z1 20BK	GROUND
	Z1 20BK	GROUND



REAR WINDOW
DEFOGGER SWITCH

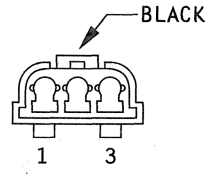
C239

CAV	CIRCUIT	FUNCTION
A	–	–
B	C15 12BK/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
C	Z1 20BK	GROUND
	Z1 20BK	GROUND
D	C80 18DB/WT	REAR WINDOW DEFOGGER RELAY CONTROL

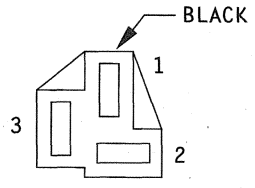


C240

CAV	CIRCUIT
1	M2 20YL
2	G26 20LB
	G26 20LB
3	Z1 20BK



CAV	CIRCUIT
1	M2 18YL
2	M2 18YL
3	Z1 18BK



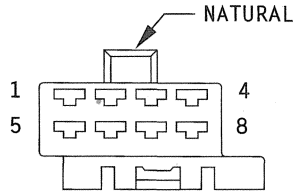
TIME DELAY
RELAY

C241

CAV	CIRCUIT	FUNCTION
1	M50 20YL/RD	KEY-IN LAMP DRIVER
2	M1 20PK	FUSED B(+)
	M1 20PK	FUSED B(+)
3	M2 20YL	COURTESY LAMP DRIVER

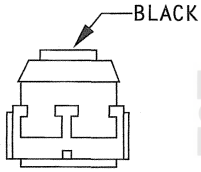
C242
RELAY BANK
(8W-11-16)

C243



BUZZER MODULE

CAV	CIRCUIT	FUNCTION
1	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (RUN/START)
2	G11 20WT/OR	SEAT BELT WARNING LAMP DRIVER
3	Z1 18BK	GROUND
	Z1 14BK	GROUND
4	G10 18LG	SEAT BELT SWITCH SENSE
5	–	–
6	M11 20PK/LB	COURTESY LAMP SWITCH OUTPUT
7	L7 18BK/YL	PARK LAMP SW OUTPUT
8	–	–

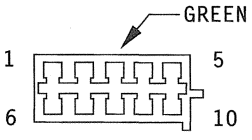


SHIFT INTERLOCK

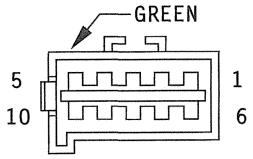
C244

CAV	CIRCUIT	FUNCTION
1	K29 18WT/PK	STOP LAMP SWITCH SENSE
2	F87 20WT/BK	FUSED IGNITION SW OUTPUT (RUN/START)

C301

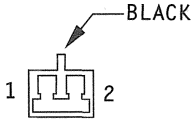


CAV	CIRCUIT
1	P38 20OR/WT
2	–
3	Q17 14DB/WT
4	Q27 14RD/BK
5	P2 18BK/WT
	P2 18BK/WT
6	P34 18PK/BK
	P34 18PK/BK
7	Z1 14BK
8	Q1 14YL
9	–
10	C15 16BK/WT

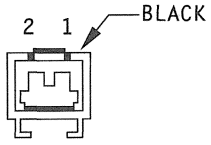


CAV	CIRCUIT
1	P38 20OR/WT
2	–
3	Q17 14DB/WT
4	Q27 14RD/BK
5	P2 18BK/WT
6	P34 18PK/BK
7	Z1 14BK
8	Q1 14YL
9	–
10	C15 14BK/WT

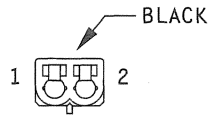
C302



CAV	CIRCUIT
1	E2 20OR
2	Z1 20BK

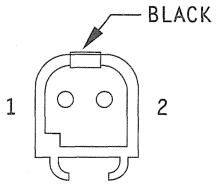


CAV	CIRCUIT
1	E2 20OR
	E2 20OR
2	Z1 20BK
	Z1 20BK

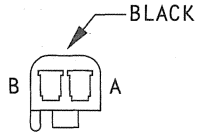


C303

CAV	CIRCUIT
1	A11 14RD
2	Z1 14BK



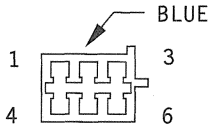
CAV	CIRCUIT
1	A11 12BK/GY
2	Z1 14BK



SEAT BELT SWITCH

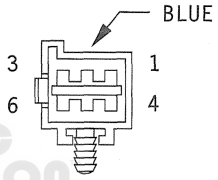
C304

CAV	CIRCUIT	FUNCTION
A	G10 20LG/RD	SEAT BELT SWITCH SENSE
B	Z1 20BK	GROUND

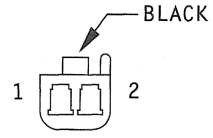


C305

CAV	CIRCUIT
1	L35 18BR/WT
	L35 18BR/WT
2	Z1 18BK
3	L60 18TN
	L60 18TN
4	L10 18BR/LG
	L10 18BR/LG
5	L90 18DB/RD
	L90 18DB/RD
6	L50 18WT/TN
	L50 18WT/TN

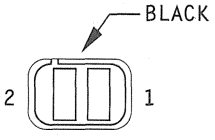


CAV	CIRCUIT
1	L35 18BR/WT
2	Z1 18BK
3	L60 18TN
4	L10 20BR/LG
5	L90 18DB/RD
	L90 18DB/RD
6	L50 18WT/TN

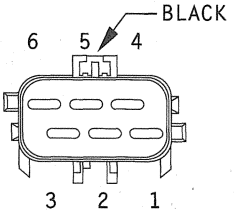


C306

CAV	CIRCUIT
1	M2 18YL
2	Z1 18BK



CAV	CIRCUIT
1	M2 18YL
2	Z1 18BK

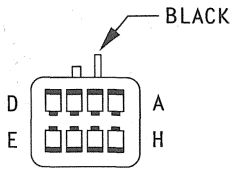


FUEL PUMP MODULE

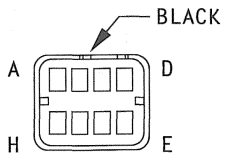
C307

CAV	CIRCUIT	FUNCTION
1	A241 14DG/TN	FUEL PUMP RELAY OUTPUT
2	K4 18BK/LB	SENSOR GROUND
3	G4 18DB	FUEL LEVEL SENSOR SIGNAL
4	–	–
5	G4 18DB	LOW FUEL SENSE
6	Z1 14BK	GROUND

C308

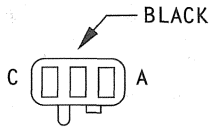


CAV	CIRCUIT
A	P2 18BK/WT**
B	P34 18PK/BK**
C	M4 20VT/YL
D	L50 18WT/TN
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 20DB/RD

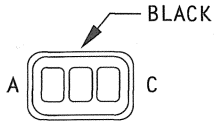


CAV	CIRCUIT
A	P2 18BK/WT**
B	P34 18PK/BK**
C	M4 20VT/YL
D	L50 18WT/TN
E	V13 18BR/LG
F	F20 18WT
G	V20 18BK/WT
H	L90 18DB/RD

C309

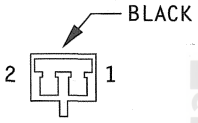


CAV	CIRCUIT
A	M1 20PK
B	M2 20YL
C	G71 20VT/YL

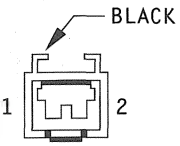


CAV	CIRCUIT
A	M1 18PK
B	M2 18YL
C	M4 20VT/YL

C310



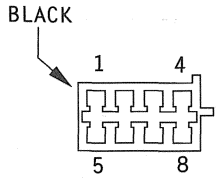
CAV	CIRCUIT
1	B40 14LB
2	–



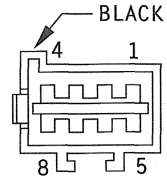
CAV	CIRCUIT
1	B40 14DB
2	–

Mopar AUTHENTIC RESTORATION PRODUCT

C311

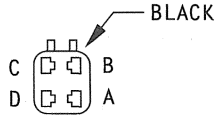


CAV	CIRCUIT
1	L35 18BR/WT
1	L36 18LG/BK*
2	Z1 18BK Z1 20BK*
2	Z1 18BK
3	L61 18LG
	L61 18LG*
4	L10 20BR/LG
	L10 18BR/LG*
5	L90 18DB/RD
	L90 18DB/RD*
6	L50 18WT/TN
	L50 18WT/TN
6	L50 18WT/TN*
7	A11 14BK/GY
8	L60 18TN

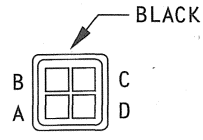


CAV	CIRCUIT
1	L36 18LG/BK*
2	Z1 18BK
2	Z1 16BK*
3	L60 18TN
3	L61 18LG*
4	L10 18BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
	L50 18WT/TN*
7	A11 14RD*
8	L60 18TN*

C312

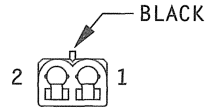


CAV	CIRCUIT
A	X58 20DB/OR
B	X52 20DB/WT
C	X57 20BR/LB
D	X51 20BR/YL



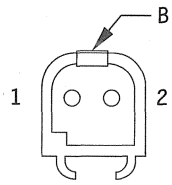
CAV	CIRCUIT
A	X58 20DB/OR
B	X52 20DB/WT
C	X57 20BR/LB
D	X51 20BR/YL

* WITH TRAILER TOW
** WITH POWER DOOR LOCKS

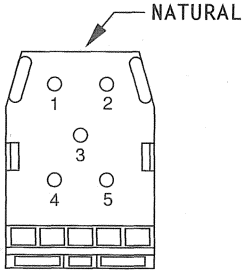


C313

CAV	CIRCUIT
1	C15 14BK/RD
2	Z1 14BK



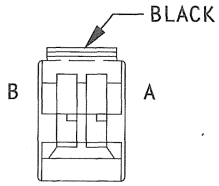
CAV	CIRCUIT
1	C15 14BK/WT
2	Z1 12BK



LEFT REAR POWER WINDOW SWITCH

C314

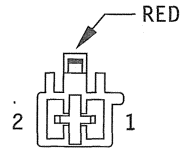
CAV	CIRCUIT	FUNCTION
1	Q12 14BR	LEFT REAR POWER WINDOW MOTOR UP CONTROL
2	Q27 14RD/BK	LEFT REAR POWER WINDOW UP CONTROL
3	Q1 14YL	LEFT FRONT DOOR POWER LOCK/WINDOW SW OUTPUT
4	Q17 14DB/WT	LEFT REAR POWER WINDOW MOTOR DOWN CONTROL
5	Q22 14VT	LEFT REAR POWER WINDOW MOTOR DOWN CONTROL



LEFT REAR POWER DOOR LOCK MOTOR

C315

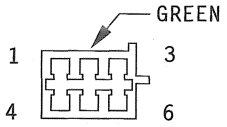
CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT



LEFT REAR WINDOW MOTOR

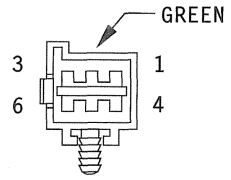
C316

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL
2	Q12 14BR	POWER WINDOW MOTOR UP CONTROL

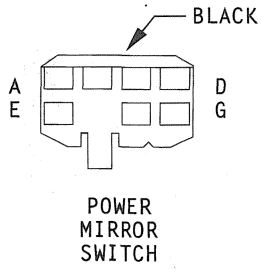


C317

CAV	CIRCUIT
1	M2 18YL
	M2 18YL
2	E2 20OR
3	G4 18DB
4	A241 14DG/TN
5	P38 20OR/WT
6	G9 20GY/BK



CAV	CIRCUIT
1	M2 18YL
2	E2 20OR
3	G4 20DB
4	A241 14DG/TN
5	P38 20OR/WT
6	G9 20GY/BK

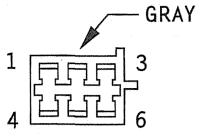


POWER
MIRROR
SWITCH

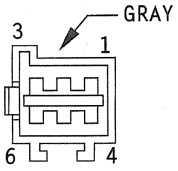
C319

CAV	CIRCUIT	FUNCTION
A	P80 20YL	POWER MIRROR LEFT/RIGHT UP CONTROL
B	P81 20DB	POWER MIRROR LEFT/RIGHT LEFT CONTROL
C	P77 20WT/BK	POWER MIRROR LEFT/RIGHT RIGHT CONTROL
D	P78 20YL/LG	POWER MIRROR LEFT/RIGHT DOWN CONTROL
E	P79 20DB/LB	POWER MIRROR CONTROL
F	Z1 14BK	GROUND
G	P60 20BR/WT	FUSED B(+)

C320



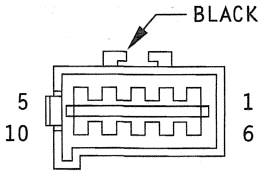
CAV	CIRCUIT
1	P2 18PK/WT
2	P34 18PK/BK
3	–
4	Q18 14GY/BK
5	Q28 14DG/WT
6	Q1 14YL



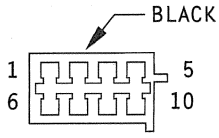
CAV	CIRCUIT
1	P2 18BK/WT
2	P34 18PK/BK
3	–
4	Q18 14GY/BK
5	Q28 14DG/WT
6	Q1 14YL

Mopar AUTHENTIC RESTORATION PRODUCT

C321



CAV	CIRCUIT
1	P38 20OR/WT
2	P35 20OR/VT
3	P36 20PK/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	–
7	P80 20YL
8	P81 20DB
9	P79 20DB/LB
10	C15 16BK/WT

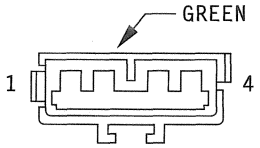


CAV	CIRCUIT
1	P38 14OR/WT
2	P35 14OR/VT
3	P36 14PK/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	–
7	P78 20YL/LG
8	P77 20WT/BK
9	P79 20DB/LB
10	C15 16BK/WT

C322

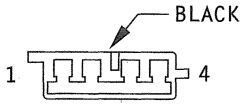
(NO MATING CONNECTOR)

CAV	CIRCUIT
1	–
2	–
3	–
4	–



CAV	CIRCUIT
1	G68 20PK/OR
2	P35 20OR/VT
3	P36 20PK/VT
4	–

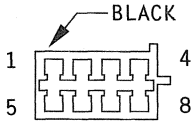
C323



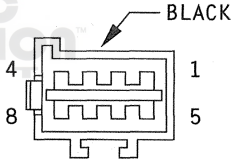
REAR WIPER MOTOR

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	V20 18BK/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
3	V13 18BR/RD	REAR WIPER MOTOR CONTROL
4	F20 18WT	FUSED IGNITION SWITCH OUTPUT (RUN)

C324

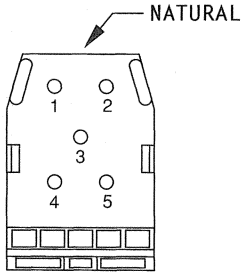


CAV	CIRCUIT
1	L35 18BR/WT
2	Z1 18BK
3	L60 18TN
4	L10 18BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	–
8	–



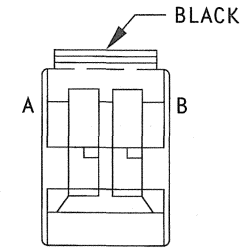
CAV	CIRCUIT
1	–
2	Z1 18BK
3	L60 18TN
4	L10 18BR/LG
5	L90 18DB/RD
6	L50 18WT/TN
7	–
8	–

C325



RIGHT REAR POWER WINDOW SWITCH

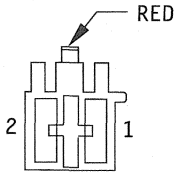
CAV	CIRCUIT	FUNCTION
1	Q12 14BR	RIGHT REAR POWER WINDOW MOTOR UP CONTROL
2	Q28 14DG/WT	LT FRT DOOR PWR LOCK/WINDOW SW RT REAR UP CNTRL
3	Q1 14YL	LEFT FRONT DOOR POWER LOCK/WINDOW SWITCH OUTPUT
4	Q18 14GY/BK	RIGHT REAR POWER WINDOW DOWN CONTROL
5	Q22 14VT	RIGHT REAR POWER WINDOW MOTOR DOWN CONTROL



RIGHT REAR
POWER DOOR LOCK
MOTOR

C326

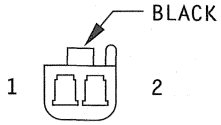
CAV	CIRCUIT	FUNCTION
A	P2 18PK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT



RIGHT REAR
WINDOW
MOTOR

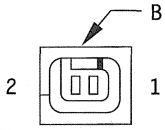
C327

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL
2	Q12 14BR	POWER WINDOW MOTOR UP CONTROL

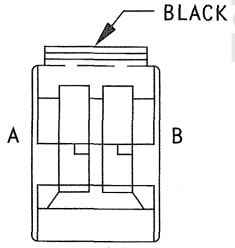


C328

CAV	CIRCUIT
1	M2 18YL
2	Z1 18BK



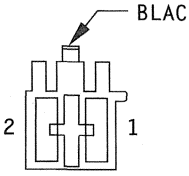
CAV	CIRCUIT
1	M2 18YL
2	Z1 18BK



RIGHT FRONT
POWER DOOR LOCK
MOTOR

C329

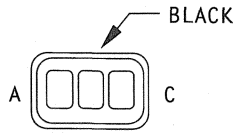
CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT



RIGHT FRONT
WINDOW
MOTOR

C331

CAV	CIRCUIT	FUNCTION
1	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL
2	Q12 14BR	POWER WINDOW MOTOR UP CONTROL

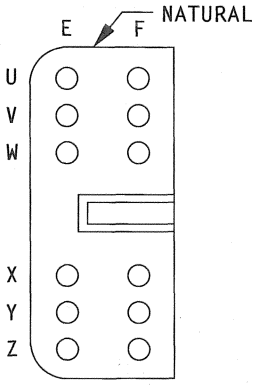


RIGHT POWER
MIRROR

C332

CAV	CIRCUIT	FUNCTION
A	P80 20YL	RIGHT POWER MIRROR UP/DOWN CONTROL
B	P77 20WT/BK	RIGHT POWER MIRROR RIGHT/LEFT CONTROL
C	P79 20DB/LB	GROUND

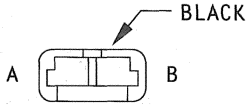
Mopar AUTHENTIC RESTORATION PRODUCT



LEFT FRONT POWER DOOR LOCK/WINDOW SWITCH

C333

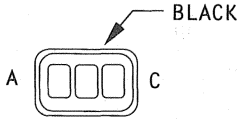
CAV	CIRCUIT	FUNCTION
UE	–	–
UF	Q16 14BR/WT	LEFT FRONT POWER WINDOW UP CONTROL
VE	Q21 14WT	LEFT FRONT POWER WINDOW MOTOR UP CONTROL
VF	Q11 14LB	LEFT FRONT POWER WINDOW MOTOR DOWN CONTROL
WE	Q26 14VT/WT	LEFT FRONT POWER WINDOW DOWN CONTROL
WF	Q1 14YL	RT FRT DOOR POWER LOCK/WINDOW SWITCH OUTPUT
XE	P38 14OR/WT	DOOR LOCK RELAY CONTROL
XF	–	–
YE	P36 14PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
YF	P35 14OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
ZE	–	–
ZF	–	–



RIGHT FRONT DOOR SPEAKER

C334

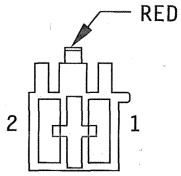
CAV	CIRCUIT	FUNCTION
A	X54 20VT	RIGHT FRONT DOOR SPEAKER (+)
B	X56 20DB/RD	RIGHT FRONT DOOR SPEAKER (-)



LEFT POWER MIRROR

C335

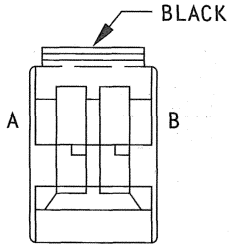
CAV	CIRCUIT	FUNCTION
A	P78 20YL/LG	LT POWER MIRROR UP/DOWN CONTROL
B	P77 20WT/BK	LT POWER MIRROR LEFT/RIGHT CONTROL
C	P79 20DB/LB	GROUND



LEFT FRONT WINDOW MOTOR

C336

CAV	CIRCUIT	FUNCTION
1	Q21 14WT	LEFT FRONT POWER WINDOW MOTOR UP CONTROL
2	Q11 14LB	LEFT FRONT POWER WINDOW MOTOR DOWN CONTROL

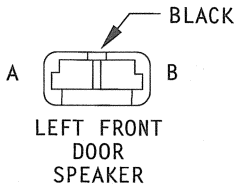


LEFT FRONT POWER DOOR LOCK MOTOR

C338

CAV	CIRCUIT	FUNCTION
A	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
B	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT

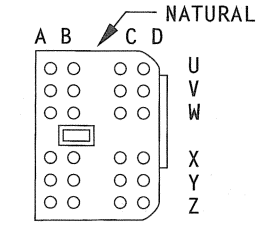
Mopar RESTORATION PRODUCT



LEFT FRONT DOOR SPEAKER

C339

CAV	CIRCUIT	FUNCTION
A	X53 20DG	LEFT FRONT DOOR SPEAKER (+)
B	X55 20BR/RD	LEFT FRONT DOOR SPEAKER (-)

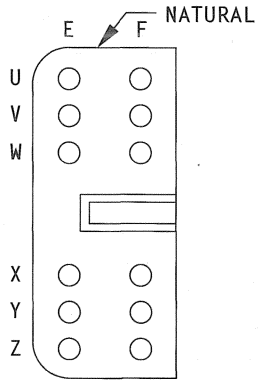


RIGHT FRONT POWER DOOR LOCK/ WINDOW SWITCH

C340

CAV	CIRCUIT	FUNCTION
UA	–	–
UB	–	–
UC	–	–
UD	–	–
VA	Q1 14YL	RT FT DR POWER LOCK/WINDOW SWITCH OUTPUT
VB	F81 14TN	FUSED IGNITION SWITCH OUTPUT (RUN)
VC	Q28 14DG/WT	RIGHT REAR POWER WINDOW DOWN CONTROL
VD	Q18 14GY/BK	RIGHT REAR POWER WINDOW UP CONTROL
WA	–	–
WB	–	–
WC	Z1 14BK	GROUND
WD	–	–
XA	P38 14OR/WT	DOOR LOCK RELAY CONTROL
XB	–	–
XC	–	–
XD	–	–
YA	P36 14PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
YB	P35 14OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
YC	Q22 14VT	POWER WINDOW MOTOR DOWN CONTROL
YD	Q12 14BR	POWER WINDOW MOTOR UP CONTROL
ZA	–	–
ZB	–	–
ZC	–	–
ZD	–	–

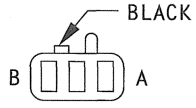
Mopar RESTORATION PROJECT



RIGHT FRONT POWER DOOR/LOCK WINDOW SWITCH

C341

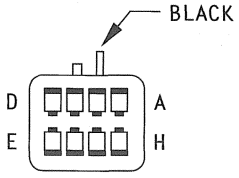
CAV	CIRCUIT	FUNCTION
UE	–	–
UF	–	–
VE	Q27 14RD/BK	LEFT REAR POWER WINDOW UP CONTROL
VF	Q17 14DB/WT	LEFT REAR POWER WINDOW DOWN CONTROL
WE	–	–
WF	–	–
XE	–	–
XF	–	–
YE	Q26 14VT/WT	LT FRT PWR WINDOW DOWN CONTROL
YF	Q16 14BR/WT	LT FRT PWR WINDOW UP CONTROL
ZE	–	–
ZF	–	–



DOME/READING LAMPS

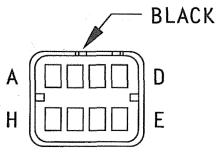
C344

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	M2 20YL	COURTESY LAMP SWITCH OUTPUT
C	Z1 20BK	GROUND



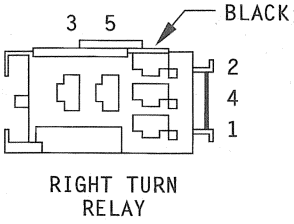
C345

CAV	CIRCUIT
A	M4 20VT/YL
B	L50 18WT/TN
C	P2 18BK/WT*
D	P34 18PK/BK*
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 20DB/RD



CAV	CIRCUIT
A	M4 20VT/YL
B	L50 18WT/TN
C	P2 18BK/WT*
D	P34 18PK/BK*
E	V13 18BR/RD
F	F20 18WT
G	V20 18BK/YL
H	L90 20DB/RD

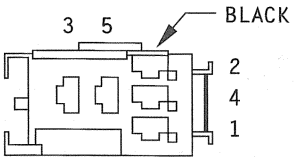
* WITH POWER LOCKS



RIGHT TURN RELAY

C346

CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	Z1 20BK	GROUND
3	L60 18TN	RIGHT TURN SIGNAL
4	L495 18PK	STOP LAMP RELAY OUTPUT
5	L494 18DG	STOP LAMP RELAY OUTPUT

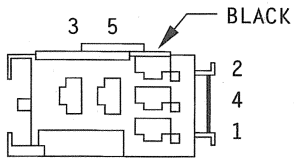


LEFT TURN RELAY

C347

CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	Z1 20BK	GROUND
3	L61 18LG	LEFT TURN SIGNAL
4	L495 18PK	STOP LAMP RELAY OUTPUT
	L495 18PK	STOP LAMP RELAY OUTPUT
5	L494 18DG	STOP LAMP RELAY OUTPUT
	L494 18DG	STOP LAMP RELAY OUTPUT

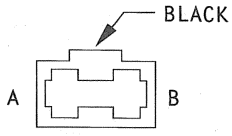
Mopar AUTHENTIC RESTORATION PRODUCT



STOP LAMP RELAY

C348

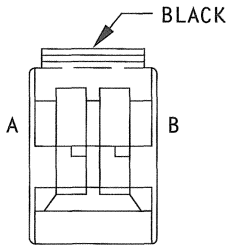
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND
3	A11 18RD/BK	GENERATOR OUTPUT
4	L494 18DG	STOP LAMP RELAY OUTPUT
5	L495 18PK	STOP LAMP RELAY OUTPUT



IN-LINE CIRCUIT BREAKER

C349

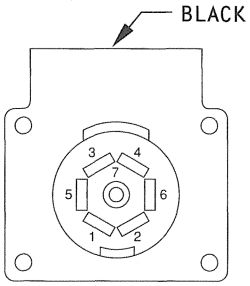
CAV	CIRCUIT	FUNCTION
A	A11 14RD	GENERATOR OUTPUT
B	A11 18RD/BK	GENERATOR OUTPUT



LIFTGATE
LOCK
MOTOR

C350

CAV	CIRCUIT	FUNCTION
A	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT
B	P2 18BK/WT	DOOR LOCK RELAY OUTPUT

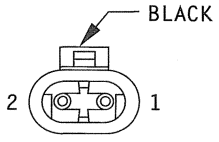


TRAILER TOW
CONNECTOR

C351

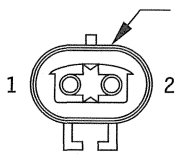
CAV	CIRCUIT	FUNCTION
1	Z1 16BK	GROUND
2	B40 14LB	ELECTRIC BRAKE FEED
3	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
4	A11 14RD	GENERATOR OUTPUT
5	L61 18LG	LEFT TURN SIGNAL
6	L60 18TN	RIGHT TURN SIGNAL
7	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT

Mopar AUTHENTIC RESTORATION PRODUCT

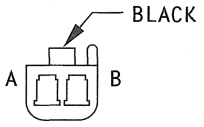


C352

CAV	CIRCUIT
1	A11 14RD
2	Z1 14BK

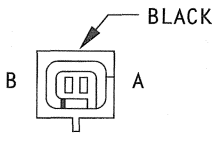


CAV	CIRCUIT
1	F35 14RD
2	Z1 14BK

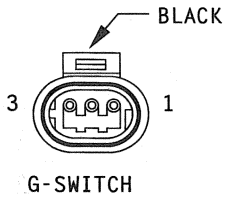


C353

CAV	CIRCUIT
A	L50 18WT/TN
B	Z1 20BK



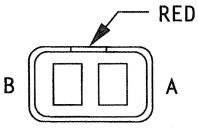
CAV	CIRCUIT
A	L50 18WT/TN
B	Z1 20BK



G-SWITCH

C354

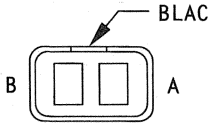
CAV	CIRCUIT	FUNCTION
1	B517 18PK/OR	G-SWITCH GROUND
2	B515 18YL/VT	G-SWITCH NO. 1 SENSE
3	B516 18TN/WT	G-SWITCH NO. 2 SENSE



RIGHT REAR WHEEL SPEED SENSOR

C355

CAV	CIRCUIT	FUNCTION
A	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR (+)
B	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)

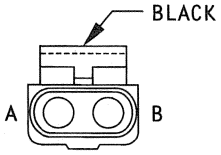


LEFT REAR WHEEL SPEED SENSOR

C356

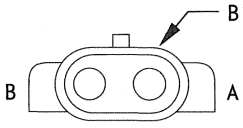
CAV	CIRCUIT	FUNCTION
A	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
B	B4 18LG	LEFT REAR WHEEL SPEED SENSOR (+)

Mopar AUTHENTIC RESTORATION PRODUCT

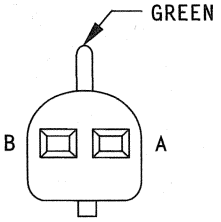


C357

CAV	CIRCUIT
A	G107 18BK/RD
B	G106 18GY/YL

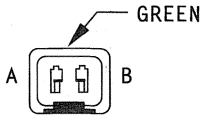


CAV	CIRCUIT
A	G107 20BK/RD
B	G106 20GY/YL



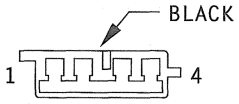
C358

CAV	CIRCUIT
A	L90 20DB/RD
B	Z1 20BK

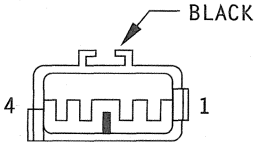


CAV	CIRCUIT
A	L90 20DB/RD
B	Z1 20BK

C359

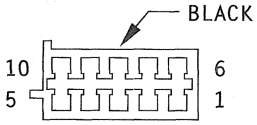


CAV	CIRCUIT
1	Q1 14YL
2	Q16 14BR/WT
3	Q26 14VT/WT
4	Z1 16BK

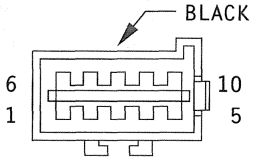


CAV	CIRCUIT
1	Q1 14YL
2	Q16 14BR/WT
3	Q26 14VT/WT
4	Z1 14BK

C360



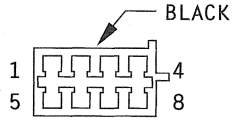
CAV	CIRCUIT
1	Q16 14BR/WT
2	Q26 14VT/WT
3	F81 14TN
4	Q1 14YL
5	Q18 14GY/BK
6	Q17 14DB/WT
7	Q28 14DG/WT
8	Q27 14RD/BK
9	P38 14OR/WT
10	Z1 14BK



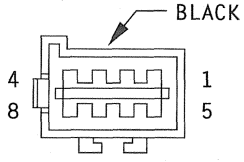
CAV	CIRCUIT
1	Q16 14BR/WT
2	Q26 14VT/WT
3	F81 12TN
4	Q1 14YL
5	Q18 14GY/BK
6	Q17 14DB/WT
7	Q28 14DG/WT
8	Q27 14RD/BK
9	P38 20OR/WT
	P38 20OR/WT
10	Z1 14BK

Mopar AUTHENTIC RESTORATION PRODUCT

C361

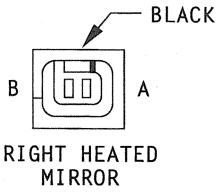


CAV	CIRCUIT
1	P79 20DB/LB
2	P77 20WT/BK
3	P35 14OR/VT
4	P2 18BK/WT
5	P34 18PK/BK
6	P36 14PK/VT
7	P80 20YL
8	C15 16BK/RD



CAV	CIRCUIT
1	P79 20DB/LB
2	P77 20WT/BK
3	P35 20OR/VT
	P35 20OR/VT
4	P2 18BK/WT
	P2 18BK/WT
5	P34 18PK/BK
	P34 18PK/BK
6	P36 20PK/VT
	P36 20PK/VT
7	P78 20YL/LG
8	C15 16BK/WT

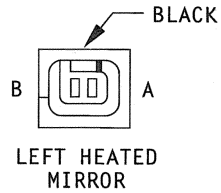
C362



RIGHT HEATED MIRROR

CAV	CIRCUIT	FUNCTION
A	C15 16BK/RD	REAR WINDOW DEFOGGER RELAY OUTPUT
B	Z1 16BK	GROUND

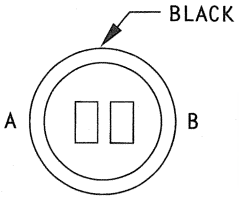
C365



LEFT HEATED MIRROR

CAV	CIRCUIT	FUNCTION
A	C15 16BK/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
B	Z1 16BK	GROUND

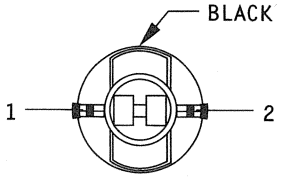
C401



PRNDL LAMP

CAV	CIRCUIT	FUNCTION
A	E2 20OR	FUSED PNL LAMPS DIMMER SW SIG
B	Z1 20BK	GROUND

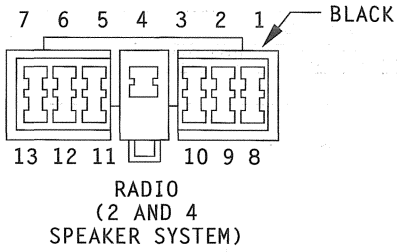
C402



TRANSFER CASE LAMP

CAV	CIRCUIT	FUNCTION
1	E2 20OR	FUSED PNL LAMPS DIMMER SW SIG
2	Z1 20BK	GROUND

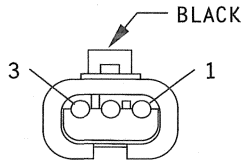
C403



RADIO
(2 AND 4
SPEAKER SYSTEM)

CAV	CIRCUIT	FUNCTION
1	X51 18DG	LEFT SOUNDBAR SPEAKER (+)
2	X53 18DG	LEFT FRONT SPEAKER (+)
3	–	–
4	M1 18PK	FUSED B(+)
5	F85 18WT	FUSED IGNITION SWITCH OUTPUT (RUN/ACC)
6	X54 18VT	RIGHT FRONT SPEAKER (+)
7	X52 18VT	RIGHT SOUNDBAR SPEAKER (+)
8	X57 18BR	LEFT SOUNDBAR SPEAKER (-)
9	X55 18BR	LEFT FRONT SPEAKER (-)
10	X5 18LB	LCD ILLUMINATION
11	E2 18OR	PANEL LAMPS DRIVER
12	X56 18DB	RIGHT FRONT SPEAKER (-)
13	X58 18DB	RIGHT SOUNDBAR SPEAKER (-)

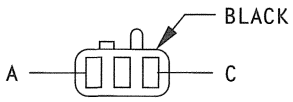
C404



VEHICLE
SPEED
SENSOR

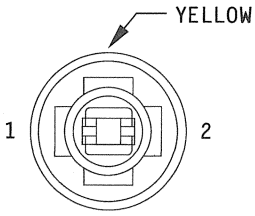
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	G7 18WT/OR	VEHICLE SPEED SENSOR SIGNAL

C405



CARGO
LAMP

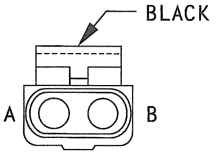
CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	M2 20YL	COURTESY LAMPS DRIVER
C	G71 20VT/YL	LIFTGATE LATCH SWITCH SENSE



LICENSE LAMP

C406

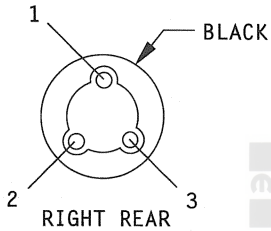
CAV	CIRCUIT	FUNCTION
1	L90 20DB/RD	PARK LAMP SWITCH OUTPUT
2	Z1 20BK	GROUND



4WD SWITCH

C407

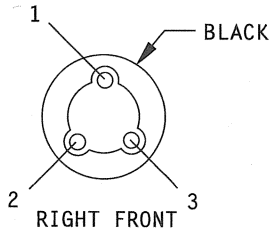
CAV	CIRCUIT	FUNCTION
A	G107 18BK/RD	4WD LOCK
B	Z1 18BK	GROUND



RIGHT REAR DOOR JAMB SWITCH

C410

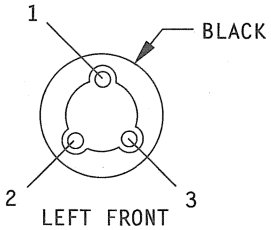
CAV	CIRCUIT	FUNCTION
1	–	–
2	Z1 18BK	GROUND
3	M2 18YL	COURTESY LAMPS DRIVER



RIGHT FRONT DOOR JAMB SWITCH

C411

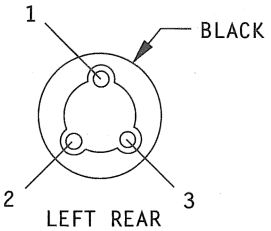
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	M2 18YL	COURTESY LAMPS DRIVER
3	M2 18YL	COURTESY LAMPS DRIVER



LEFT FRONT DOOR JAMB SWITCH

C412

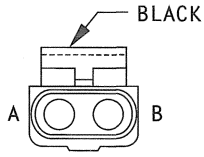
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	M2 18YL	COURTESY LAMPS DRIVER
3	–	–



LEFT REAR DOOR JAMB SWITCH

C413

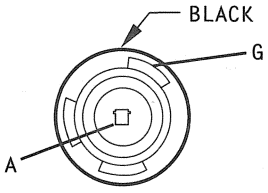
CAV	CIRCUIT	FUNCTION
1	–	–
2	Z1 18BK	GROUND
3	M2 18YL	COURTESY LAMPS DRIVER



4WD SWITCH

C414

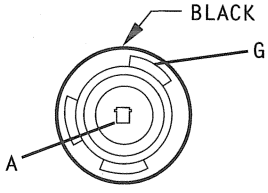
CAV	CIRCUIT	FUNCTION
A	G107 18BK/RD	4WD LOCK
B	G106 18GY/YL	4WD FULL TIME



LEFT BACK-UP LAMP

C416

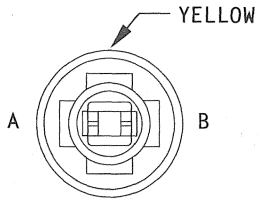
CAV	CIRCUIT	FUNCTION
A	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



RIGHT BACK-UP LAMP

C417

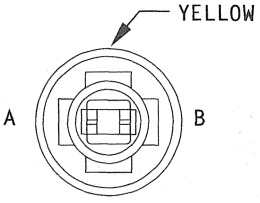
CAV	CIRCUIT	FUNCTION
A	L10 18BR/LG	BACK-UP LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



LEFT REAR SIDE MARKER LAMP

C418

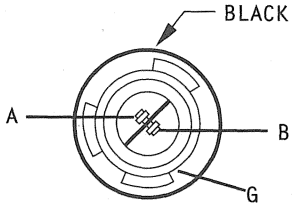
CAV	CIRCUIT	FUNCTION
A	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
B	Z1 18BK	GROUND



RIGHT REAR SIDE MARKER LAMP

C419

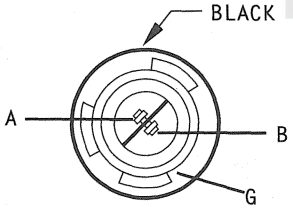
CAV	CIRCUIT	FUNCTION
A	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
B	Z1 18BK	GROUND



LEFT TAIL/STOP LAMP

C420

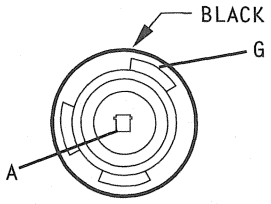
CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



RIGHT TAIL/STOP LAMP

C421

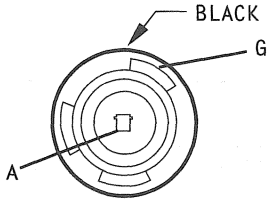
CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
G	Z1 18BK	GROUND



LEFT REAR TURN SIGNAL LAMP

C422

CAV	CIRCUIT	FUNCTION
A	L60 18TN	LEFT TURN SIGNAL
G	Z1 18BK	GROUND

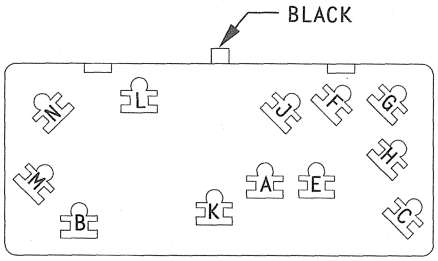


RIGHT REAR TURN SIGNAL LAMP

C423

CAV	CIRCUIT	FUNCTION
A	L60 18TN	RIGHT TURN SIGNAL
G	Z1 18BK	GROUND

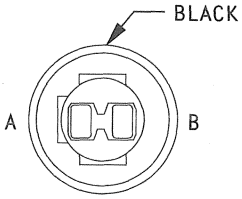
Mopar AUTHENTIC RESTORATION PRODUCT



RIGHT POWER SEAT SWITCH

C424

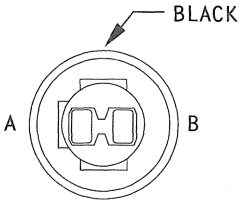
CAV	CIRCUIT	FUNCTION
A	Z1 14BK	GROUND
B	F35 14RD	FUSED B(+)
C	–	–
E	P11 14YL/WT	RIGHT POWER SEAT REAR UP
F	–	–
G	–	–
H	–	–
J	P13 14RD/WT	RIGHT POWER SEAT REAR DOWN
K	P15 14YL/LB	RIGHT POWER SEAT HORIZONTAL FORWARD
L	P17 14RD/LB	RIGHT POWER SEAT HORIZONTAL REARWARD
M	P19 14YL/LG	RIGHT POWER SEAT FRONT UP
N	P21 14RD/LG	RIGHT POWER SEAT FRONT DOWN



CENTER HIGH MOUNTED STOP LAMP NO. 1

C426

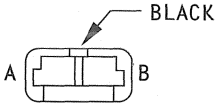
CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	Z1 20BK	GROUND
	Z1 20BK	GROUND



CENTER HIGH MOUNTED STOP LAMP NO. 2

C427

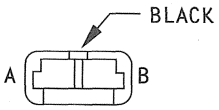
CAV	CIRCUIT	FUNCTION
A	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
B	Z1 20BK	GROUND



LEFT SOUNDBAR SPEAKER

C429

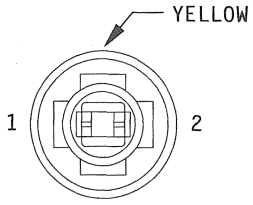
CAV	CIRCUIT	FUNCTION
A	X51 20BR/YL	LEFT SOUND BAR SPEAKER (+)
B	X57 20BR/LB	LEFT SOUND BAR SPEAKER (–)



RIGHT SOUNDBAR SPEAKER

C430

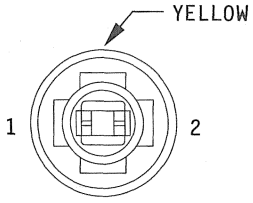
CAV	CIRCUIT	FUNCTION
A	X52 20DB/WT	RIGHT SOUND BAR SPEAKER (+)
B	X58 20DB/OR	RIGHT SOUND BAR SPEAKER (–)



LEFT
COURTESY LAMP

C432

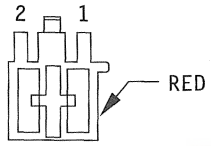
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMPS DRIVER



RIGHT
COURTESY LAMP

C433

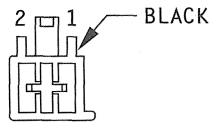
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	M2 20YL	COURTESY LAMPS DRIVER



RIGHT FRONT
VERTICAL
MOTOR

C434

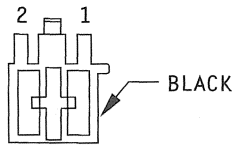
CAV	CIRCUIT	FUNCTION
1	P19 14YL/LG	RIGHT POWER SEAT FRONT UP
2	P21 14RD/LG	RIGHT POWER SEAT FRONT DOWN



RIGHT FORWARD/
BACKWARD
MOTOR

C435

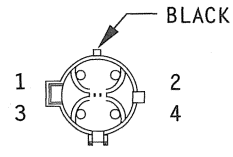
CAV	CIRCUIT	FUNCTION
1	P17 14RD/LB	RIGHT POWER SEAT HORIZONTAL REARWARD
2	P15 14YL/LB	RIGHT POWER SEAT HORIZONTAL FORWARD



RIGHT REAR
VERTICAL
MOTOR

C436

CAV	CIRCUIT	FUNCTION
1	P11 14YL/WT	RIGHT POWER SEAT REAR UP
2	P13 14RD/WT	RIGHT POWER SEAT REAR DOWN



DOWNSTREAM
HEATED
OXYGEN SENSOR

C437

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	Z11 16BK/WT	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K341 18TN/WT	DOWNSTREAM HEATED OXYGEN SENSOR SIGNAL

Mopar AUTHENTIC RESTORATION PRODUCT

8W-90 CONNECTOR LOCATIONS

INDEX

page

DESCRIPTION AND OPERATION
INTRODUCTION 1

SCHEMATICS AND DIAGRAMS
CONNECTOR/GROUND LOCATIONS 1

DESCRIPTION AND OPERATION

INTRODUCTION

This section provides illustrations identifying component and connector locations in the vehicle. A connector index is provided. Use the wiring diagrams in each section for connector number identification. Refer to the index for the proper figure number.

SCHEMATICS AND DIAGRAMS

CONNECTOR/GROUND LOCATIONS

For items that are not shown in this section a N/S is placed in the Fig. column.

Conn #	Color	Location	Fig.
C100	BK	Left Fender Side Shield	2
C101	WT	Left Fender Side Shield	2
C102	BK	Bottom Right of Radiator Closure Panel	1
C103	BK	Top of Radiator Fan Shroud	2
C104	BK	Left Fender Side Shield	2
C105	BK	Left Fender Side Shield	2
C106	BK	Bottom of Knee Bolster, Right of Steering Column	8
C107	BK	Left Fender Side Shield	2
C108	RD	Rear of Engine	3
C109	BK	Center of Dash Panel	3
C110	BK	Left Rear Corner of Engine Compartment	3
C112	BK	Near Controller, Antilock Brakes	N/S
C113	BK	Taped to Harness, Near Controller, Antilock Brakes	9
C117	BK	Rear of Intake Manifold	4
C118	BK	On Throttle Body	4
C119	GY	Bottom Left Front of Cylinder Block	4
C120	BK	On Throttle Body	4
C121	GY	Rear of Intake Manifold	4
C122	BK	At Thermostat Housing	4
C123	BK	Injector No. 1	4
C124	BK	Injector No. 2	4
C125	BK	Injector No. 3	4
C126	BK	Injector No. 4	4
C127	BK	Injector No. 5	4
C128	BK	Injector No. 6	4
C129	BK	Center of Dash Panel	5, 6
C130	BK	Below Brake Master Cylinder	3
C131	BK	At Distributor	4
C132	GN	Below and Behind Glove Box	8
C133	BK	Side of Transmission	N/S
C134	GY	Rear of Engine	3
C135	GY	Side of Transmission	N/S
C136	BK	Right Fender Side Shield	2
C137	BK	Under Side of Hood	3
C138	BK	Right Fender Side Shield	3
C139	BK	Left Fender Side Shield	2
C140	BK	Bottom of Washer Fluid Reservoir	2
C141	BK	Near Blower Motor	2
C143	BK	Left Fender Side Shield	2
C144	BK	Right Corner of Engine Compartment	3
C145	BK	Right Fender Side Shield	3
C146	BK	Rear of Engine	N/S
C147	BK	Below Distributor	4
C148	BK	Right Side of Engine, Behind Generator	5
C149	BK	Rear of Generator	5,
C150	BK	Rear of Engine Starter Motor	4
C151	BK	Right Fender Side Shield	3
C154	BK	Left Side of Radiator Closure Panel	1
C155	BK	Left Rear of Radiator Closure Panel	1
C156	BK	Behind Lens	1

SCHEMATICS AND DIAGRAMS (Continued)

Conn #	Color	Location	Fig.
C157	BK	Behind Left Headlamp	1
C158	YL	Behind Lens	1
C159	BK	Center of Grille Opening	1
C160	BK	Behind Lens	1
C161	BK	Behind Right Headlamp	1
C162	YL	Behind Lens	1
C163	BK	Center of Grille Opening	1
C165	GY	Left Fender Side Shield	2
C168	GY	Side of Transmission	N/S
C169	BK	Bottom of Battery Tray	5
C170	BK	Bottom of I.P., Near Controller, Antilock Brakes	9
C171	BK	Bottom of I.P., Near Controller, Antilock Brakes	9
C172	GY	Bottom of I.P., Near Controller, Antilock Brakes	9
C173	BK	Bottom of I.P., Near Controller, Antilock Brakes	9
C174	GY	Bottom of I.P., Near Controller, Antilock Brakes	9
C175	NAT	Bottom of I.P., Near Controller, Antilock Brakes	9
C201	BK	Center bottom of I.P.	8
C202	GN	Near Left Kick Panel	9
C203	BK	Behind Left Kick Panel	9
C205	BK	Bottom Left of I.P.	8
C206	BK	Bottom Left of I.P.	8
C207	BK	Behind Headlamp Switch	6
C209	BK	On I.P., Left of Steering Column	7
C210	BK	On I.P., Left of Steering Column	7
C211	BK	Rear of Radio	7
C212	BR	Rear of A/C-Heater Controls	6
C213	BK	Rear of A/C-Heater Controls	6
C214	GY	Lower Left of I.P.	9
C215	GY	Lower Left of I.P.	9
C216	GY	Glove Box	6
C217	BK	Right Rear of I.P.	8
C218	RD	Near Fuse Block	N/S
C219	BK	Bottom Right of I.P.	8
C220	GY	Near Left Kick Panel	N/S
C221	BK	Near Left Kick Panel	9
C222	GN	Right Rear of I.P.	9
C223	BK	Right Front of Steering Column	10
C224	BK	Right Front of Steering Column	10
C225	BK	Below Steering Column	10
C226	BK	Near Right Kick Panel	N/S
C227	BK	Right Rear of I.P.	9
C228	GY	Side of Steering Column	10
C229	BK	Below Stop Lamp Switch	9
C230	BK	Near Fuse Block	8
C231	BK	Rear of A/C-Heater Controls	6
C232	GY	Near Fuse Block	8
C233	BK	Rear of I.P., Right of Steering Column	7
C234	BK	Rear of I.P. Cluster	6
C235	NAT	Rear of I.P. Cluster	6
C236	BK	On I.P.,Right of Steering Column	7
C237	BK	On I.P., Right of Steering Column	7
C238	BK	On I.P., Right of Steering Column	7
C239	RD	On I.P., Right of Steering Column	8
C240	BK	Lower Right of I.P.	9
C241	BK	Near Relay Bank	N/S
C242	BK	Center Bottom of I.P.	8
C243	NAT	Top of Fuse Block	8
C244	BK	At Shift Interlock Solenoid	N/S
C301	GN	Behind Left Kick Panel	N/S
C302	BK	Near Floor Console	N/S
C303	BK	Bottom of Driver's Seat	11
C304	BK	Bottom of Driver's Seat	N/S
C305	BL	Under Right Rear Seat	13
C306	BK	Left B Pillar	13
C307	BK	Near Fuel Tank	16
C308	BK	In Liftgate	18
C309	BK	Under Rear of Roof Liner	17
C310	BK	Left Rear Quarter Panel	17
C311	BK	Left Rear Quarter Panel	17
C312	BK	Left Rear Quarter Panel	17
C313	BK	In Liftgate	N/S
C314	NAT	In Left Rear Door	13
C315	BK	In Left Rear Door	13
C316	RD	In Left Rear Door	13
C317	GN	Behind Left Kick Panel	12
C318	RD	Behind Left Kick Panel	12
C319	BK	Under Floor Console	16
C320	GY	Behind Right Kick Panel	12
C321	BK	Behind Right Kick Panel	12
C322	GN	Behind Right Kick Panel	12
C323	BK	In Liftgate	18
C324	BK	Right Rear Quarter Panel	17
C325	NAT	In Right Rear Door	13

SCHEMATICS AND DIAGRAMS (Continued)

Conn #	Color	Location	Fig.
C326	BK	In Right Rear Door	13
C327	RD	In Right Rear Door	13
C328	BK	In Right B Pillar	13
C329	BK	In Right Front Door	12
C331	BK	In Right Front Door	12
C332	BK	In Right Front Door	12
C333	BK	In Left Front Door	12
C334	BK	In Right Front Door	12
C335	BK	In Left Front Door	12
C336	RD	In Left Front Door	12
C338	BK	In Right Front Door	12
C339	BK	In Left Front Door	12
C340	BK	In Right Front Door	12
C341	BK	In Right Front Door	12
C344	BK	Behind Dome Lamp	14
C345	BK	In Left Rear Corner of Vehicle	17
C346	BK	Left Rear Quarter Panel	18
C347	BK	Left Rear Quarter Panel	18
C348	BK	Left Rear Quarter Panel	18
C349	BK	Left Rear Quarter Panel	17
C350	BK	In Liftgate	18
C351	BK	Rear Bumper	18
C352	BK	Floor Pan, Near Drivers Seat	N/S
C353	BK	In Liftgate	20
C354	BK	Below Left Rear Seat	15
C355	RD	Below Left Rear Seat	15
C356	BK	Below Left Rear Seat	15
C357	BK	On Transmission	19
C358	GN	In Liftgate	18
C359	BK	Near Left Kick Panel	N/S
C360	BK	Behind Right Kick Panel	N/S
C361	BK	Behind Right Kick Panel	N/S
C362	BK	In Right Front Door	12
C363	BK	In Left Front Door	12
C401	BK	Behind PRNDL	16
C402	BK	Near Floor Console	N/S
C403	BK	Rear of Radio	N/S
C404	BK	Rear of Transmission (2WD)	19
C404	BK	Rear of Transfer Case (4WD)	19
C405	BK	Behind Cargo Lamp	17
C406	YL	In Liftgate	N/S
C410	BK	In Left Rear Door B-Pillar	13
C411	BK	In Left A-Pillar	12
C412	BK	In Right A-Pillar	12
C413	BK	In Right C-Pillar	13
C414	BK	On Transfer Case	19
C416	BK	Behind Lens	N/S
C417	BK	Behind Lens	N/S
C418	YL	Behind Lens	N/S
C419	YL	Behind Lens	N/S
C420	BK	Behind Lens	N/S
C421	BK	Behind Lens	N/S
C422	BK	Behind Lens	N/S
C423	BK	Behind Lens	N/S
C424	BK	Side of Driver's Seat	11
C426	BK	Behind Lens	20
C427	BK	Behind Lens	20
C429	BK	In Sound Bar	17
C430	BK	In Sound Bar	17
C432	YL	Behind Lamp	8
C433	YL	Behind Lamp	8
C434	RD	Under Seat	N/S
C435	BK	Under Seat	N/S
C436	BK	Under Seat	N/S
C437	BK	Side of Transmission	N/S
G101	N/A	Near Ignition Coil	5
G102	N/A	Near Battery	5
G103	N/A	Right Front Side of Engine, Behind Generator	5
G104	N/A	Left Fender Side Shield	2
G105	N/A	Left Fender Side Shield	2
G106	N/A	Right Rear of Engine	4
G107	N/A	Right Rear of Engine	4
G108	N/A	Right Rear of Engine	4
G200	N/A	Below Headlamp Switch	N/S
G300	N/A	Left Rear Quarter Panel	17

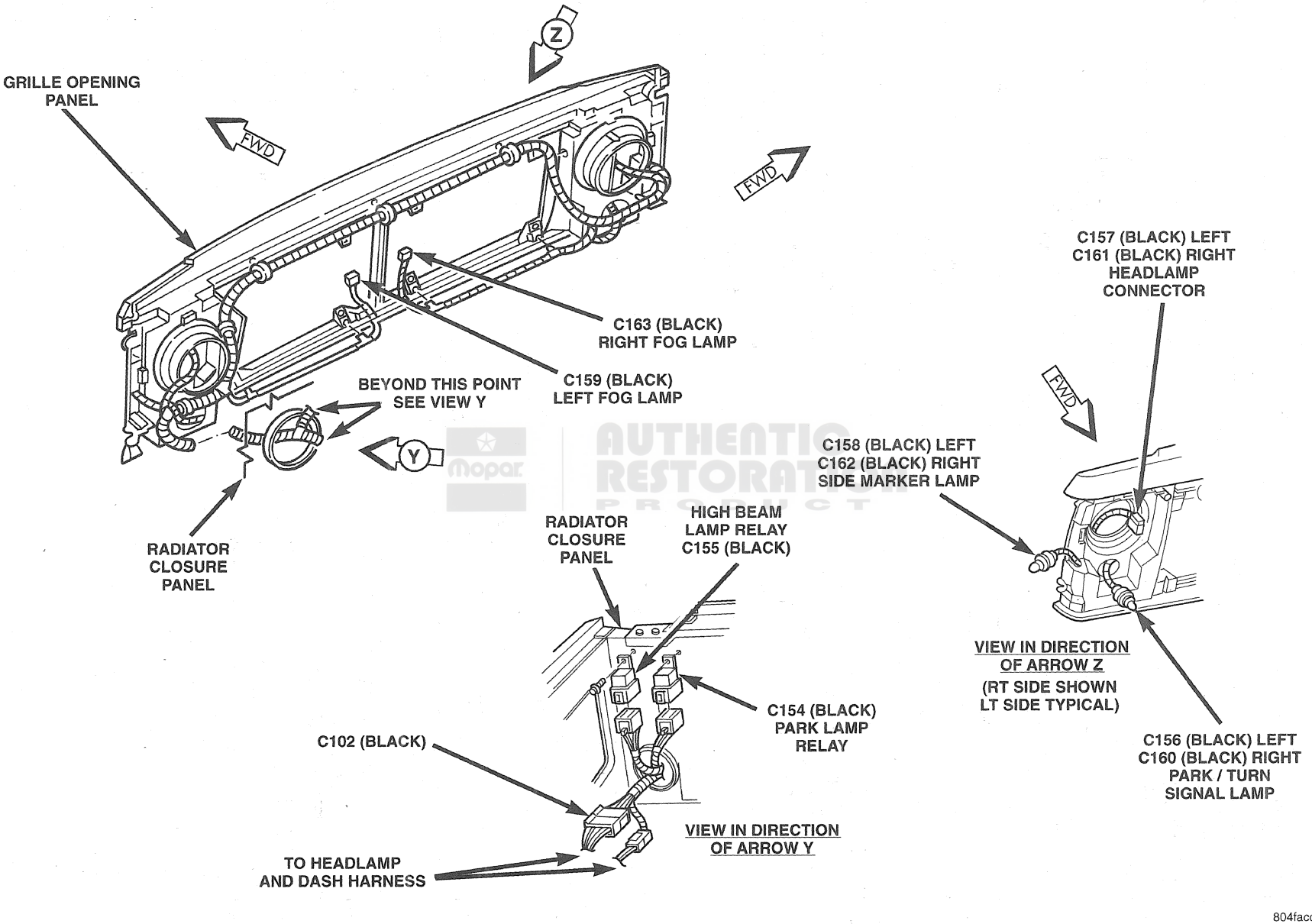


Fig. 1 Front End Lighting Wiring Connectors

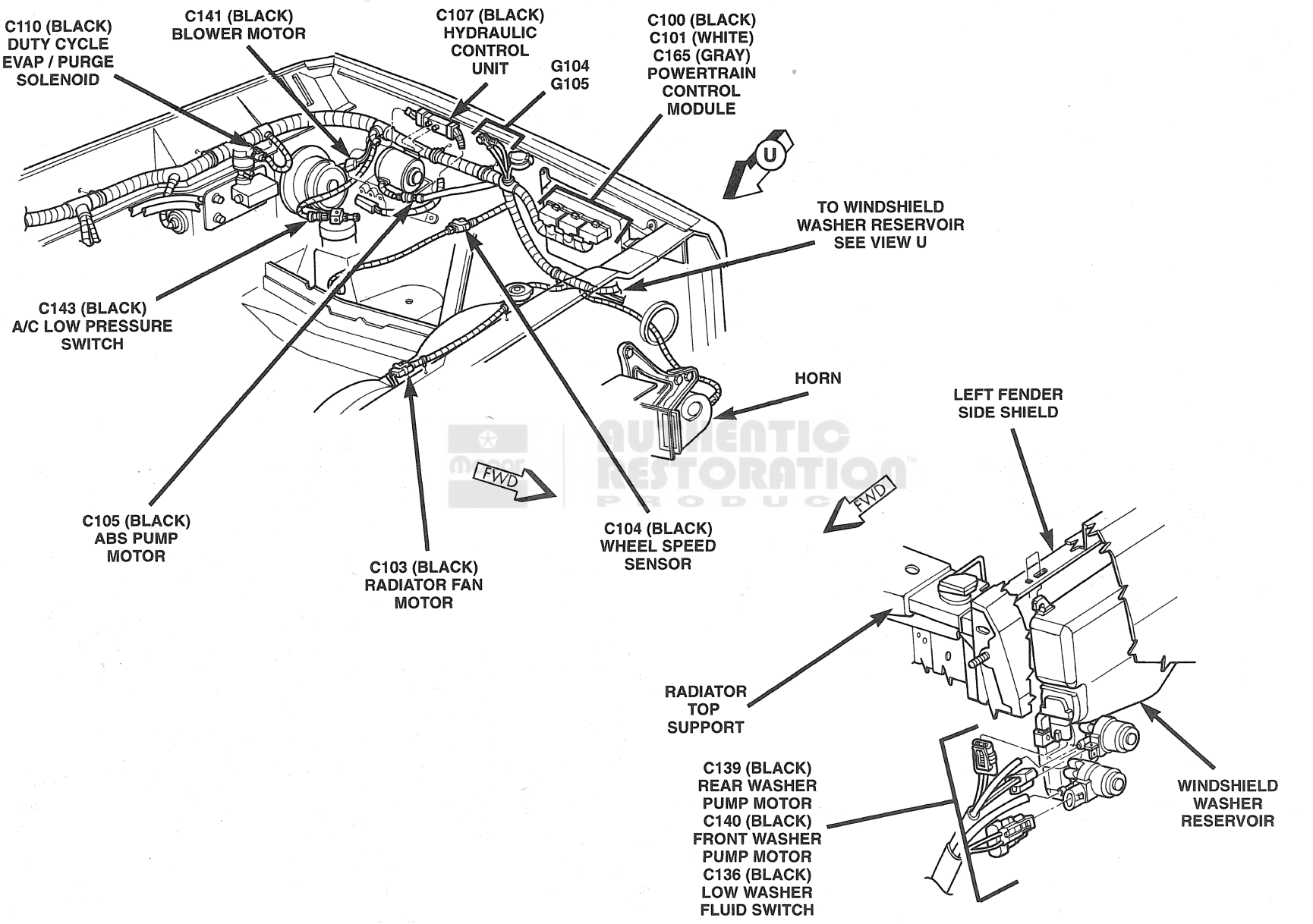
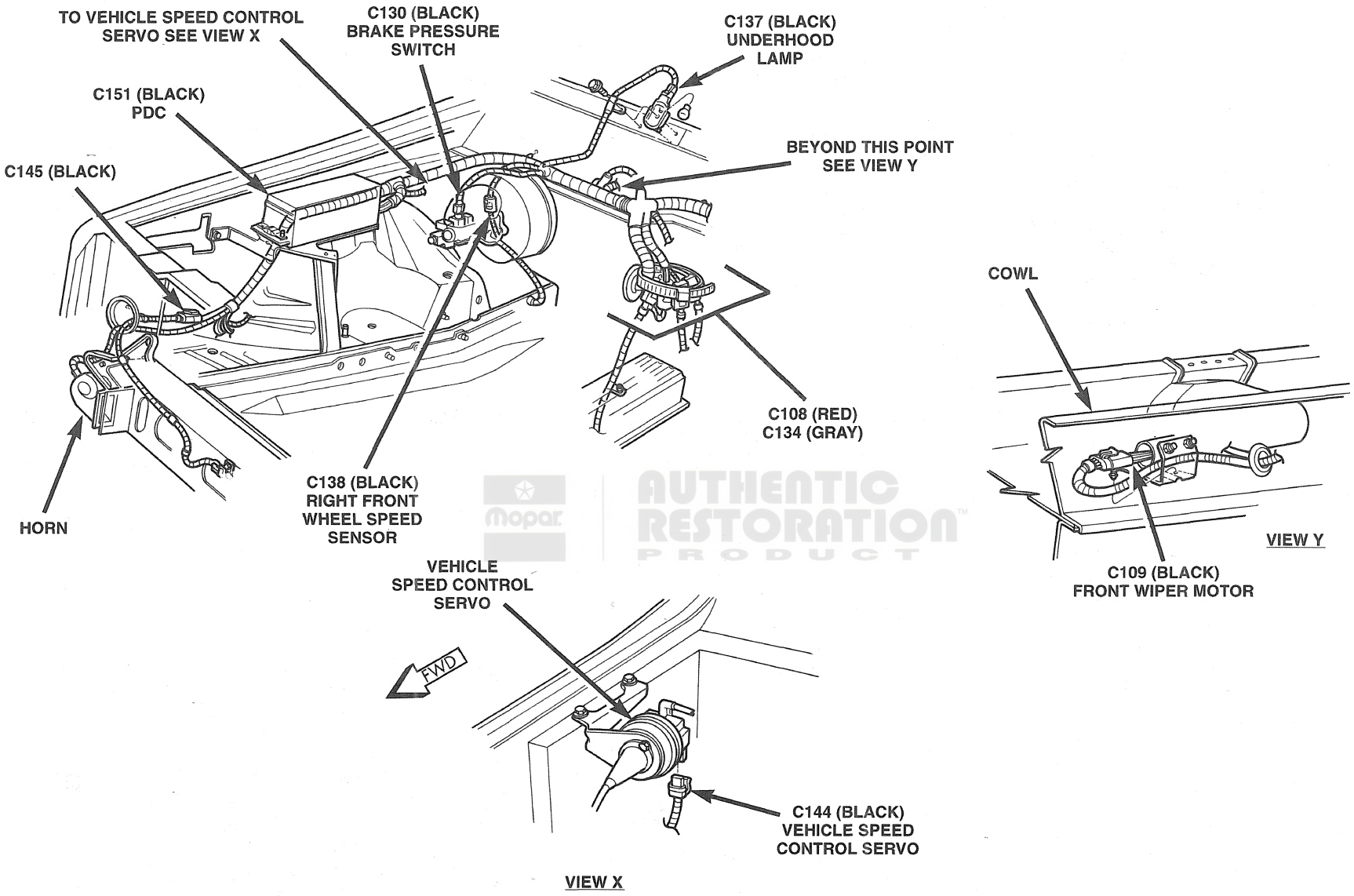


Fig. 2 Engine Compartment Wiring Connectors—Left Side



Mopar AUTHENTIC RESTORATION™ PRODUCT

804face9

Fig. 3 Engine Compartment Wiring Connectors—Right Side

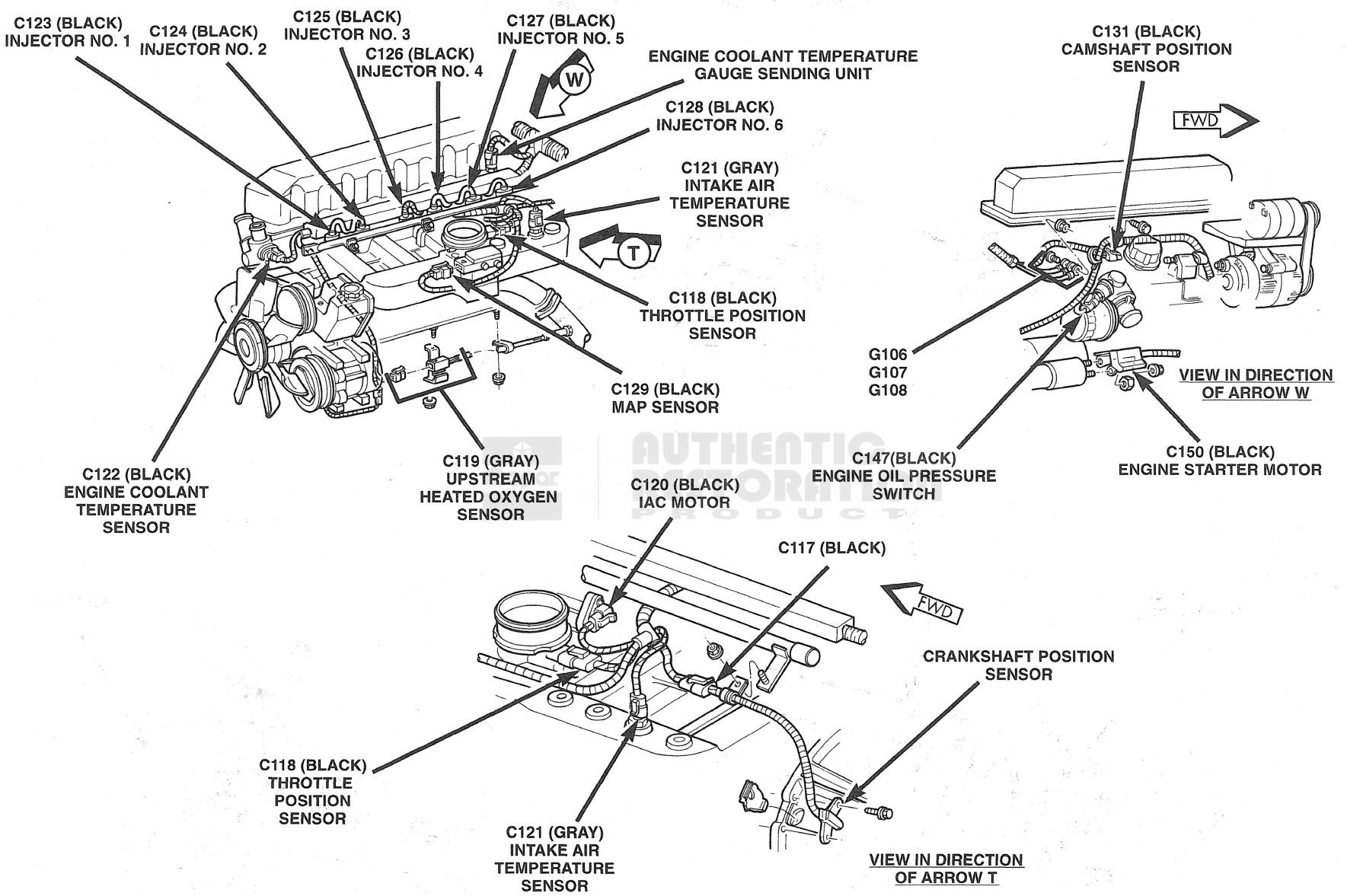
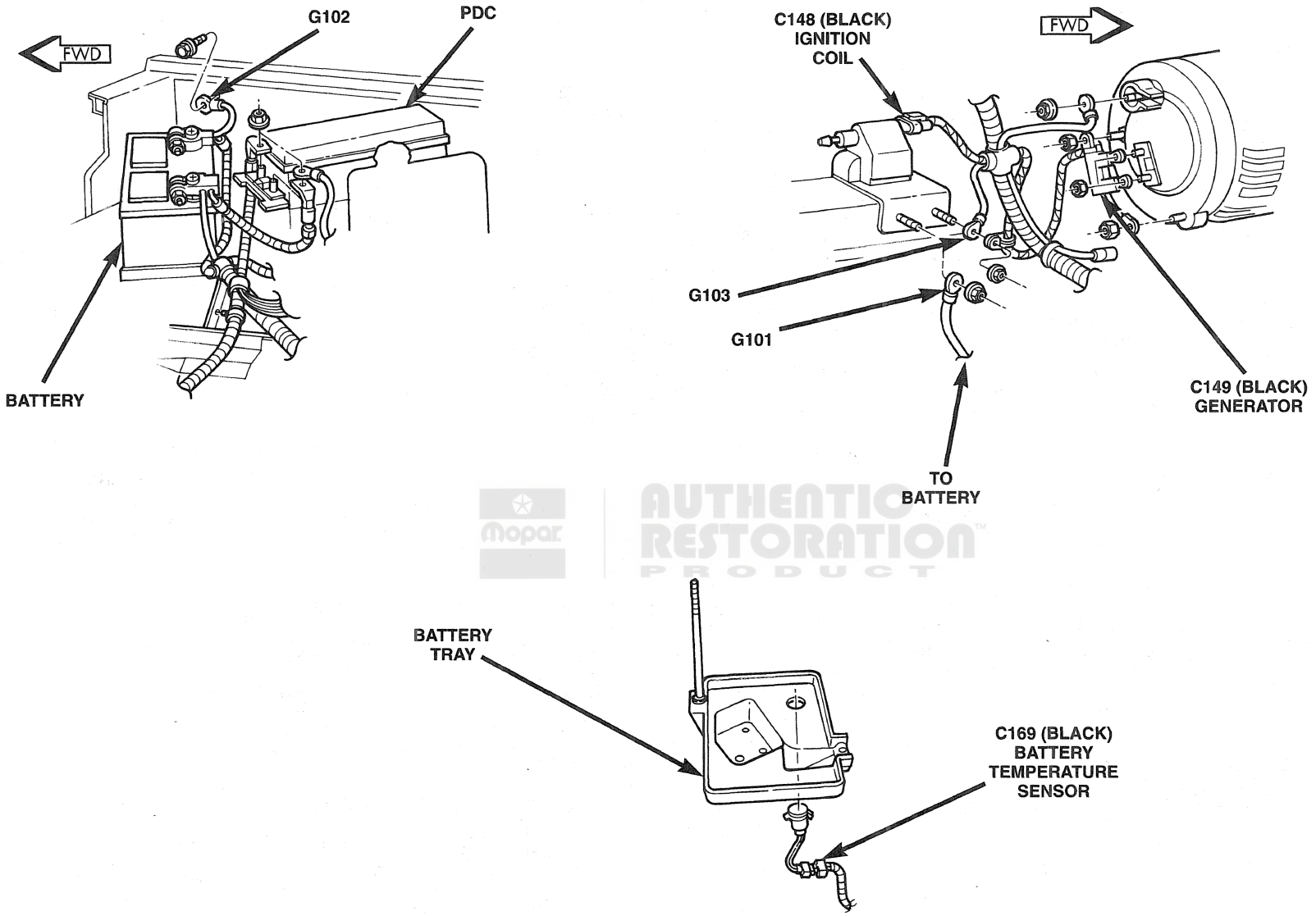
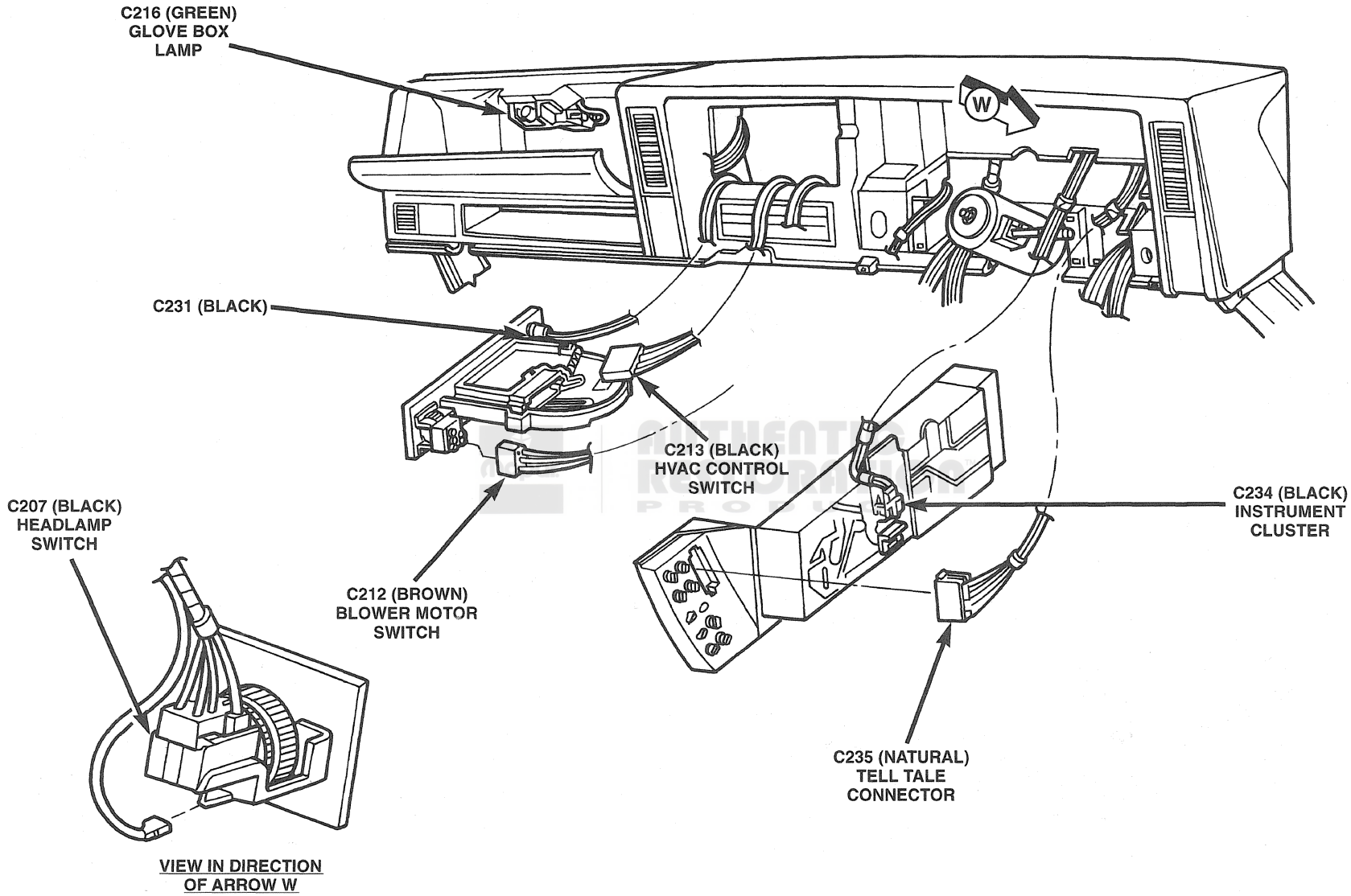


Fig. 4 Engine Wiring Connectors



804face7

Fig. 5 Battery and Generator Connectors



804face1

Fig. 6 Instrument Panel Wiring Connectors—Right Side

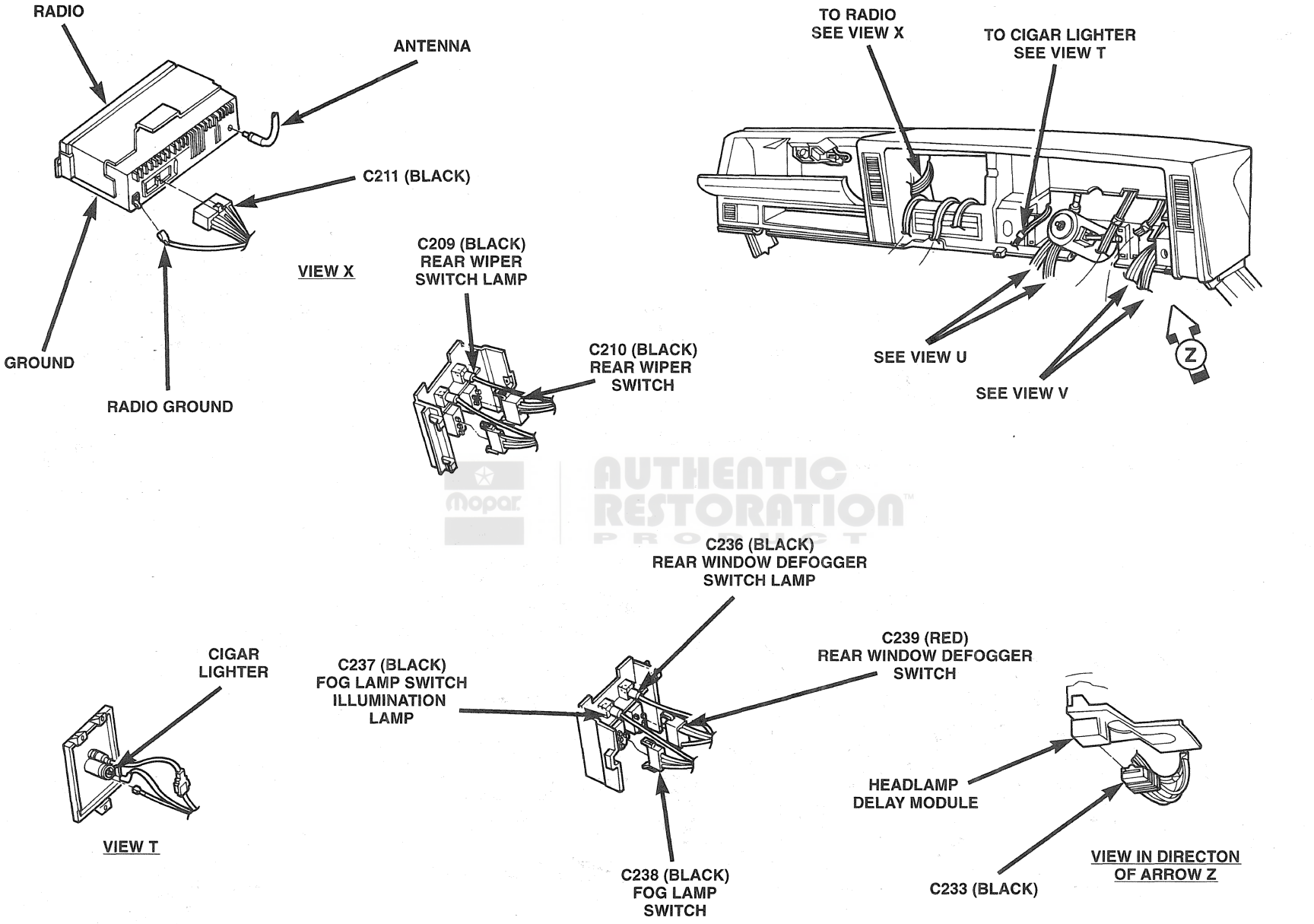
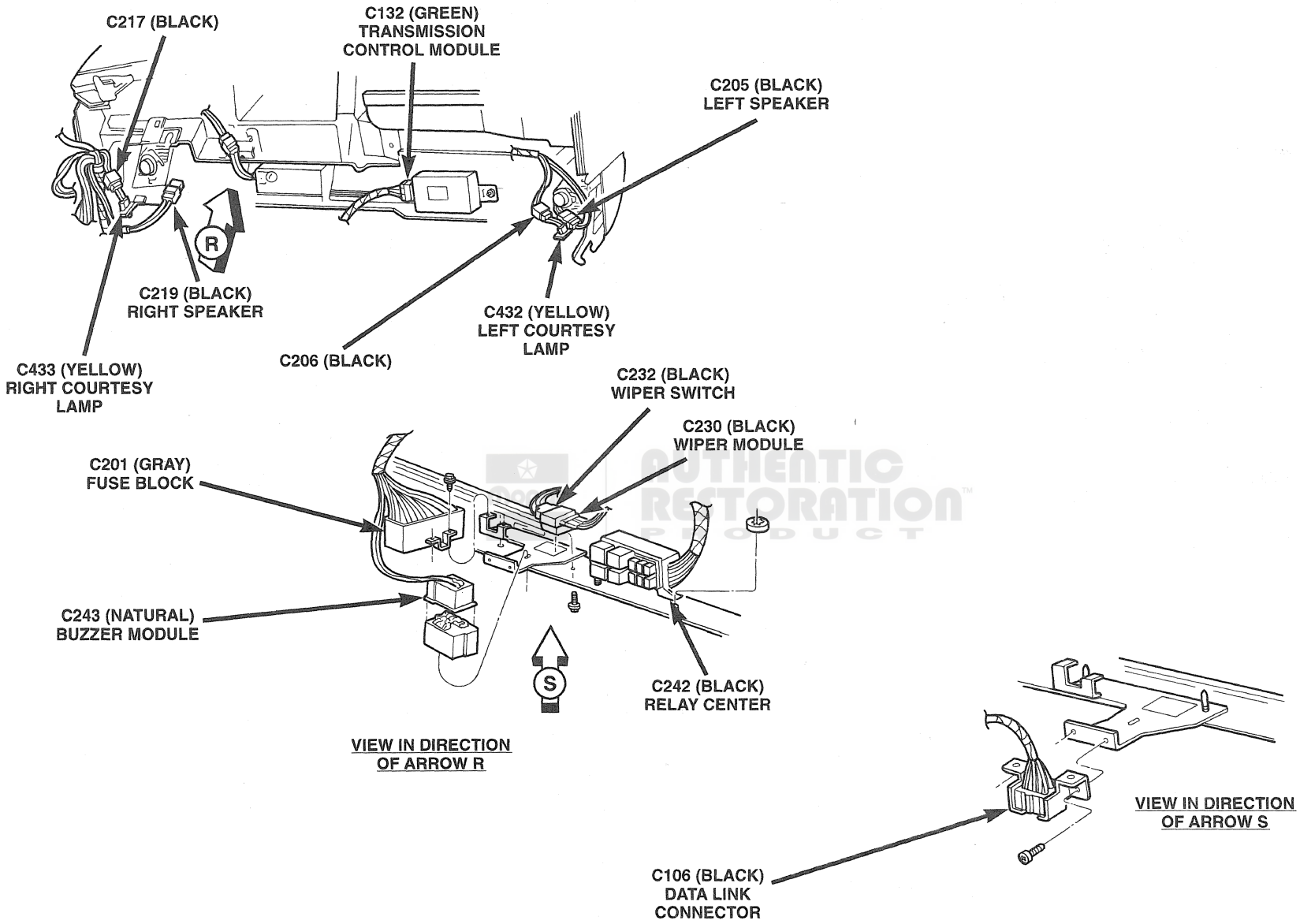


Fig. 7 Instrument Panel Wiring Connectors—Center



804face5

Fig. 8 Fuse Block and Relay Center

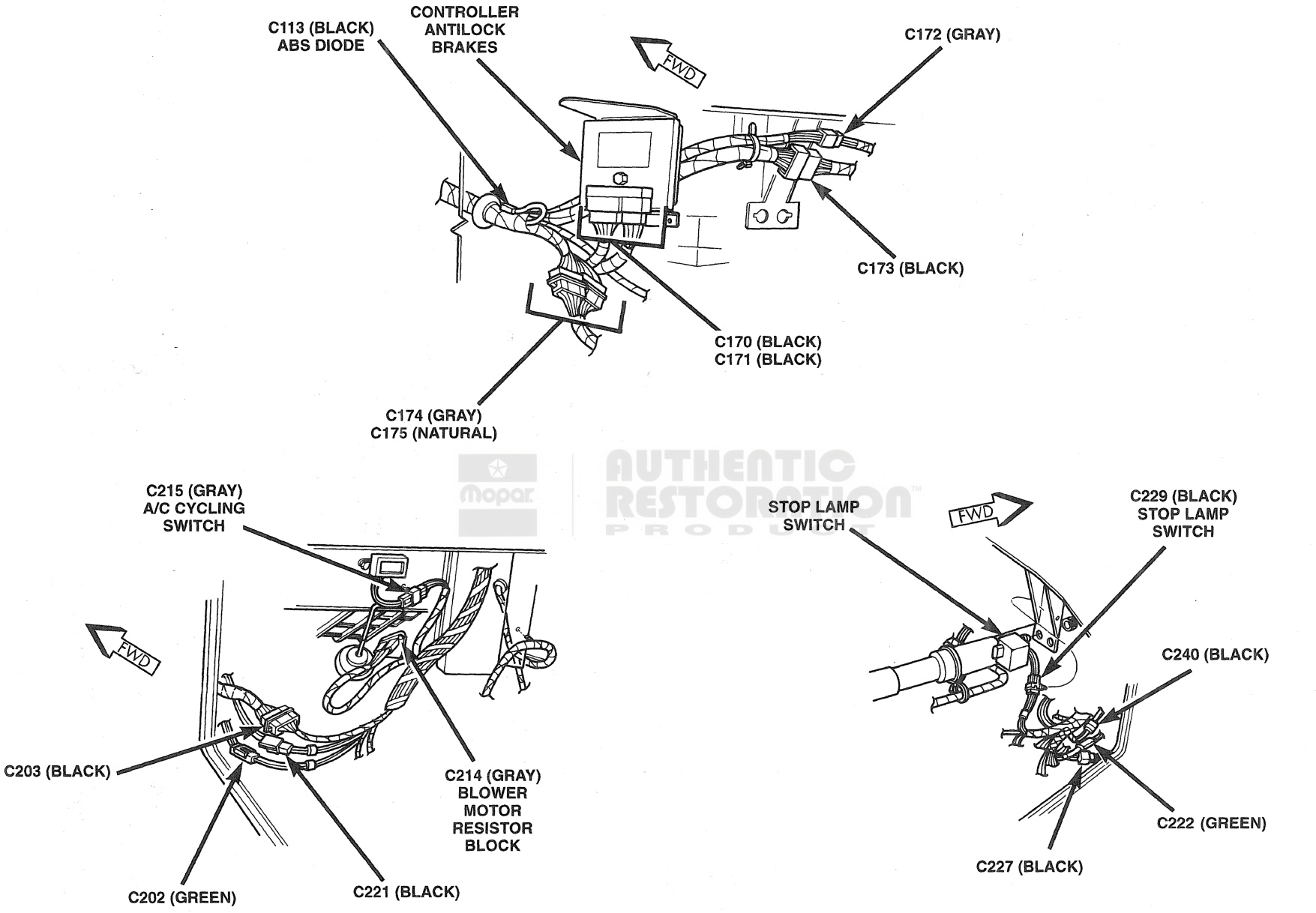


Fig. 9 Instrument Panel Wiring Connectors—Bottom

SCHEMATICS AND DIAGRAMS (Continued)

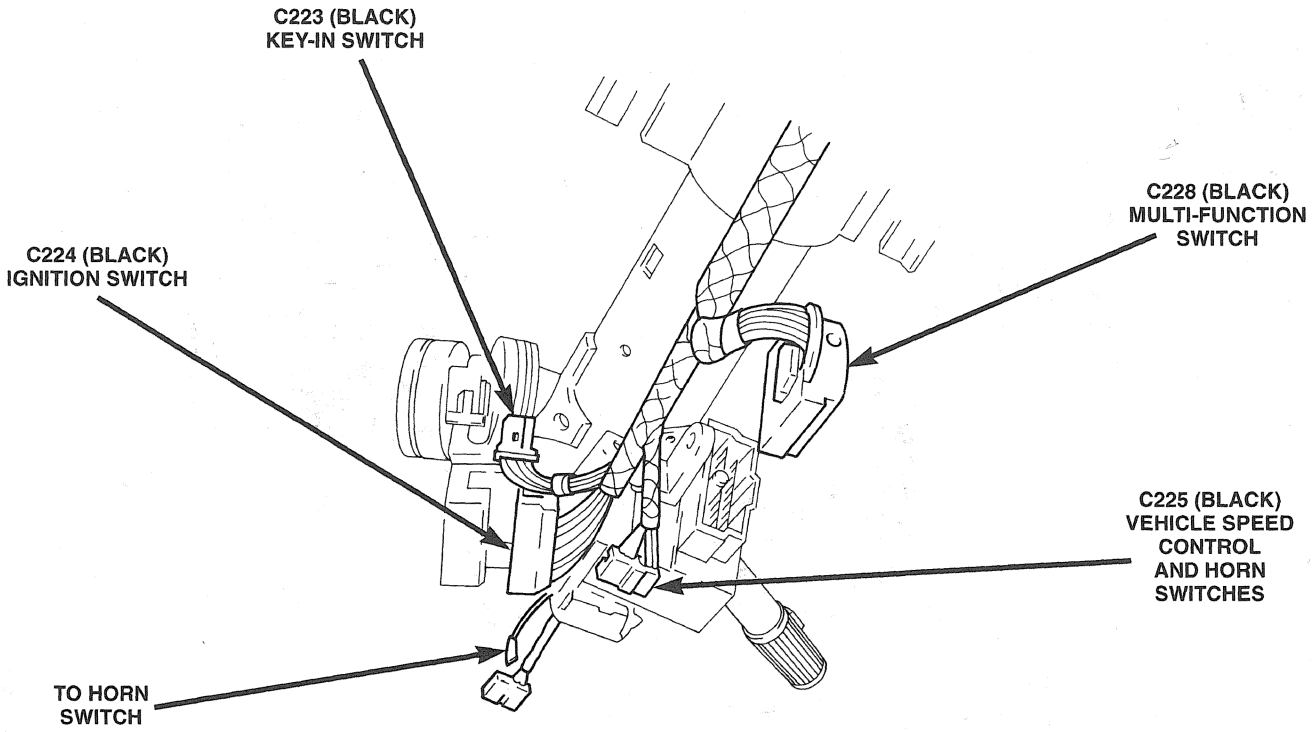


Fig. 10 Steering Column Wiring Connectors

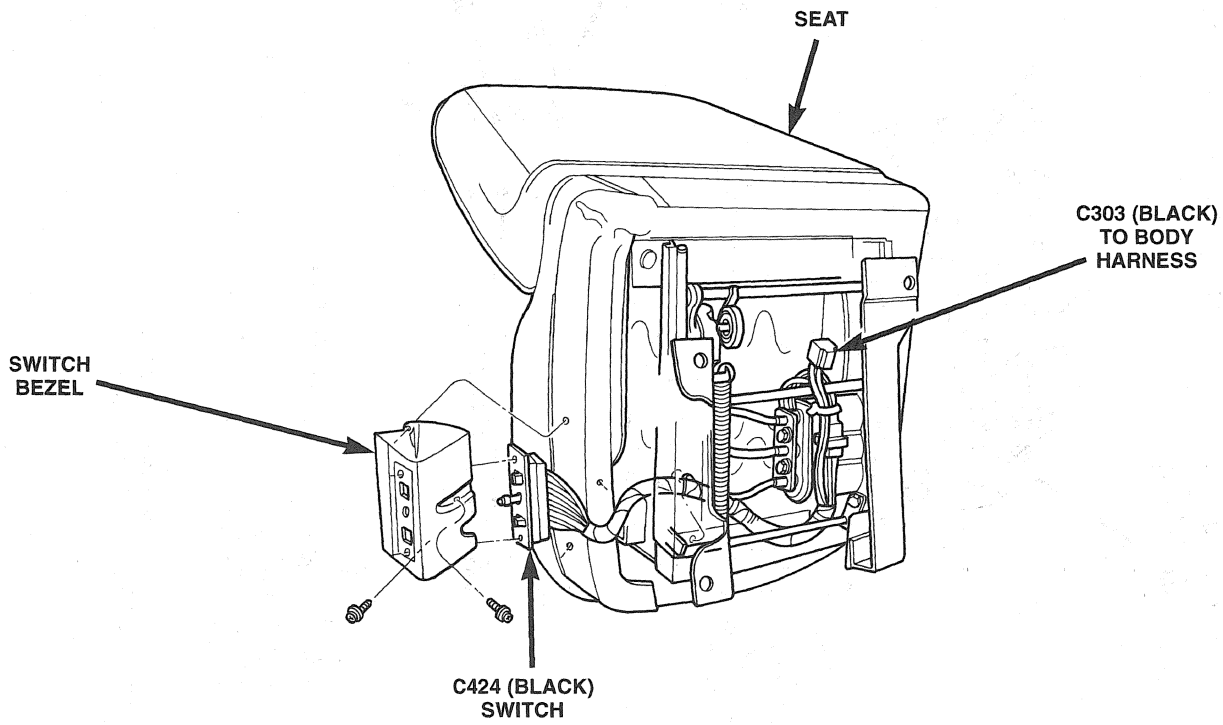


Fig. 11 Power Seat Wiring Connectors

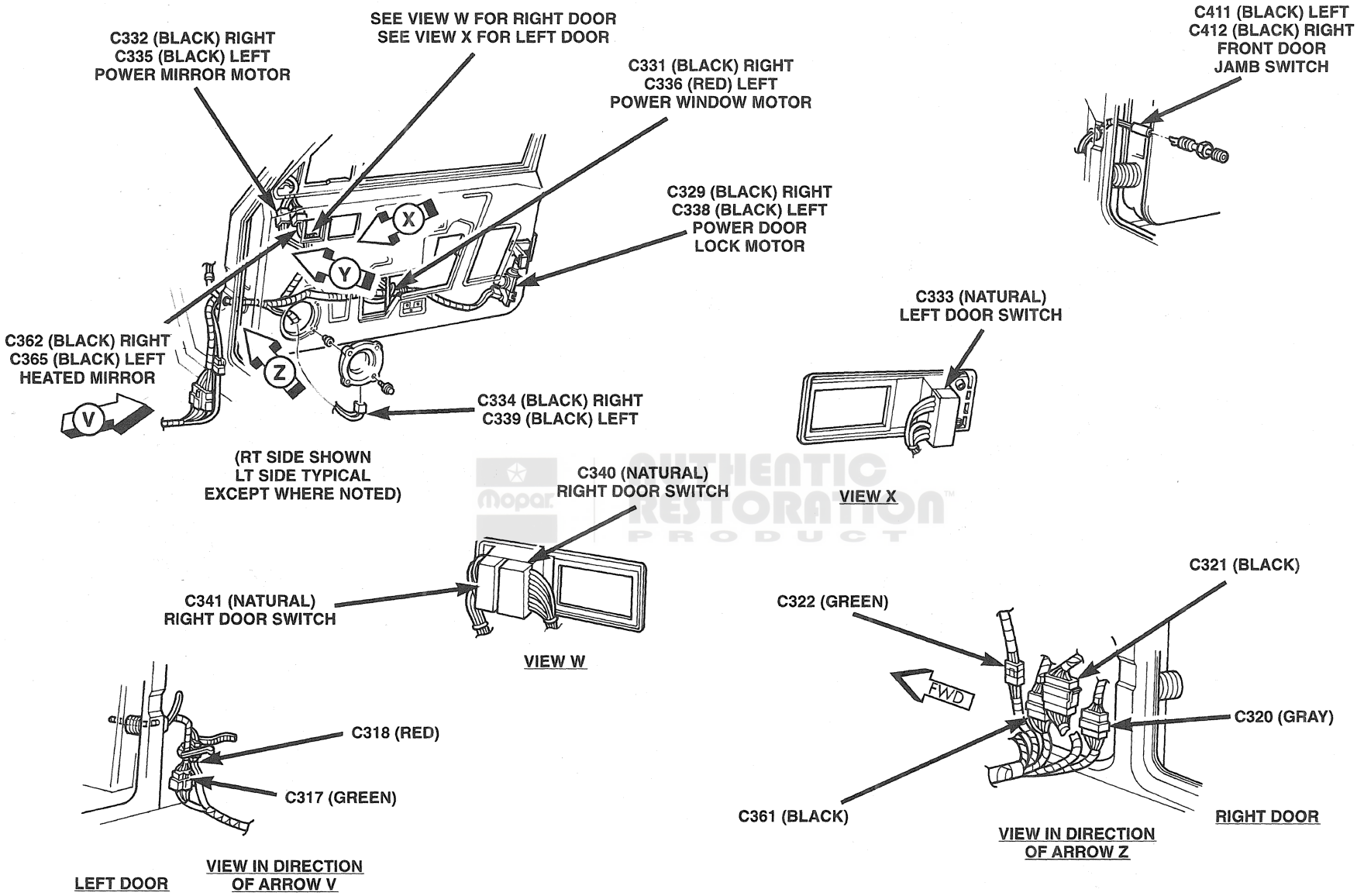


Fig. 12 Front Door Wiring Connectors

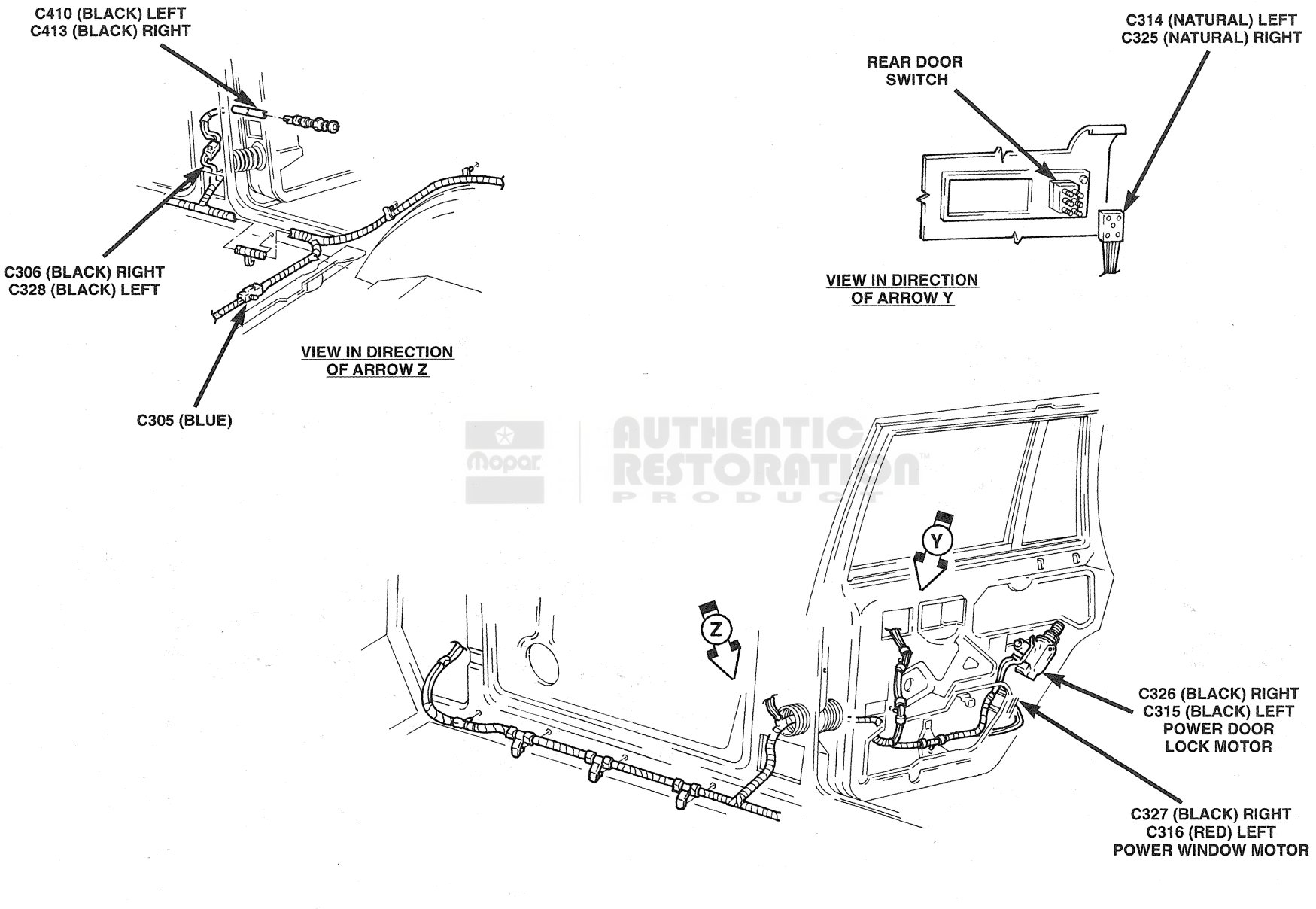


Fig. 13 Rear Door Wiring Connectors

SCHEMATICS AND DIAGRAMS (Continued)

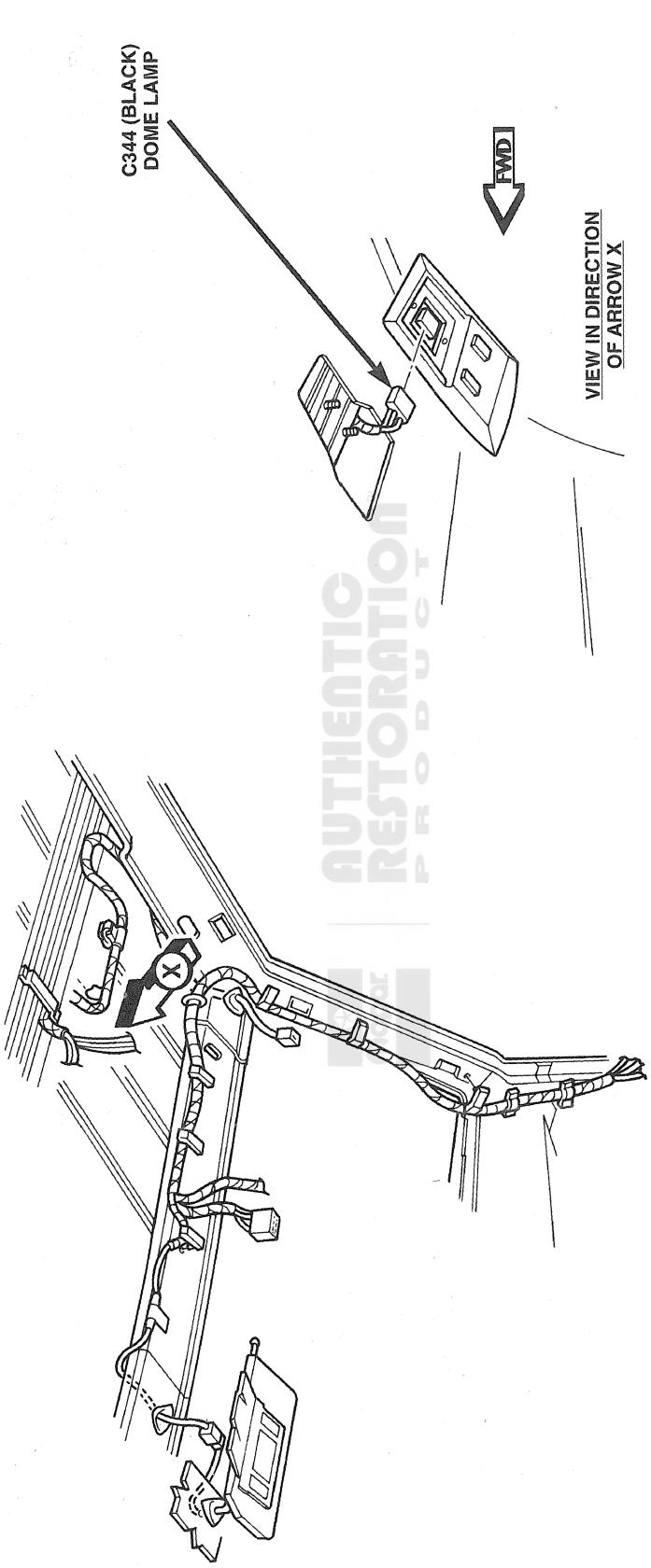


Fig. 14 Dome lamp Wiring Connectors

SCHEMATICS AND DIAGRAMS (Continued)

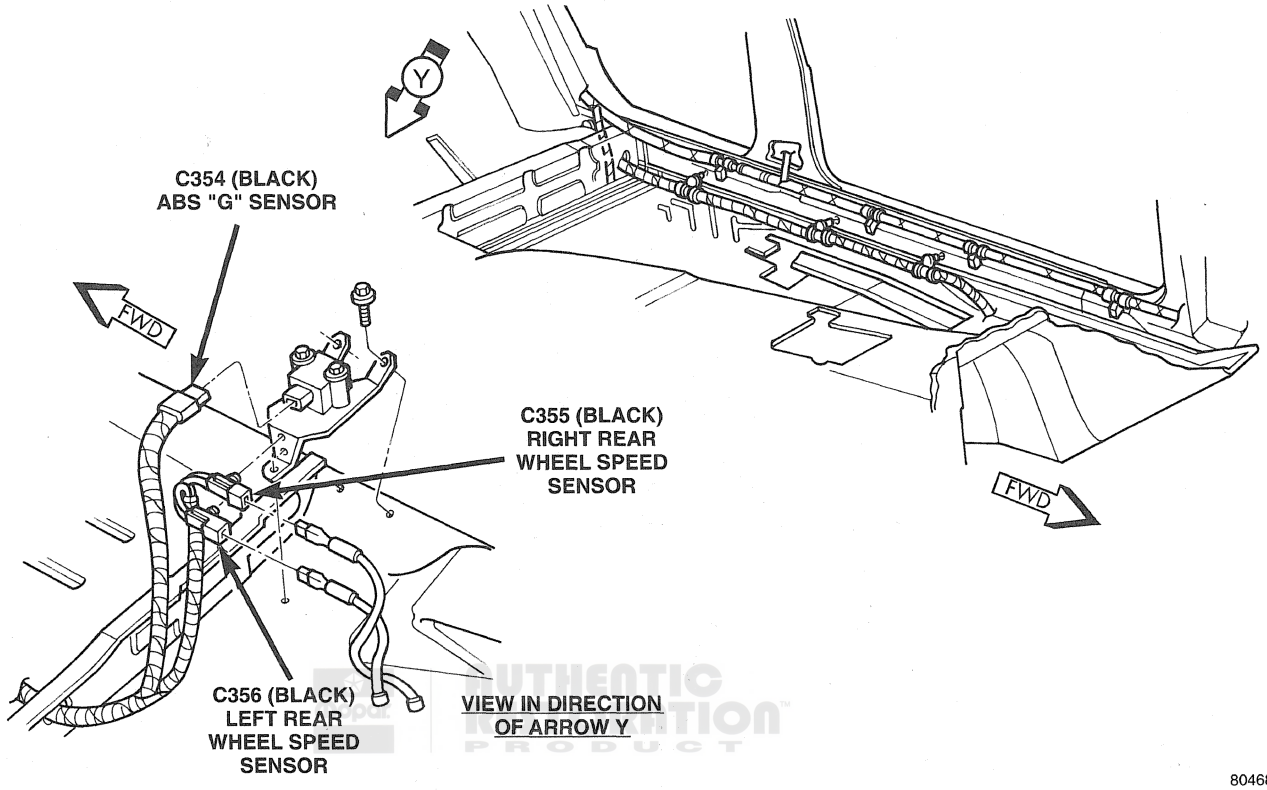


Fig. 15 ABS Wheel Speed Sensor Connectors

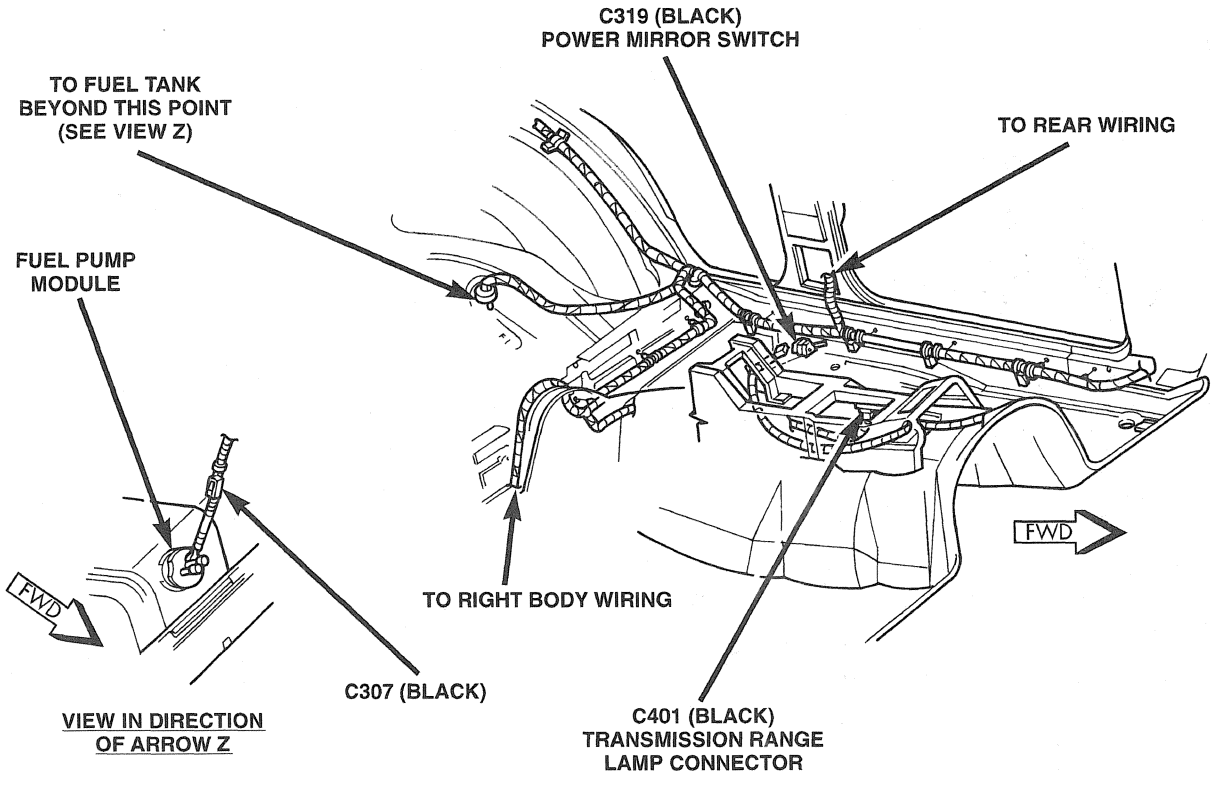


Fig. 16 Floor Console Wiring Connectors

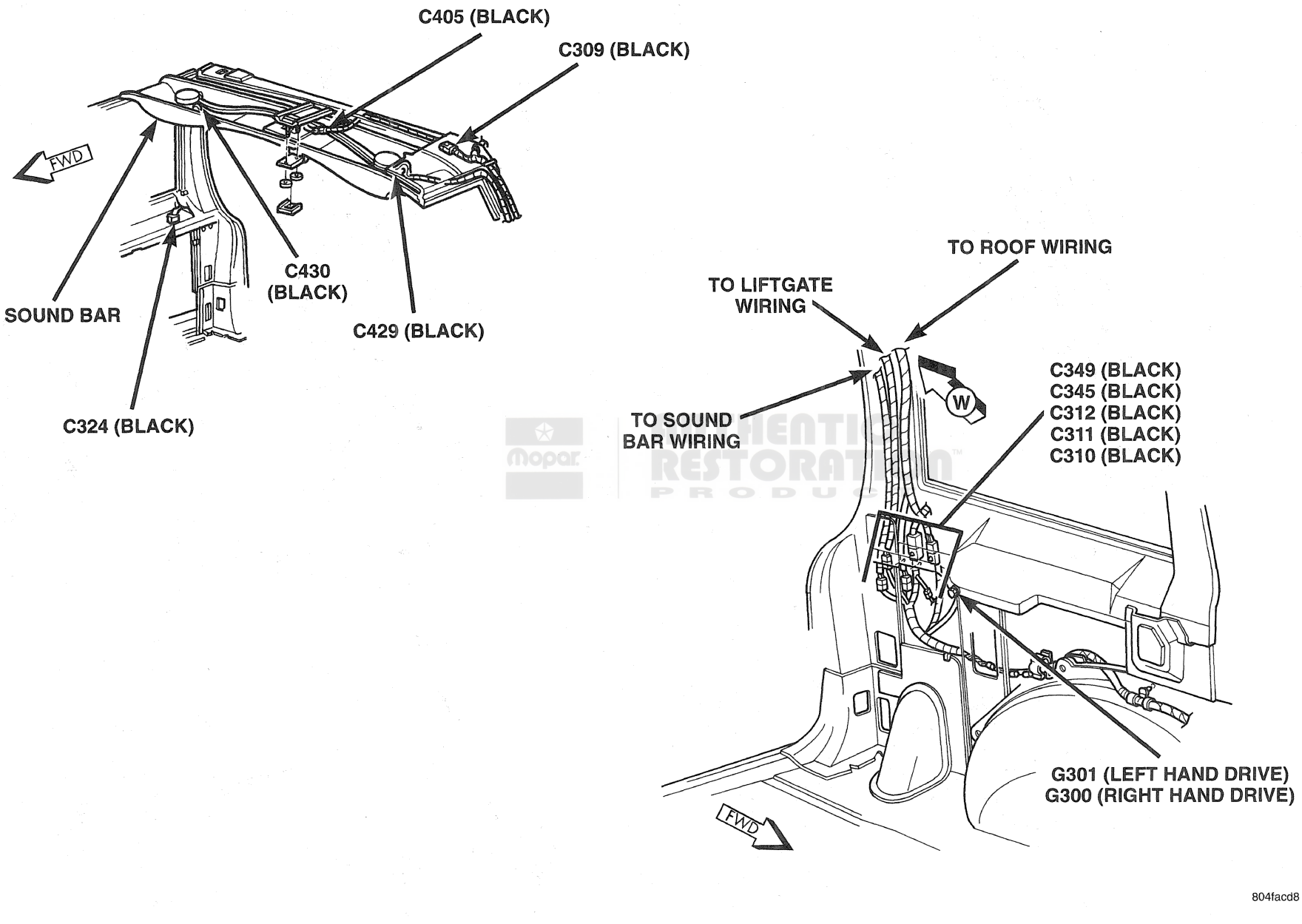


Fig. 17 Rear Compartment Wiring Connectors

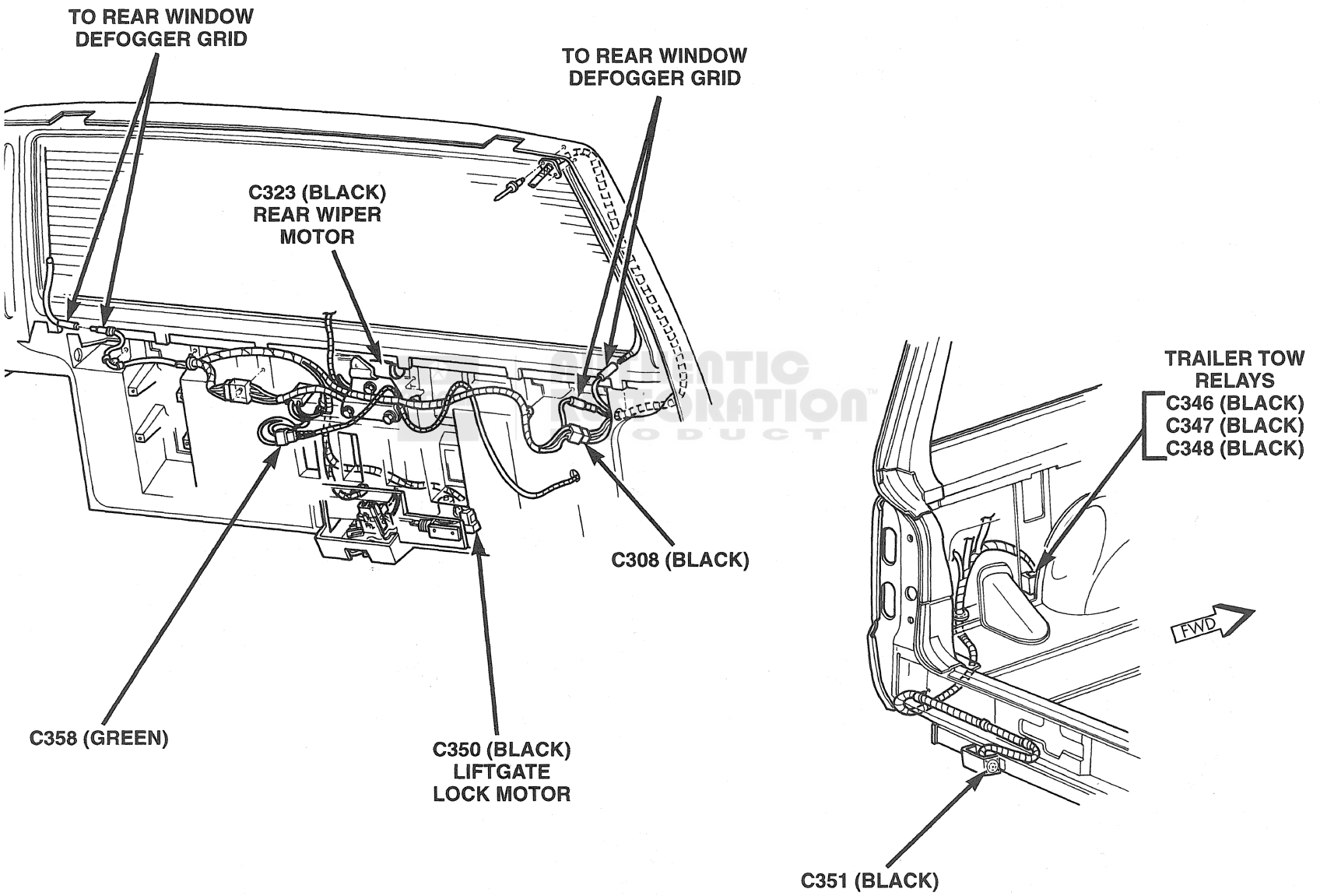


Fig. 18 Liftgate Wiring Connectors

SCHEMATICS AND DIAGRAMS (Continued)

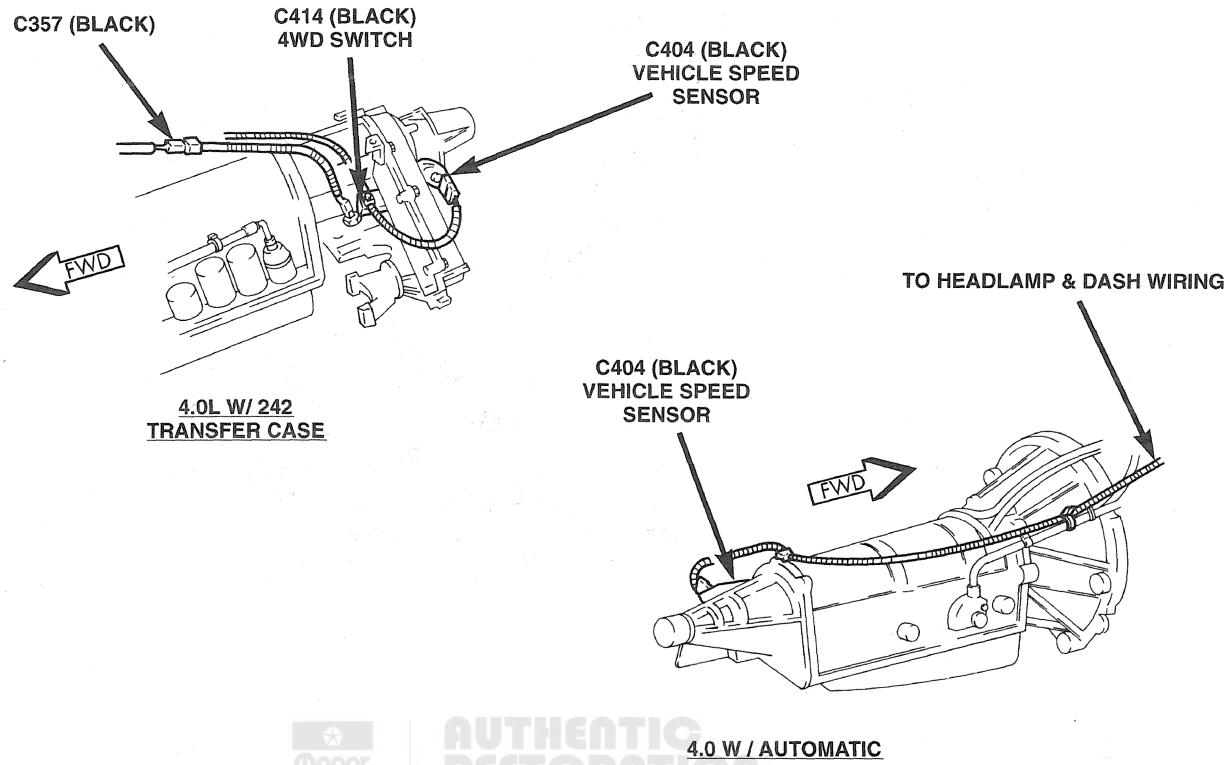


Fig. 19 Transmission Wiring Connectors

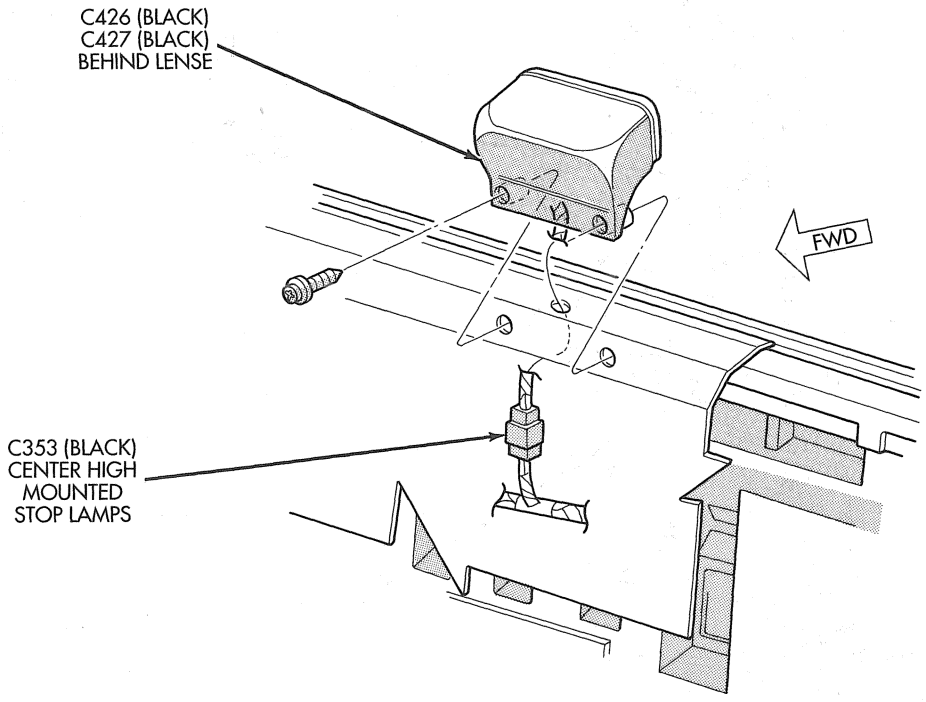


Fig. 20 Center High Mounted Stop Lamp (CHMSL)

8W-95 SPLICE LOCATIONS

INDEX

	page
DIAGNOSIS AND TESTING	
INTRODUCTION	1
SCHEMATICS AND DIAGRAMS	
SPLICE LOCATIONS	1

DIAGNOSIS AND TESTING

INTRODUCTION

This section provides illustrations identifying the general location of the splices in this vehicle. A splice index is provided. Use the wiring diagrams in each section for splice number identification. Refer to the index for proper splice number.

SCHEMATICS AND DIAGRAMS

SPLICE LOCATIONS

For splices that are not shown in the figures in this section a N/S is placed in the Fig. column.

Splice Number	Location	Fig.
S101	Near Ignition Coil T/O	2
S103	In T/O to Camshaft Position Sensor	2
S104	Near T/O to A/C Low Pressure Switch	1
S105	Near Vehicle Speed Control Servo T/O	1
S107	Near Duty Cycle EVAP Solenoid T/O	1
S108	Near Front Wiper Motor T/O	1
S109	After Branch to Engine Harness	1
S110	Near Grommet in Branch to Controller, Antilock Brakes (CAB)	1
S111	Near Branch to ABS Diode	1
S112	In T/O to Camshaft Position Sensor	2
S114	Between T/Os for Injectors No. 4 and 6	2
S115	After T/O for Injector No. 6	2
S116	After T/O to Transmission Control Module, Near Grommet	1
S118	Near Branch to Engine Harness	1
S119	Near Branch to Engine Harness	1
S120	Between Wiper Motor and Underhood Lamp T/Os	1
S121	Between Wiper Motor and Underhood Lamp T/Os	1
S122	Between Wiper Motor and Underhood Lamp T/Os	1
S123	Near Underhood Lamp T/O	1
S124	Between Vehicle Speed Control Servo T/O and Underhood Lamp T/O	1
S128	Between Left and Right Fog Lamp T/Os	3
S129	Between Left and Right Fog Lamp T/Os	3
S130	Between Left and Right Fog Lamp T/Os	3
S131	Before Branch to Left Horn	1
S201	Near Buzzer Module T/O	4
S202	Near Telltale Connector (Cluster) T/O	4
S203	Between T/Os for Front Wiper Switch and Multi-Function Switch	4
S204	Between T/Os for Blower Motor Switch and Glove Box	4
S205	In Branch to Rear Window Defogger Switch	4
S206	Near Glove Box Lamp T/O	4
S207	Near Telltale Connector (Cluster) T/O	4
S208	In Branch to Rear Window Defogger Switch	4
S209	In Headlamp Switch T/O	4

SCHEMATICS AND DIAGRAMS (Continued)

Splice Number	Location	Fig.
S210	Between T/Os for Blower Motor and Glove Box Lamp	4
S211	Near Buzzer Module T/O	4
S212	Between T/Os for Headlamp Switch and Telltale Connector (Cluster)	4
S213	Between T/Os for Blower Motor and Glove Box Lamp	4
S214	Near Blower Motor Resistor Block T/O	4
S215	Near A/C Cycling Switch T/O	4
S216	Between T/Os for Headlamp Switch and Dash Connector (C175)	4
S217	In T/O to Dash Connector (C173)	4
S218	Near T/O for Headlamp Switch	4
S219	Between T/Os for Multi-Function Switch and Wiper Motor Switch	4
S220	Before Branch to Dash Connector (C173)	4
S221	In Branch to Relay Center	4
S222	In Branch to Relay Center	4
S223	Near Blower Motor T/O	4
S301	Near Branch to Left Rear Door	6
S302	Near Branch to Left Rear Door	6
S303	Near Right Front Door Grommet, Before Power Mirror T/O	7
S304	Before T/O to Right Rear Door Jamb Switch	6
S307	After Branch to Fuel Pump Module	6
S309	Near Branch to Left Rear Door	6
S310	Bottom of Left Front Door Opening	6
S311	In Branch to Fuel Pump Module	6
S312	Near T/Os' for Left Front Door Connectors	5
S313	In Power Mirror Switch T/O	5
S314	Near T/O for Left Front Door Connectors	5
S315	Near T/O for Left Front Door Connectors	5
S316	Right A-Pillar	8
S317	In Trailer Tow Harness, Near Grommet	9
S318	In Trailer Tow Harness, Near Grommet	9
S319	In Liftgate, Near T/O for Liftgate Lock Motor	9
S401	In Left Rear Tail Lamp Harness	N/S
S402	In Right Rear Tail Lamp Harness	N/S
S403	In Left Rear Tail Lamp Harness	N/S

AUTHENTIC RESTORATION PRODUCT

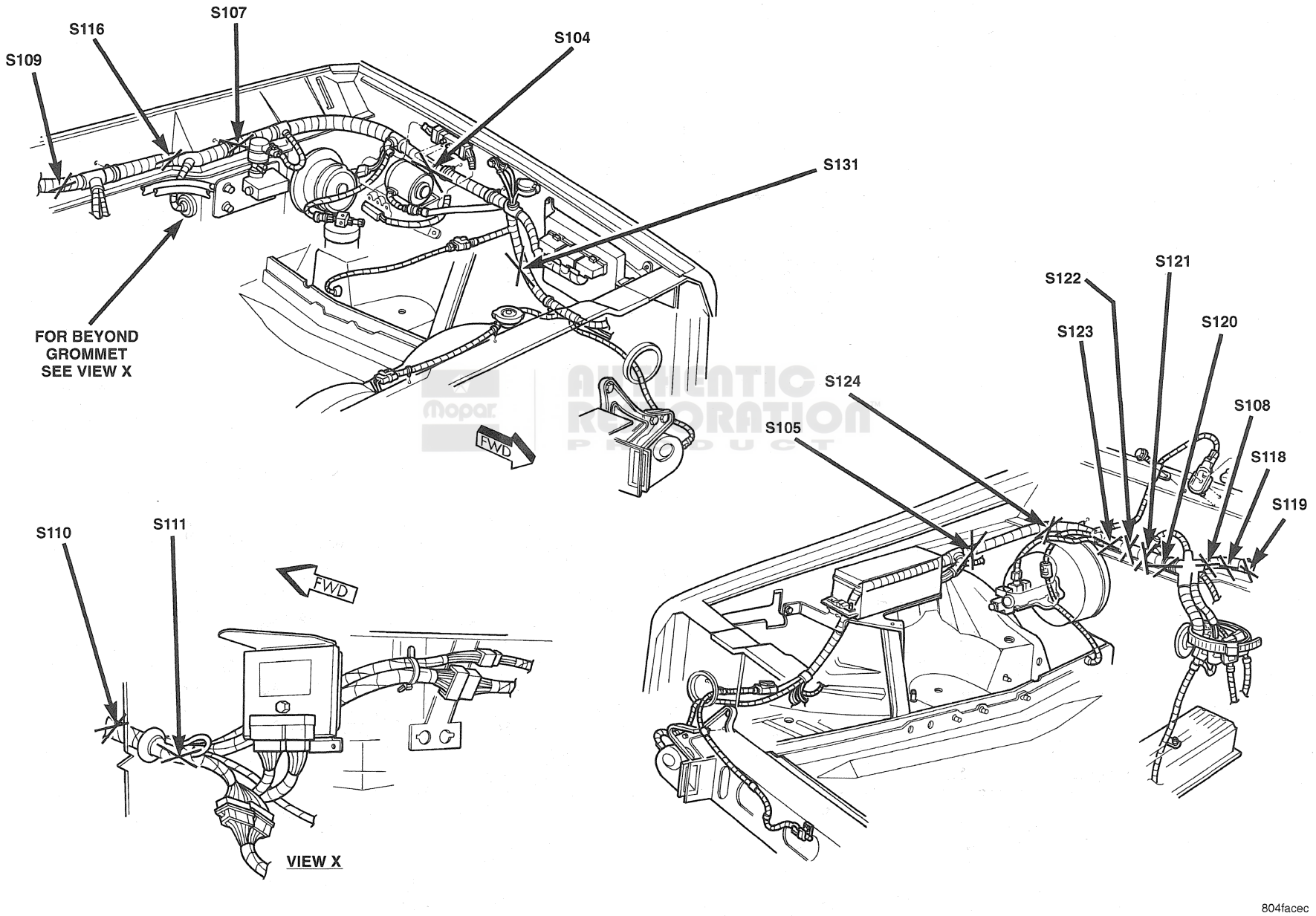


Fig. 1 Engine Compartment Wiring Splices

SCHEMATICS AND DIAGRAMS (Continued)

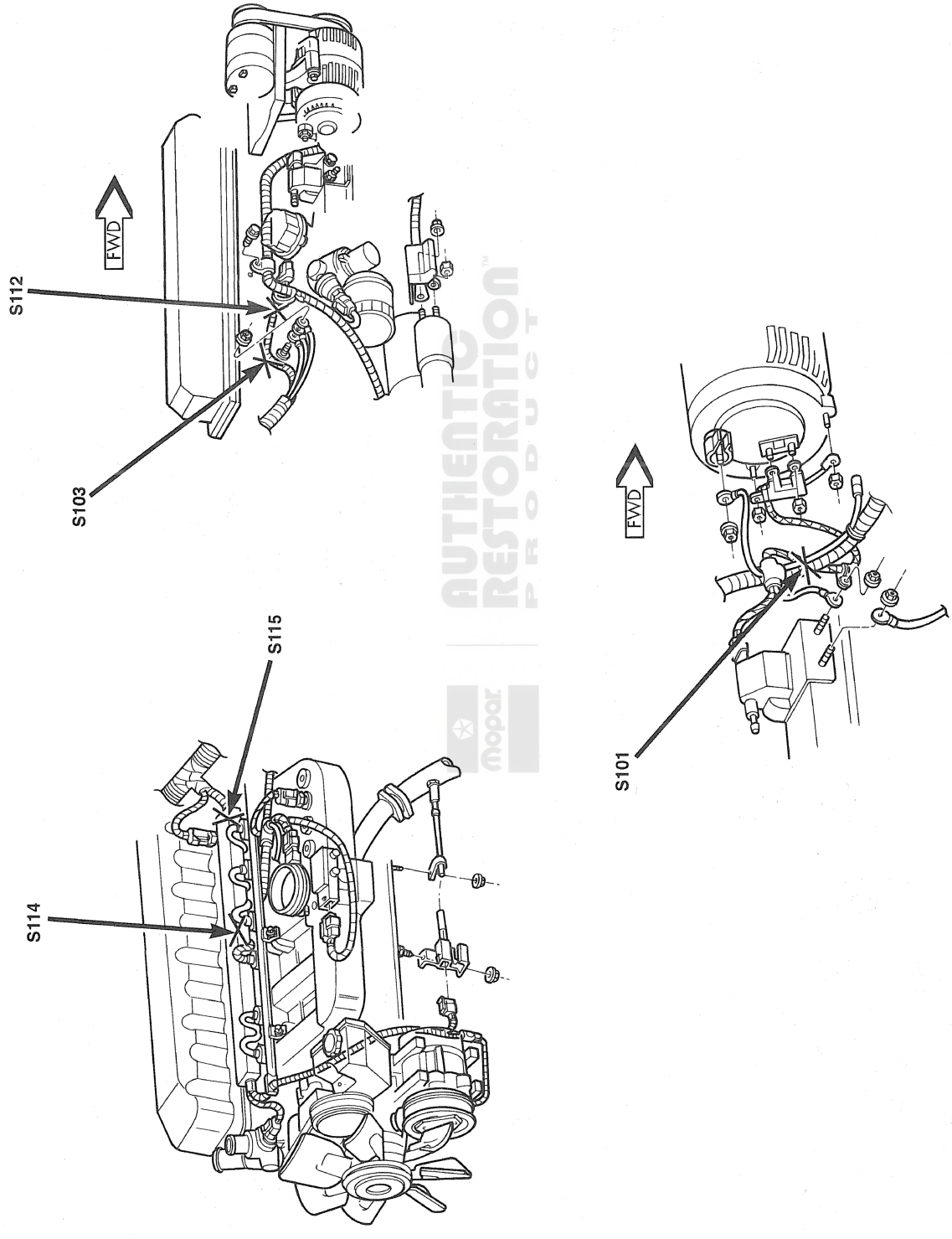
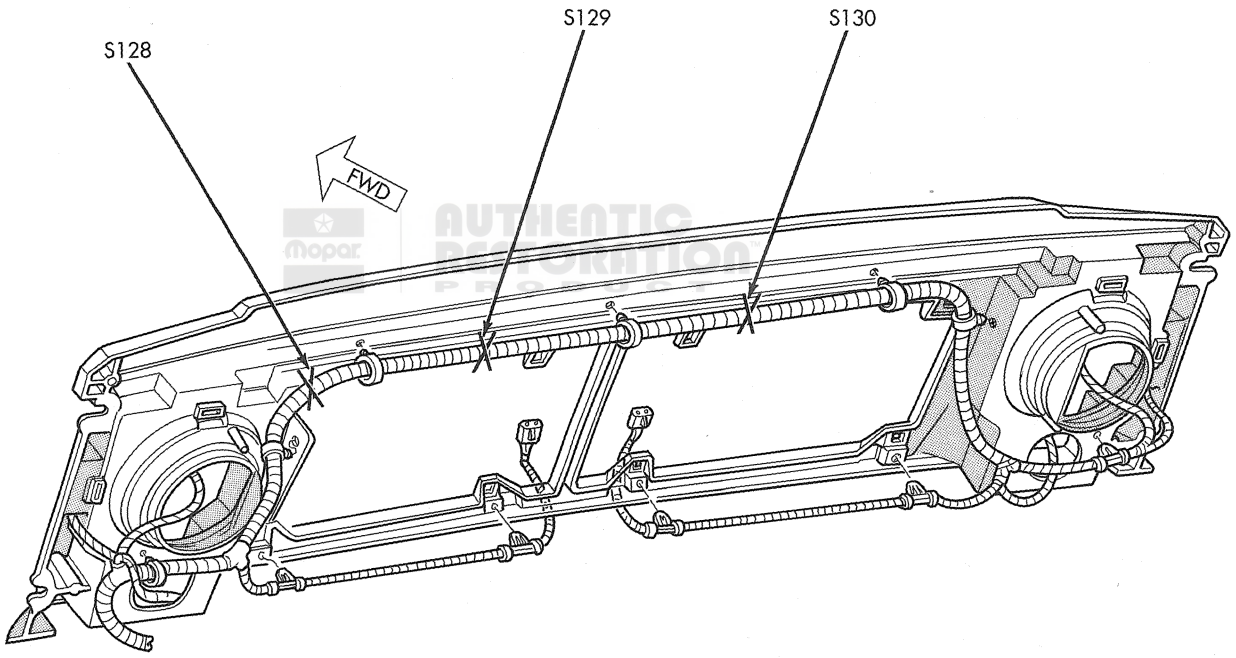


Fig. 2 Engine Wiring Splices

SCHEMATICS AND DIAGRAMS (Continued)



J958W-130

Fig. 3 Front End Lighting Wiring Splices

SCHEMATICS AND DIAGRAMS (Continued)

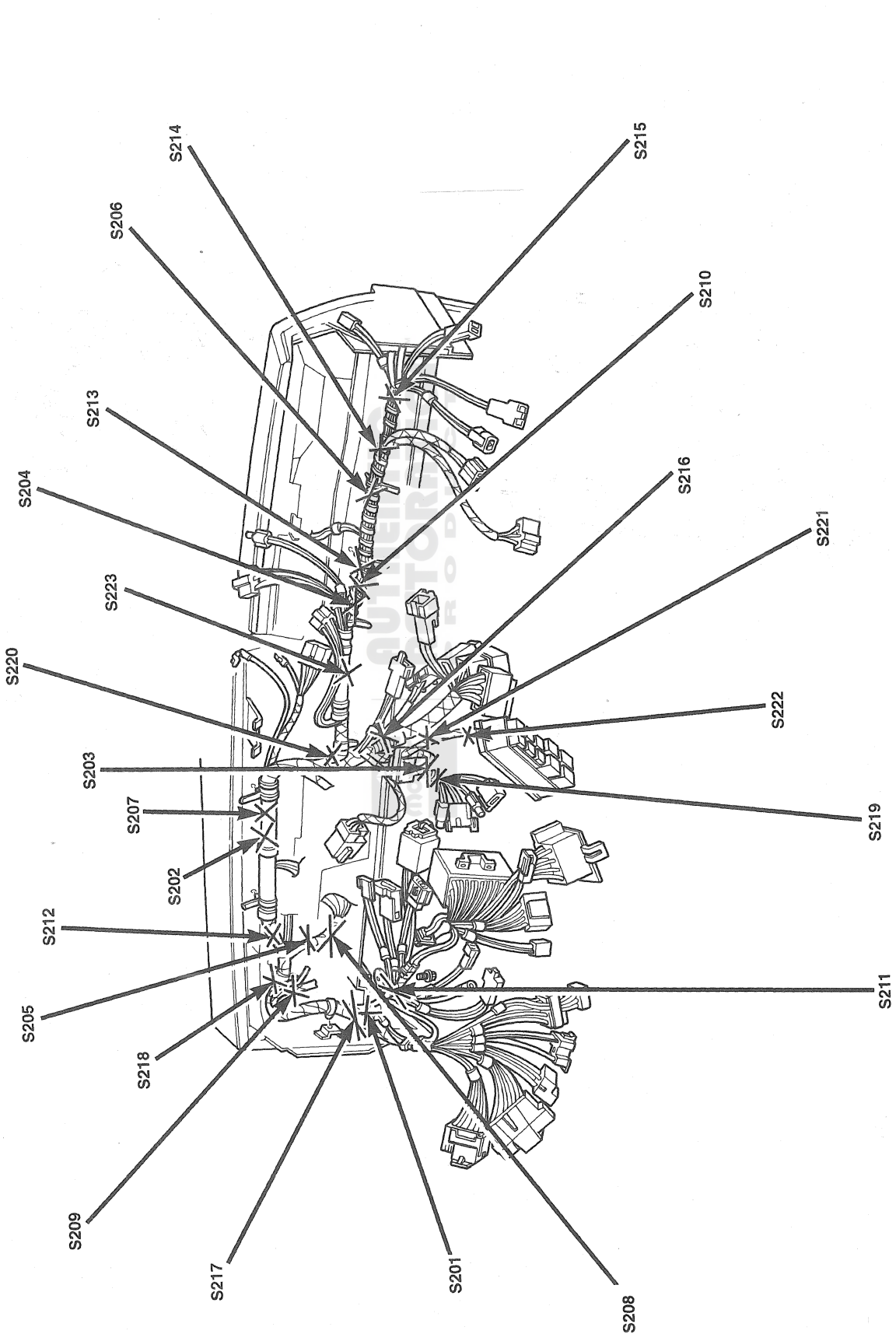
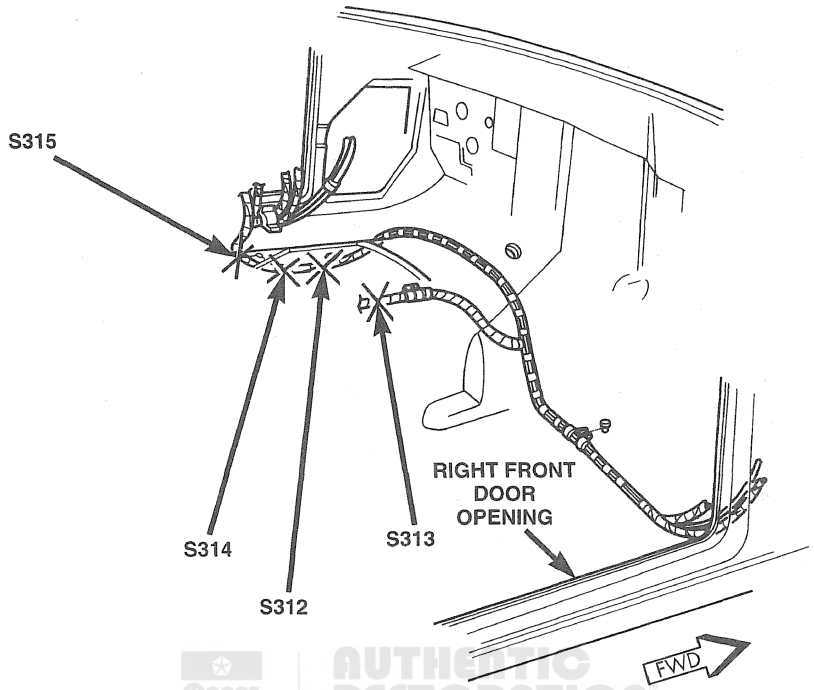


Fig. 4 Instrument Panel Wiring Splices

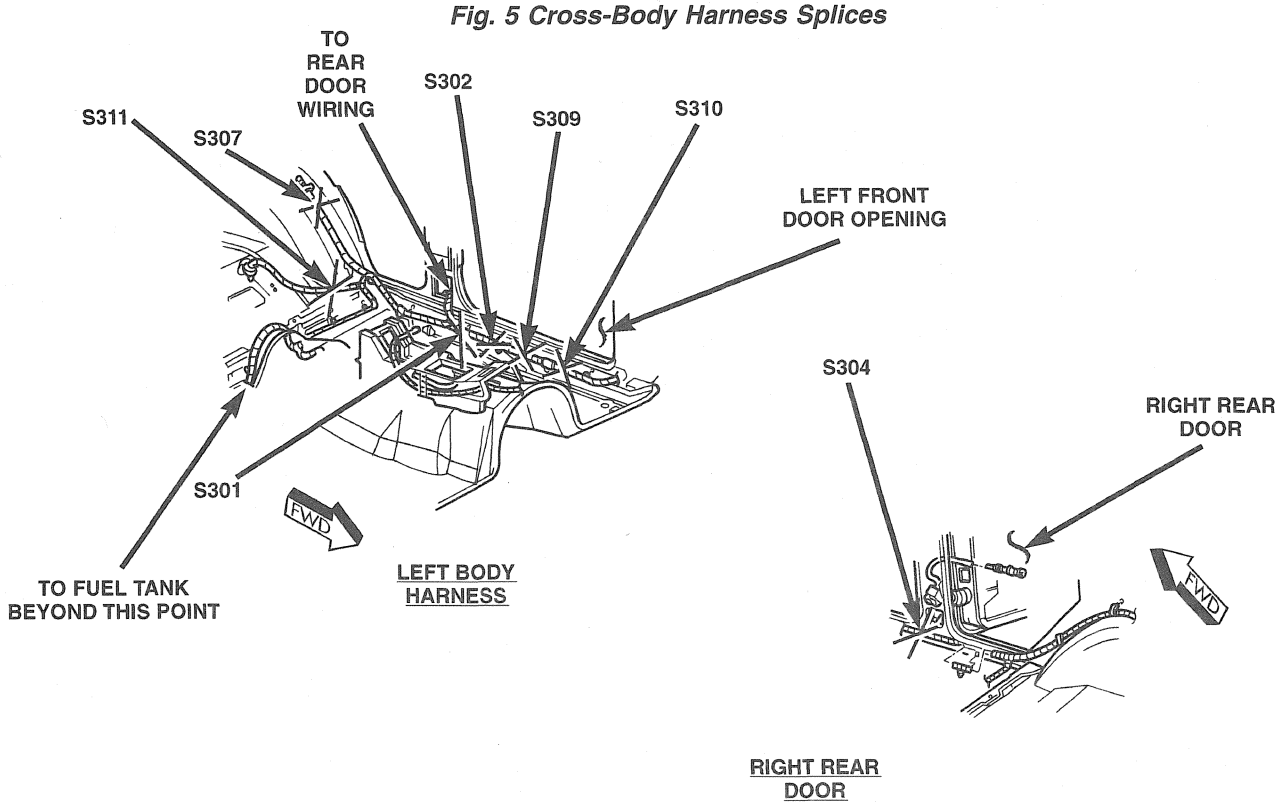
SCHEMATICS AND DIAGRAMS (Continued)



Mopar AUTHENTIC RESTORATION PRODUCT

80468d9f

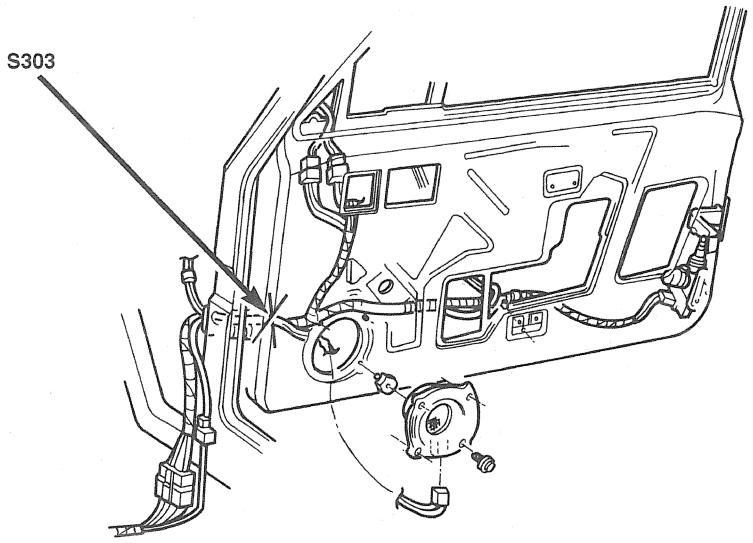
Fig. 5 Cross-Body Harness Splices



80468da1

Fig. 6 Left Body Harness and Right Rear Door Splices

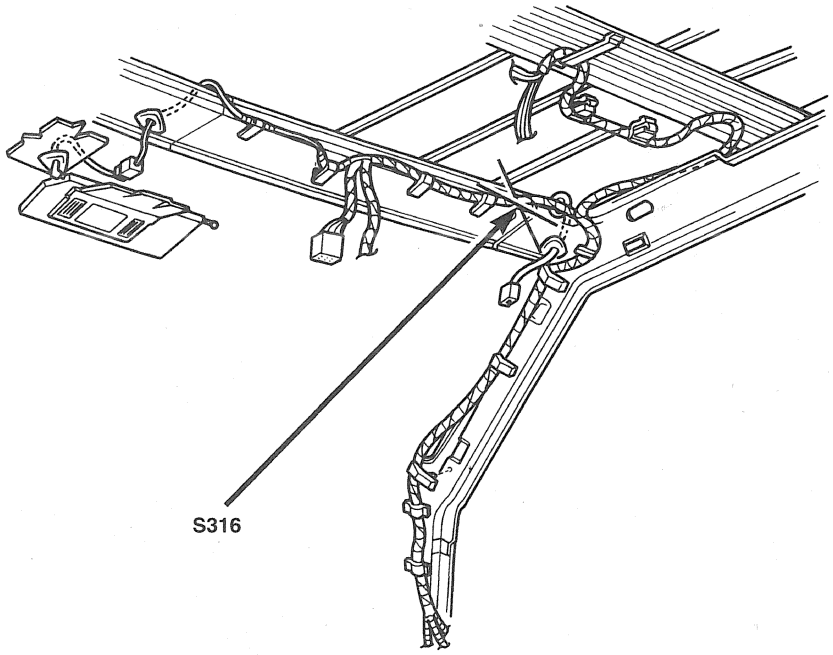
SCHEMATICS AND DIAGRAMS (Continued)



Mopar AUTHENTIC RESTORATION PRODUCT

80468da0

Fig. 7 Right Front Door Wiring Splice



80468da2

Fig. 8 Dome Lamp Harness Splice

SCHEMATICS AND DIAGRAMS (Continued)

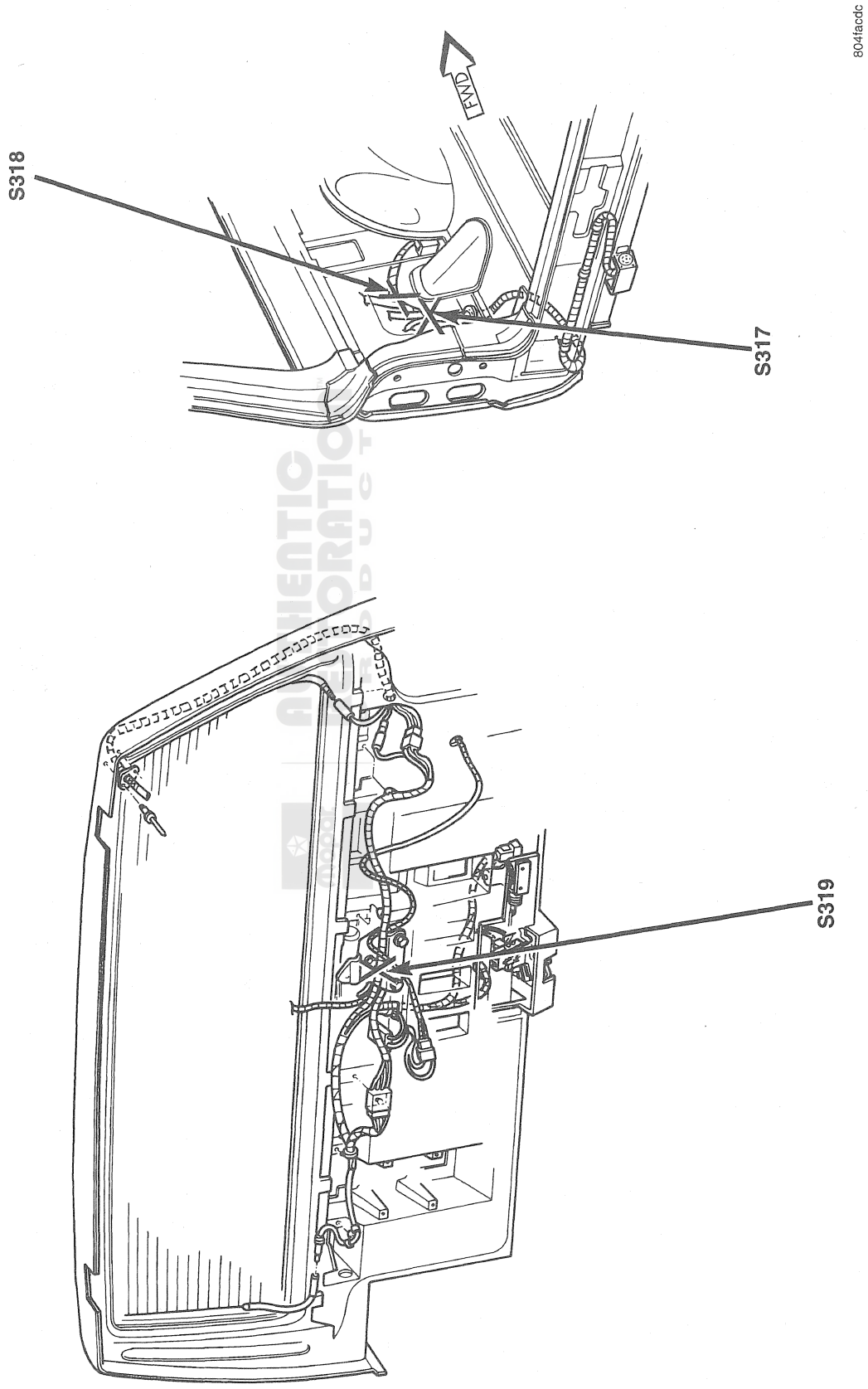


Fig. 9 Liftgate and Trailer Tow Wiring Splices

ENGINE

CONTENTS

	page		page
2.5L ENGINE	15	ENGINE DIAGNOSIS	8
4.0L ENGINE	54	STANDARD SERVICE INFORMATION	1

STANDARD SERVICE INFORMATION

INDEX

	page		page
GENERAL INFORMATION		HYDROSTATIC LOCK	4
ENGINE OIL	5	MEASURING WITH PLASTIGAGE	3
ENGINE PERFORMANCE	2	REPAIR DAMAGED OR WORN THREADS	4
FORM-IN-PLACE GASKETS	1	SERVICE ENGINE ASSEMBLY	
HONING CYLINDER BORES	2	(SHORT BLOCK)	4

AUTHENTIC Mopar RESTORATION PRODUCT

GENERAL INFORMATION

FORM-IN-PLACE GASKETS

There are several places where form-in-place gaskets are used on the engine. **DO NOT use form-in-place gasket material unless specified.** Care must be taken when applying form-in-place gaskets. Bead size, continuity and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over. A continuous bead of the proper width is essential to obtain a leak-free joint.

Two types of form-in-place gasket materials are used in the engine area (Mopar Silicone Rubber Adhesive Sealant and Mopar Gasket Maker). Each have different properties and cannot be used interchangeably.

MOPAR SILICONE RUBBER ADHESIVE SEALANT

Mopar Silicone Rubber Adhesive Sealant, normally black in color, is available in 3 ounce tubes. Moisture in the air causes the sealant material to cure. This material is normally used on flexible metal flanges. It has a shelf life of a year and will not properly cure if over aged. Always inspect the package for the expiration date before use.

MOPAR GASKET MAKER

Mopar Gasket Maker, normally red in color, is available in 6 cc tubes. This anaerobic type gasket material cures in the absence of air when squeezed between smooth machined metallic surfaces. It will not cure if left in the uncovered tube. DO NOT use on flexible metal flanges.

SURFACE PREPARATION

Parts assembled with form-in-place gaskets may be disassembled without unusual effort. In some instances, it may be necessary to lightly tap the part with a mallet or other suitable tool to break the seal between the mating surfaces. A flat gasket scraper may also be lightly tapped into the joint but care must be taken not to damage the mating surfaces.

Scrape or wire brush all gasket surfaces to remove all loose material. Inspect stamped parts to ensure gasket rails are flat. Flatten rails with a hammer on a flat plate, if required. Gasket surfaces must be free of oil and dirt. Make sure the old gasket material is removed from blind attaching holes.

GASKET APPLICATION

Assembling parts using a form-in-place gasket requires care.

Mopar Silicone Rubber Adhesive Sealant should be applied in a continuous bead approximately 3 mm (0.12 inch) in diameter. All mounting holes must be circled. For corner sealing, a 3 or 6 mm (1/8 or 1/4

inch) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The use of a locating dowel is recommended during assembly to prevent smearing the material off location.

Mopar Gasket Maker should be applied sparingly to one gasket surface. The sealant diameter should be 1.00 mm (0.04 inch) or less. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing the material off location.

ENGINE PERFORMANCE

To provide best vehicle performance and lowest vehicle emissions, it is most important that the tune-up be done accurately. Use the specifications listed on the Vehicle Emission Control Information label found on the engine compartment hood.

(1) Test battery specific gravity. Add water, if necessary. Clean and tighten battery connections.

(2) Test cranking amperage draw (refer to Group 8B, Battery/Starter Service for the proper procedures).

(3) Tighten the intake manifold bolts (refer to Group 11, Exhaust System and Intake Manifold for the proper specifications).

(4) Perform cylinder compression test:

CAUTION: DO NOT overspeed the engine.

(a) Check engine oil level and add oil, if necessary.

(b) Drive the vehicle until engine reaches normal operating temperature.

(c) Select a route free from traffic and other forms of congestion, observe all traffic laws and briskly accelerate through the gears several times. The higher engine speed may help clean out valve seat deposits which can prevent accurate compression readings.

(d) Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators—fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.

(e) Disconnect coil wire from distributor and secure to good ground to prevent a spark from starting a fire.

(f) Be sure throttle blades are fully open during the compression check.

(g) Insert compression gage adaptor into the No.1 spark plug hole. Crank engine until maximum pressure is reached on gauge. Record this pressure as No.1 cylinder pressure.

(h) Insert compression gage adaptor into the No.1 spark plug hole. Crank engine until maximum pressure is reached on gauge. Record this pressure as No.1 cylinder pressure.

(i) Repeat Step 4g for all remaining cylinders.

(j) Compression should not be less than 689 kPa (100 psi) and not vary more than 172 kPa (25 psi) from cylinder to cylinder.

(k) If cylinder(s) have abnormally low compression pressures, repeat procedure.

(l) If the same cylinder(s) repeat an abnormally low reading, it could indicate the existence of a problem in the cylinder.

NOTE: The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should NOT be disassembled to determine the cause of low compression unless some malfunction is present.

(5) Clean or replace spark plugs as necessary. Adjust gap (refer to Group 8D, Ignition System for gap adjustment and torque).

(6) Test resistance of spark plug cables (refer to Group 8D, Ignition System).

(7) Inspect the primary wire. Test coil output voltage, primary and secondary resistance. Replace parts as necessary (refer to Group 8D, Ignition System and make necessary adjustment).

(8) Perform a combustion analysis.

(9) Test fuel pump for pressure (refer to Group 14, Fuel System for the proper specifications).

(10) Inspect air filter element (refer to Group 0, Lubrication and Maintenance for the proper procedure).

(11) Inspect crankcase ventilation system (refer to Group 0, Lubrication and Maintenance for the proper procedure).

(12) For emission controls refer to Group 25, Emission Controls System for service procedures.

(13) Inspect and adjust accessory belt drives (refer to Group 7, Cooling System for the proper adjustments).

(14) Road test vehicle as a final test.

HONING CYLINDER BORES

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

(1) Used carefully, the Cylinder Bore Sizing Hone C-823 equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes

GENERAL INFORMATION (Continued)

will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

(2) Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880 or a light honing oil available from major oil distributors.

CAUTION: DO NOT use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 50° to 60° for proper seating of rings (Fig. 1).

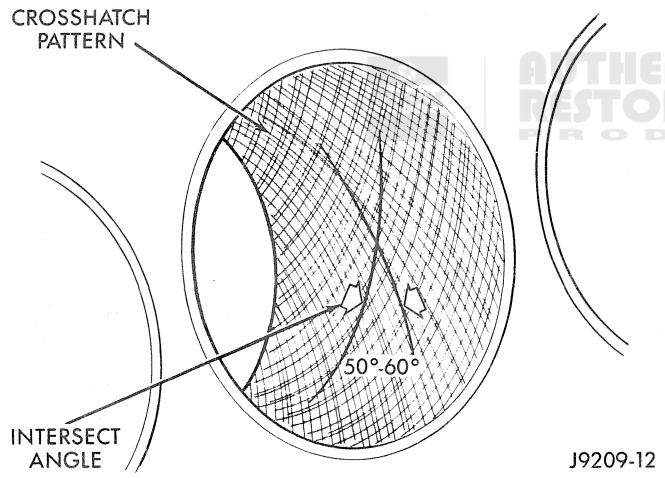


Fig. 1 Cylinder Bore Crosshatch Pattern

(4) A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.

(5) After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

MEASURING WITH PLASTIGAGE

CRANKSHAFT MAIN BEARING CLEARANCE

Engine crankshaft bearing clearances can be determined by use of Plastigage, or equivalent. The following is the recommended procedures for the use of Plastigage:

(1) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(2) The total clearance of the main bearings can only be determined by removing the weight of the crankshaft. This can be accomplished by either of two methods:

METHOD - 1 (PREFERRED)

Shim the bearings adjacent to the bearing to be checked. This will remove the clearance between upper bearing shell and the crankshaft. Place a minimum of 0.254 mm (0.010 inch) shim between the bearing shell and the adjacent bearing cap. Tighten the bolts to 18 N·m (13 ft. lbs.) torque.

- **ALL ENGINES**—When checking No.1 main bearing; shim No.2 main bearing.
- **ALL ENGINES**—When checking No.2 main bearing; shim No.1 and No.3 main bearing.
- **ALL ENGINES**—When checking No.3 main bearing; shim No.2 and No.4 main bearing.
- **ALL ENGINES**—When checking No.4 main bearing; shim No.3 and No.5 main bearing.
- **2.5L ENGINE**—When checking No.5 main bearing; shim No.4 main bearing.
- **4.0L ENGINE**—When checking No.5 main bearing; shim No.4 and No.6 main bearing.
- **4.0L ENGINE**—When checking No.6 main bearing; shim No.5 and No.7 main bearing.
- **4.0L ENGINE**—When checking No.7 main bearing; shim No.6 main bearing.

NOTE: Remove all shims before assembling engine.

METHOD - 2 (ALTERNATIVE)

The weight of the crankshaft is supported by a jack under the counterweight adjacent to the bearing being checked.

(1) Place a piece of Plastigage across the entire width of the bearing cap shell (Fig. 2). Position the Plastigage approximately 6.35 mm (1/4 inch) off center and away from the oil holes. In addition, suspect areas can be checked by placing the Plastigage in that area. Tighten the bearing cap bolts of the bearing being checked to 108 N·m (80 ft. lbs.) torque. **DO NOT rotate the crankshaft or the Plastigage may be smeared, giving inaccurate results.**

(2) Remove the bearing cap and compare the width of the flattened Plastigage with the scale provided on

GENERAL INFORMATION (Continued)

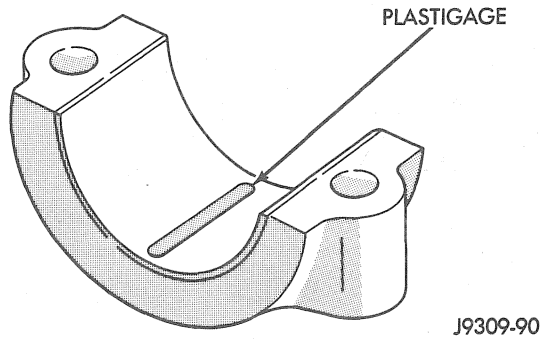


Fig. 2 Placement of Plastigage in Bearing Shell

the package (Fig. 3). Plastigage generally comes in 2 scales (one scale is in inches and the other is a metric scale). Locate the band closest to the same width. This band shows the amount of clearance. Differences in readings between the ends indicate the amount of taper present. Record all readings taken (refer to Engine Specifications).

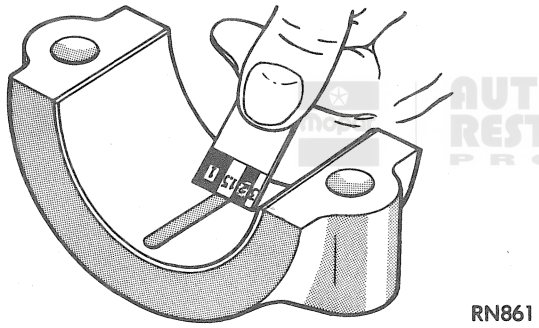


Fig. 3 Clearance Measurement

(3) Plastigage is available in a variety of clearance ranges. The 0.025-0.076 mm (0.001-0.003 inch) range is usually the most appropriate for checking engine bearing clearances.

CONNECTING ROD BEARING CLEARANCE

Engine connecting rod bearing clearances can be determined by use of Plastigage, or equivalent. The following is the recommended procedures for the use of Plastigage:

(1) Remove oil film from surface to be checked. Plastigage is soluble in oil.

(2) Place a piece of Plastigage across the entire width of the bearing cap shell (Fig. 2). Position the Plastigage approximately 6.35 mm (1/4 inch) off center and away from the oil holes. In addition, suspect areas can be checked by placing the Plastigage in the suspect area.

(3) The crankshaft must be turned until the connecting rod to be checked starts moving toward the top of the engine. Only then should the rod cap with Plastigage in place be assembled. Tighten the rod cap nut to 45 N·m (33 ft. lbs.) torque. **DO NOT rotate the crankshaft or the Plastigage may be smeared, giving inaccurate results.**

(4) Remove the bearing cap and compare the width of the flattened Plastigage with the scale provided on the package (Fig. 3). Plastigage generally comes in 2 scales (one scale is in inches and the other is a metric scale). Locate the band closest to the same width. This band shows the amount of clearance. Differences in readings between the ends indicate the amount of taper present. Record all readings taken (refer to Engine Specifications).

(5) Plastigage is available in a variety of clearance ranges. The 0.025-0.076 mm (0.001-0.003 inch) range is usually the most appropriate for checking engine bearing clearances.

REPAIR DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole.

This brings the hole back to its original thread size.

AUTHENTIC RESTORATION PRODUCTS

CAUTION: Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

SERVICE ENGINE ASSEMBLY (SHORT BLOCK)

A service replacement engine assembly (short block) may be installed whenever the original cylinder block is defective or damaged beyond repair. It consists of the cylinder block, crankshaft, piston and rod assemblies. If needed, the camshaft must be procured separately and installed before the engine is installed in the vehicle.

A short block is identified with the letter "S" stamped on the same machined surface where the build date code is stamped for complete engine assemblies.

Installation includes the transfer of components from the defective or damaged original engine. Follow the appropriate procedures for cleaning, inspection and torque tightening.

HYDROSTATIC LOCK

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

(1) Perform the Fuel Pressure Release Procedure (refer to Group 14, Fuel System).

(2) Disconnect the negative cable from the battery.

GENERAL INFORMATION (Continued)

(3) Inspect air cleaner, induction system and intake manifold to ensure system is dry and clear of foreign material.

(4) Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the plugs from the engine.

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

(5) With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.

(6) Identify the fluid in the cylinders (i.e. coolant, fuel, oil, etc.).

(7) Make sure all fluid has been removed from the cylinders.

(8) Repair engine or components as necessary to prevent this problem from occurring again.

(9) Squirt engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.

(10) Install new spark plugs. Tighten the spark plugs to 37 N·m (27 ft. lbs.) torque.

(11) Drain engine oil. Remove and discard the oil filter.

(12) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(13) Install a new oil filter.

(14) Fill engine crankcase with the specified amount and grade of oil (refer to Group 0, Lubrication and Maintenance).

(15) Connect the negative cable to the battery.

(16) Start the engine and check for any leaks.

ENGINE OIL

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY.

ENGINE OIL SPECIFICATION

CAUTION: Do not use non-detergent or straight mineral oil when adding or changing crankcase lubricant. Engine failure can result.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified or an oil that conforms to the API Service Grade SH or SH/CD. MOPAR provides engine oils that conform to all of these service grades.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 30 specifies a single viscosity engine oil. Engine oils also have multiple viscosities. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 4).

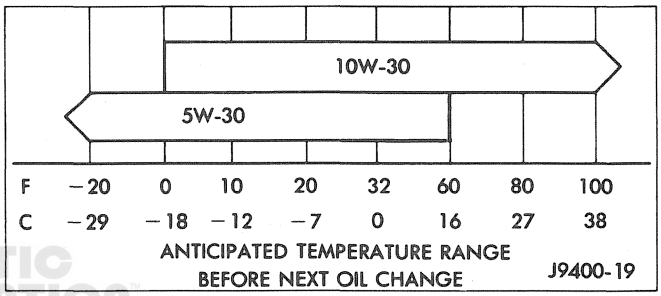


Fig. 4 Temperature/Engine Oil Viscosity

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. They are designated as either ENERGY CONSERVING or ENERGY CONSERVING II.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 5).



9400-9

Fig. 5 Engine Oil Container Standard Notations

ENGINE OIL ADDITIVES

In some instances, such as infrequent operation, short trip driving, and during break-in after a major overhaul, addition of special materials containing

GENERAL INFORMATION (Continued)

anti-rust and anti-scuff additives are beneficial. A suitable product for this purpose is MOPAR Engine Oil Supplement.

OIL LEVEL INDICATOR (DIPSTICK)

The engine oil level indicator (Dipstick) is located at the right rear of both 2.5L engines and 4.0L engines (Fig. 6).

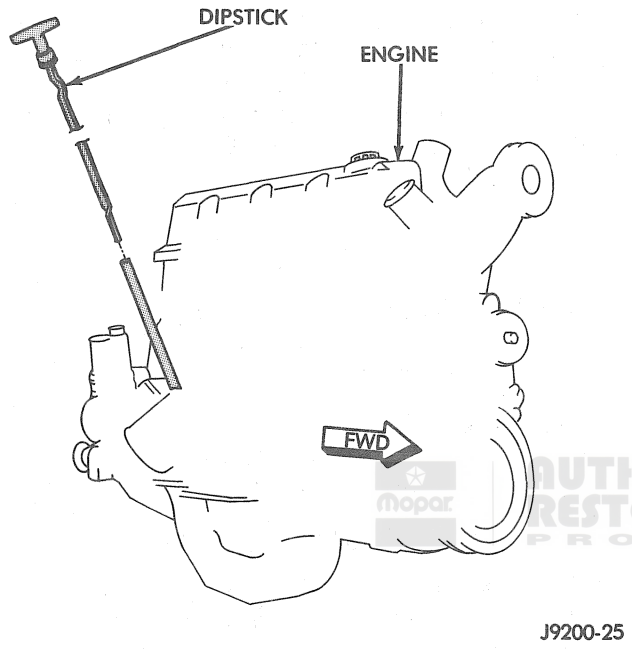


Fig. 6 Engine Oil Dipstick Location—Typical

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, oil foaming and oil pressure loss can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick (Fig. 7) (Fig. 8).

(1) Position vehicle on level surface.

(2) With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.

(3) Wipe dipstick clean.

(4) Install dipstick and verify it is seated in the tube.

(5) Remove dipstick, with handle held above the tip, take oil level reading (Fig. 7) (Fig. 8).

(6) Add oil only if level is below the ADD mark on dipstick.

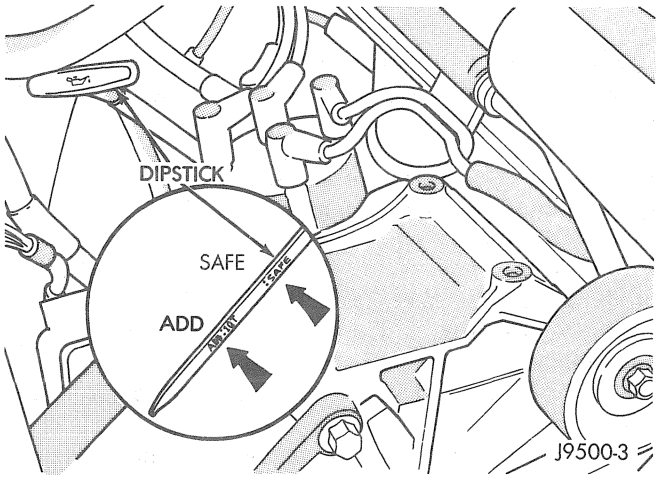


Fig. 7 Engine Oil Dipstick—2.5L Engine

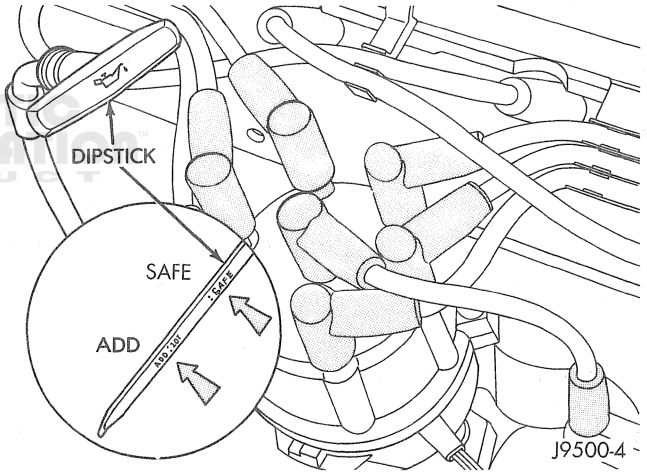


Fig. 8 Engine Oil Dipstick—4.0L Engine

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Hoist and support vehicle on safety stands.

(3) Remove oil fill cap.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.

(6) Install drain plug in crankcase.

(7) Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.

GENERAL INFORMATION (Continued)

(8) Install oil fill cap.
(9) Start engine and inspect for leaks.
(10) Stop engine and inspect oil level.

ENGINE OIL FILTER CHANGE

FILTER SPECIFICATION

CAUTION: Do not use oil filter with metric threads. The proper oil filter has SAE type 3/4 X 16 threads. An oil filter with metric threads can result in oil leaks and engine failure.

All Jeep engines are equipped with a high quality full-flow, throw-away type oil filter. Chrysler Corporation recommends a Mopar or equivalent oil filter be used.

OIL FILTER REMOVAL

(1) Position a drain pan under the oil filter.
(2) Using a suitable oil filter wrench loosen filter.
(3) Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss (Fig. 9) (Fig. 10).

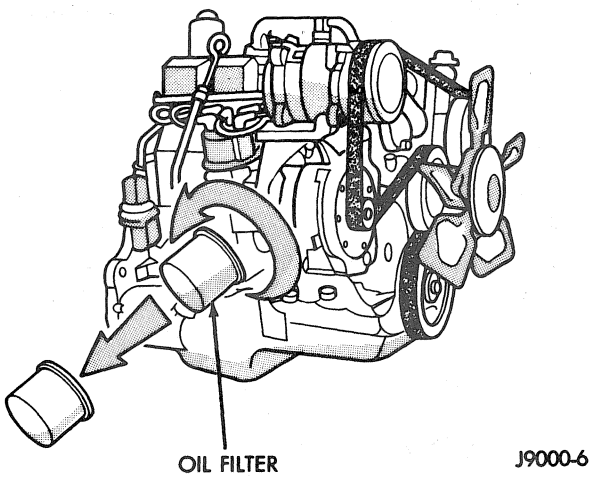


Fig. 9 Oil Filter—2.5L Engine

(4) When filter separates from adapter nipple, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

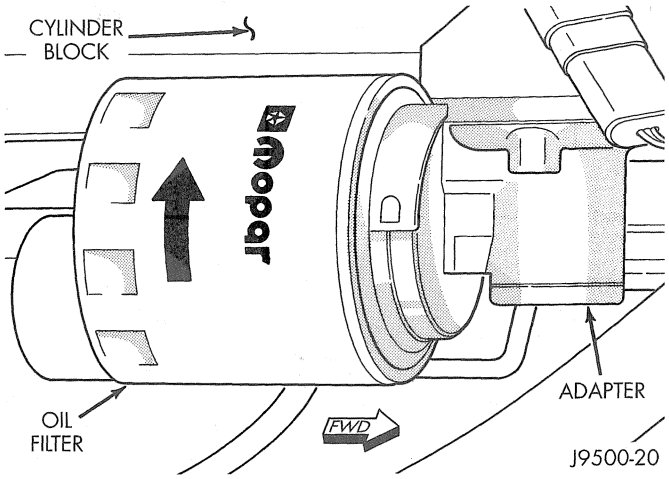


Fig. 10 Oil Filter—4.0L Engine

(5) With a wiping cloth, clean the gasket sealing surface (Fig. 11) of oil and grime.

OIL FILTER INSTALLATION

(1) Lightly lubricate oil filter gasket with engine oil or chassis grease.
(2) Thread filter onto adapter nipple. When gasket makes contact with sealing surface, (Fig. 11) hand tighten filter one full turn, do not over tighten.
(3) Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

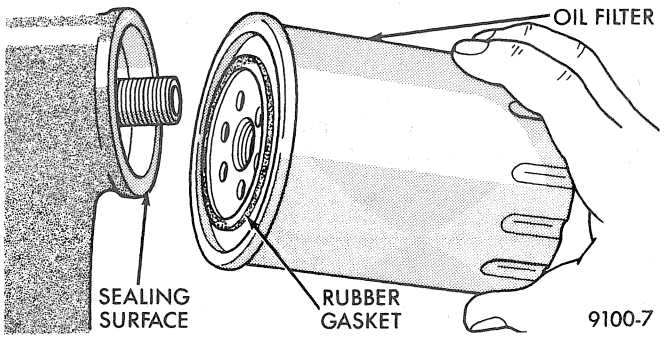


Fig. 11 Oil Filter Sealing Surface—Typical

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

ENGINE DIAGNOSIS

INDEX

page

DIAGNOSIS AND TESTING
CYLINDER COMBUSTION PRESSURE LEAKAGE TEST 9
CYLINDER COMPRESSION PRESSURE TEST . . 8
ENGINE CYLINDER HEAD GASKET FAILURE DIAGNOSIS 8
ENGINE OIL PRESSURE 10
GENERAL INFORMATION 8
INSPECTION (ENGINE OIL LEAKS IN GENERAL) 9
INTAKE MANIFOLD LEAKAGE DIAGNOSIS 8
SERVICE DIAGNOSIS—LUBRICATION 14
SERVICE DIAGNOSIS—MECHANICAL 13
SERVICE DIAGNOSIS—PERFORMANCE 11

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine tune-ups.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

Refer to the Service Diagnosis—Performance chart and the Service Diagnosis—Mechanical chart for possible causes and corrections of malfunctions. Refer to Group 14, Fuel System for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test.
- Cylinder Combustion Pressure Leakage Test.
- Engine Cylinder Head Gasket Failure Diagnosis.
- Intake Manifold Leakage Diagnosis.

INTAKE MANIFOLD LEAKAGE DIAGNOSIS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.
(2) Spray a small stream of water at the suspected leak area.
(3) If a change in RPM'S, the area of the suspected leak has been found.
(4) Repair as required.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Clean the spark plug recesses with compressed air.
(2) Remove the spark plugs.
(3) Secure the throttle in the wide-open position.
(4) Disconnect the ignition coil.
(5) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
(6) Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

Refer to Engine Specifications for the correct engine compression pressures.

ENGINE CYLINDER HEAD GASKET FAILURE DIAGNOSIS

A leaking engine cylinder head gasket usually results in loss of power, loss of coolant and engine misfiring.

An engine cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- An engine cylinder head gasket leaking between adjacent cylinders is indicated by a loss of power and/or engine misfire.
- An engine cylinder head gasket leaking between a cylinder and an adjacent water jacket is indicated by coolant foaming or overheating and loss of coolant.

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders; follow the procedures outlined in Cylinder Compression Pressure

DIAGNOSIS AND TESTING (Continued)

Test. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50-70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

Remove the radiator cap.

Start the engine and allow it to warm up until the engine thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

If bubbles are not visible, install a radiator pressure tester and pressurize the coolant system.

If a cylinder is leaking combustion pressure into the water jacket, the tester pointer will pulsate with every combustion stroke of the cylinder.

CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

Check the coolant level and fill as required. DO NOT install the radiator cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1 379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to the Cylinder Combustion Pressure Leakage Test Diagnosis chart.

INSPECTION (ENGINE OIL LEAKS IN GENERAL)

Begin with a through visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

(1) Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.

(2) Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.

(3) Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24km (15 miles), and repeat inspection.

(5) **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

(1) Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.

(2) Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.

(3) Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

(4) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

(5) If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(6) If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.

(7) Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH CARBURETOR/THROTTLE BODY	Intake valve not seated properly.	Inspect valve. Reface or replace, if necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve not seated properly.	Inspect valve.Reface or replace, if necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaks or crack in cylinder block.	Remove cylinder head and inspect. Replace, if necessary.
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaks or crack in cylinder block or head between adjacent cylinders.	Remove cylinder head and inspect. Replace gasket or head, if necessary.
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston ring(s); cracked piston; worn rings and/or cylinder wall.	Inspect for broken ring(s) or piston. Measure ring gap and cylinder diameter, taper, and out-of-round. Replace affected part, if necessary.

J8909-78

Mopar AUTHENTIC RESTORATION PRODUCT

speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.

(4) If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit.

(2) Install Oil Pressure Line and Gauge Tool C-3292. Start engine and record pressure. Refer to Oil Pressure in Engine Specifications for the proper pressures.

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS—PERFORMANCE

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE WILL NOT START	1. Weak battery. 2. Corroded or loose battery connections. 3. Faulty starter. 4. Moisture on ignition wires and distributor cap. 5. Faulty ignition cables. 6. Faulty coil or control unit. 7. Incorrect spark plug gap. 8. Incorrect ignition timing. 9. Dirt or water in fuel system. 10. Faulty fuel pump. 11. Faulty connectors for crankshaft or camshaft position sensors.	1. Test battery specific gravity. Charge or replace as necessary. 2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals. 3. Refer to Group 8A, Battery/Starter/Charging System Diagnostics. 4. Wipe wires and cap clean and dry. 5. Replace any cracked or shorted cables. 6. Test and replace, if necessary (refer to Group 8D, Ignition System). 7. Set gap (refer to Group 8D, Ignition System). 8. Refer to Group 8D, Ignition System. 9. Clean system and replace fuel filter. 10. Install new fuel pump (refer to Group 14, Fuel System). 11. Rebuild or replace the connectors.
ENGINE STALLS OR ROUGH IDLE	1. Idle speed set too low. 2. Idle mixture too lean or too rich. 3. Leak in intake manifold. 4. Worn or burned distributor rotor. 5. Incorrect ignition wiring. 6. Faulty coil. 7. EGR valve leaking.	1. Refer to Group 14, Fuel System. 2. Refer to Group 14, Fuel System. 3. Inspect intake manifold gasket and vacuum hoses. Replace, if necessary (refer to Group 11, Exhaust System & Intake Manifold). 4. Install new distributor rotor. 5. Install correct wiring. 6. Test and replace, if necessary (refer to Group 8D, Ignition System). 7. Test and replace, if necessary (refer to Group 25, Emissions Control System).

J9409-91

SERVICE DIAGNOSIS—PERFORMANCE

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE LOSS OF POWER	1. Incorrect ignition timing. 2. Worn or burned distributor rotor. 3. Worn distributor shaft. 4. Dirty or incorrectly gapped spark plugs. 5. Dirt or water in fuel system. 6. Faulty fuel pump. 7. Incorrect valve timing. 8. Blown cylinder head gasket. 9. Low compression. 10. Burned, warped or pitted valves. 11. Plugged or restricted exhaust system. 12. Faulty ignition cables. 13. Faulty coil. 14. Faulty crankshaft or camshaft sensor.	1. Refer to Group 8D, Ignition System. 2. Install new distributor rotor. 3. Remove and repair distributor (refer to Group 8D, Ignition System). 4. Clean plugs and set gap (refer to Group 8D, Ignition System). 5. Clean system and replace fuel filter. 6. Install new fuel pump. 7. Correct valve timing. 8. Install new cylinder head gasket. 9. Test compression of each cylinder. 10. Install new valves. 11. Install new parts, as necessary. 12. Replace any cracked or shorted cables. 13. Test and replace, as necessary (refer to Group 8D, Ignition System). 14. Replace sensor.
ENGINE MISSES ON ACCELERATION	1. Dirty or gap set too wide in spark plug. 2. Incorrect ignition timing. 3. Dirt in fuel system. 4. Burned, warped or pitted valves. 5. Faulty coil.	1. Clean spark plugs and set gap (refer to Group 8D, Ignition System). 2. Refer to Group 8D, Ignition System. 3. Clean fuel system. 4. Install new valves. 5. Test and replace, if necessary, (refer to Group 8D, Ignition System).
ENGINE MISSES AT HIGH SPEED	1. Dirty or gap set too wide in spark plug. 2. Worn distributor shaft. 3. Worn or burned distributor rotor. 4. Faulty coil. 5. Incorrect ignition timing. 6. Dirty injector in throttle body. 7. Dirt or water in fuel system.	1. Clean spark plugs and set gap (refer to Group 8D, Ignition System). 2. Remove and repair distributor (refer to Group 8D, Ignition System). 3. Install new distributor rotor. 4. Test and replace, as necessary (refer to Group 8D, Ignition System). 5. Refer to Group 8D, Ignition System. 6. Clean injector. 7. Clean system and replace fuel filter.

J9409-92

SERVICE DIAGNOSIS—PERFORMANCE—CONT.

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS—MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	1. High or low oil level in crankcase.	1. Check for correct oil level (refer to Group 0, Lubrication and Maintenance.
	2. Thin or diluted oil.	2. Change oil (refer to Group 0, Lubrication and Maintenance).
	3. Low oil pressure.	3. Check engine oil level.
	4. Dirt in tappets/lash adjusters.	4. Clean hydraulic tappets/hydraulic lash adjusters.
	5. Bent push rods.	5. Install new push rods.
	6. Worn rocker arms.	6. Inspect oil supply to rocker arms.
	7. Worn tappets/lash adjusters.	7. Install new hydraulic tappets/ hydraulic lash adjusters.
	8. Worn valve guides.	8. Ream and install new valves with oversize stems.
	9. Excessive runout of valve seats on valve faces.	9. Grind valve seats and valves.
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. Check engine oil level (refer to Group 0, Lubrication and Maintenance).
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Excessive bearing clearance.	4. Measure bearings for correct clearance. Repair as necessary.
	5. Connecting rod journal out-of-round.	5. Replace crankshaft or grind journals.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. Check engine oil level (refer to Group 0, Lubrication and Maintenance).
	2. Low oil pressure.	2. Check engine oil level. Inspect oil pump relief valve and spring.
	3. Thin or diluted oil.	3. Change oil to correct viscosity.
	4. Excessive bearing clearance.	4. Measure bearings for correct clearance. Repair as necessary.
	5. Excessive end play.	5. Check No. 3 main bearing for wear on flanges.
	6. Crankshaft journal out-of-round, worn.	6. Grind journals or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque.

AUTHENTIC RESTORATION

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS—LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings. (a) Misaligned, deteriorated or torn. (b) Loose fastener, broken or porous metal part. 2. Crankshaft Rear Seal (a) Misinstalled, inverted or torn lip (b) Torn, cut or shaved seal back bead. 3. Crankshaft Seal Flange. Scratched, nicked or grooved. 4. Cylinder block to Cap Mating Surface. (a) Inadequate Loctite sealant. (b) Oil hole burr. 5. Oil Pan to Rear Main Cap Sealant (Slots 3.9 - 5.2 only). (a) Inadequate or mislocated sealant. (b) Torn, cut or misinstalled oil pan. (c) Cracked or damaged oil pan flange. 6. Chain Case Cover Seal. (a) Misinstalled, cocked or misaligned. (b) Torn, cut or damaged seal lips. (c) Scratched or damaged seal casing or cover bore. (d) Scratched or damaged vibration damper hub.	1. (a) Replace the part. (b) Tighten, repair or replace the part. 2. (a) Replace the seal. (b) Replace the seal. 3. Replace or polish if necessary. 4. (a) Apply sealant per sealant per service manual. (b) Carefully stone or chamfer hole. 5. (a) Apply sealant per service manual procedures. (b) Replace the gasket. (c) Replace the oil pan. 6. (a) Replace per service manual procedures. (b) Replace the seal. (c) Replace the seal. (d) Minor damage can be polished out; otherwise replace the part.
OIL PRESSURE DROP	1. Low oil level. 2. Faulty oil pressure sending unit. 3. Low oil pressure. 4. Clogged oil filter. 5. Worn parts in oil pump. 6. Thin or diluted oil. 7. Excessive bearing clearance. 8. Oil pump relief valve stuck. 9. Oil pump suction tube loose; bent or cracked. 10. Oil pump cover warped or cracked.	1. Check engine oil level. 2. Install new sending unit. 3. Check sending unit and check main bearing oil clearance. 4. Install new oil filter. 5. Replace worn parts or pump. 6. Change oil to correct viscosity. 7. Measure bearings for correct clearance. 8. Remove valve and inspect, clean and install. 9. Remove oil pan and install new tube, if necessary. 10. Install new oil pump.
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn, scuffed or broken rings. 2. Carbon in oil ring slot. 3. Rings fitted too tightly in grooves. 4. Worn valve guides. 5. Leaking intake gasket (3.9L & 5.2L engines). 6. Leaking valve guide seals (3.9L & 5.2L engines). 7. Dislodged valve guide seals (3.9L & 5.2L engines).	1. Hone cylinder bores and install new rings. 2. Install new rings. 3. Remove the rings. Check grooves. If grooves are not proper width, replace piston. 4. Ream guides and replace valves with oversize valves and seals. 5. Replace gasket and tighten intake manifold to proper torque. 6. Replace seals. 7. Seat valve guide seals or replace, as needed.

J9509-61

2.5L ENGINE

INDEX

page

DESCRIPTION AND OPERATION
ENGINE DESCRIPTION 15
LUBRICATION SYSTEM 16
OIL PUMP PRESSURE 16
OVERSIZE AND UNDERSIZE COMPONENT CODES 16
SERVICE PROCEDURES
FITTING CONNECTING ROD BEARINGS 20
FITTING CRANKSHAFT MAIN BEARINGS 23
PISTON FITTING 18
PISTON RING FITTING 19
VALVE TIMING 16
REMOVAL AND INSTALLATION
CAMSHAFT BEARINGS 41
CAMSHAFT PIN REPLACEMENT 39
CAMSHAFT 38
CRANKSHAFT MAIN BEARINGS 41
CYLINDER HEAD COVER 30
ENGINE ASSEMBLY 28
ENGINE CYLINDER HEAD 32
ENGINE DAMPER 27
ENGINE MOUNTS—FRONT 26

page

ENGINE MOUNT—REAR 27
HYDRAULIC TAPPETS 34
OIL PAN 43
OIL PUMP 44
PISTONS AND CONNECTING RODS 44
REAR MAIN OIL SEALS 46
ROCKER ARMS AND PUSH RODS 30
TIMING CASE COVER OIL SEAL 35
TIMING CASE COVER 36
TIMING CHAIN AND SPROCKETS 37
VALVE SPRINGS AND OIL SEALS 31
VALVES AND VALVE SPRINGS 34
VIBRATION DAMPER 35
DISASSEMBLY AND ASSEMBLY
CYLINDER BLOCK 48
VALVE SERVICE 46
CLEANING AND INSPECTION
CYLINDER BLOCK 49
ENGINE CYLINDER HEAD 49
ROCKER ARMS AND PUSH RODS 48
SPECIFICATIONS
2.5L ENGINE SPECIFICATIONS 50

DESCRIPTION AND OPERATION

ENGINE DESCRIPTION

The 2.5 liter (150 CID) four-cylinder engine is an In-line, lightweight, overhead valve engine.

Engine Type . . . . . .In-line 4 Cylinder
Bore and Stroke . . . . .98.4 x 81.0mm (3.88 x 3.19 in.)
Displacement . . . . . .2.5 (150 cu. in.)
Compression Ratio 9.1:1
Torque . . . . . .202 N·m (149 ft. lbs.) @ 3250 rpm
Firing Order 1–3–4–2
Lubrication . . . . .Pressure Feed–Full Flow Filtration
Engine Oil Capacity . . . . . .3.8 L (4 Quarts)
Cooling System . . .Liquid Cooled–Forced Circulation
Cooling System Capacity . . . . . .9.5L (10 Quarts)
Cylinder Block . . . . . .Cast Iron
Crankshaft . . . . . .Cast Nodular Iron
Cylinder Head . . . . . .Cast Nodular Iron
Camshaft . . . . . .Cast Nodular Iron
Pistons . . . . . .Aluminum Alloy (with Struts)
Pistons Combustion Cavity . . . . . .Double Quench
Connecting Rods . . . . . .Cast Nodular Iron

This engine is designed for unleaded fuel.

The engine cylinder head has dual quench-type combustion chambers that create turbulence and fast burning of the air/fuel mixture. This results in good fuel economy.

The cylinders are numbered 1 through 4 from front to rear. The firing order is 1-3-4-2 (Fig. 1).

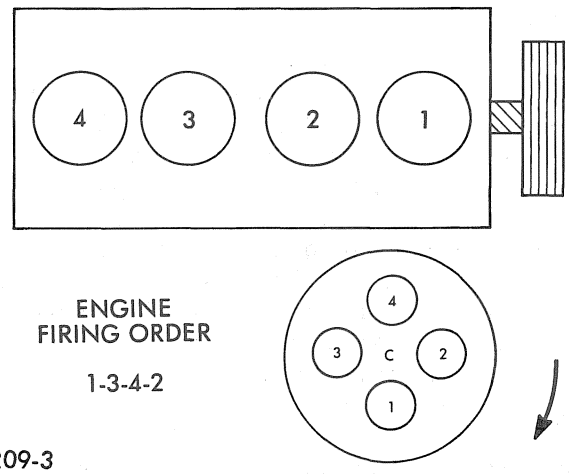


Fig. 1 Engine Firing Order

The crankshaft rotation is clockwise, when viewed from the front of the engine. The crankshaft rotates

DESCRIPTION AND OPERATION (Continued)

within five main bearings and the camshaft rotates within four bearings.

BUILD DATE CODE

The engine Build Date Code is located on a machined surface on the right side of the cylinder block between the No.3 and No.4 cylinders (Fig. 2).

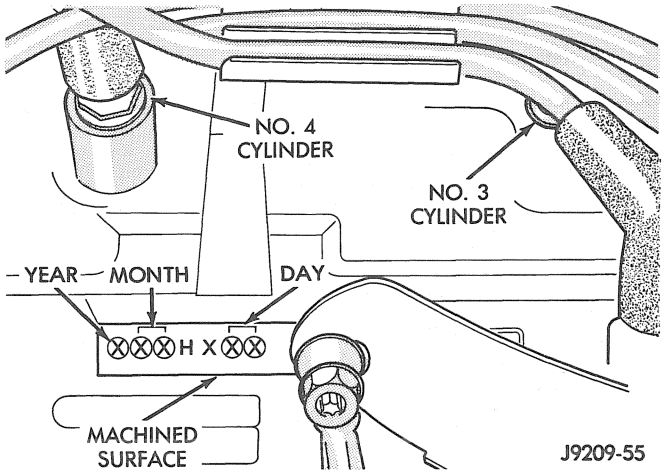


Fig. 2 Build Date Code Location

The digits of the code identify:

- 1st Digit—The year (5 = 1995).
- 2nd & 3rd Digits—The month (01 - 12).
- 4th & 5th Digits—The engine type/fuel system/compression ratio (HX = A 2.5 liter (150 CID) 9.1:1 compression ratio engine with a multi-point fuel injection system).
- 6th & 7th Digits—The day of engine build (01 - 31).

FOR EXAMPLE: Code * 501HX23 * identifies a 2.5 liter (150 CID) engine with a multi-point fuel injection system, 9.1:1 compression ratio and built on January 23, 1994.

LUBRICATION SYSTEM

A gear—type positive displacement pump is mounted at the underside of the block opposite the No. 4 main bearing. The pump draws oil through the screen and inlet tube from the sump at the rear of the oil pan. The oil is driven between the drive and idler gears and pump body, then forced through the outlet to the block. An oil gallery in the block channels the oil to the inlet side of the full flow oil filter. After passing through the filter element, the oil passes from the center outlet of the filter through an oil gallery that channels the oil up to the main gallery which extends the entire length of the block.

Galleries extend downward from the main oil gallery to the upper shell of each main bearing. The crankshaft is drilled internally to pass oil from the main bearing journals (except number 4 main bearing journal) to the connecting rod journals. Each connecting rod bearing cap has a small squirt hole, oil passes through the squirt hole and is thrown off as the rod rotates. This oil throwoff lubricates the camshaft lobes, distributor drive gear, cylinder walls, and piston pins.

The hydraulic valve tappets receive oil directly from the main oil gallery. Oil is provided to the camshaft bearing through galleries. The front camshaft bearing journal passes oil through the camshaft sprocket to the timing chain. Oil drains back to the oil pan under the number one main bearing cap.

The oil supply for the rocker arms and bridged pivot assemblies is provided by the hydraulic valve tappets which pass oil through hollow push rods to a hole in the corresponding rocker arm. Oil from the rocker arm lubricates the valve train components, then passes down through the push rod guide holes in the cylinder head past the valve tappet area, and returns to the oil pan.

OIL PUMP PRESSURE

The MINIMUM oil pump pressure is 89.6 kPa (13 psi) at 600 rpm. The MAXIMUM oil pump pressure is 255-517 kPa (37-75 psi) at 1600 rpm or more.

OVERSIZE AND UNDERSIZE COMPONENT CODES

Some engines may be built with oversize or undersize components such as:

- Oversize cylinder bores.
- Oversize camshaft bearing bores.
- Undersize crankshaft main bearing journals.
- Undersize connecting rod journals.

These engines are identified by a letter code (Fig. 3) stamped on the oil filter boss near the distributor (Fig. 4).

SERVICE PROCEDURES

VALVE TIMING

Disconnect the spark plug wires and remove the spark plugs.

Remove the engine cylinder head cover.

Remove the capscrews, bridge and pivot assembly, and rocker arms from above the No.1 cylinder.

Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridge.

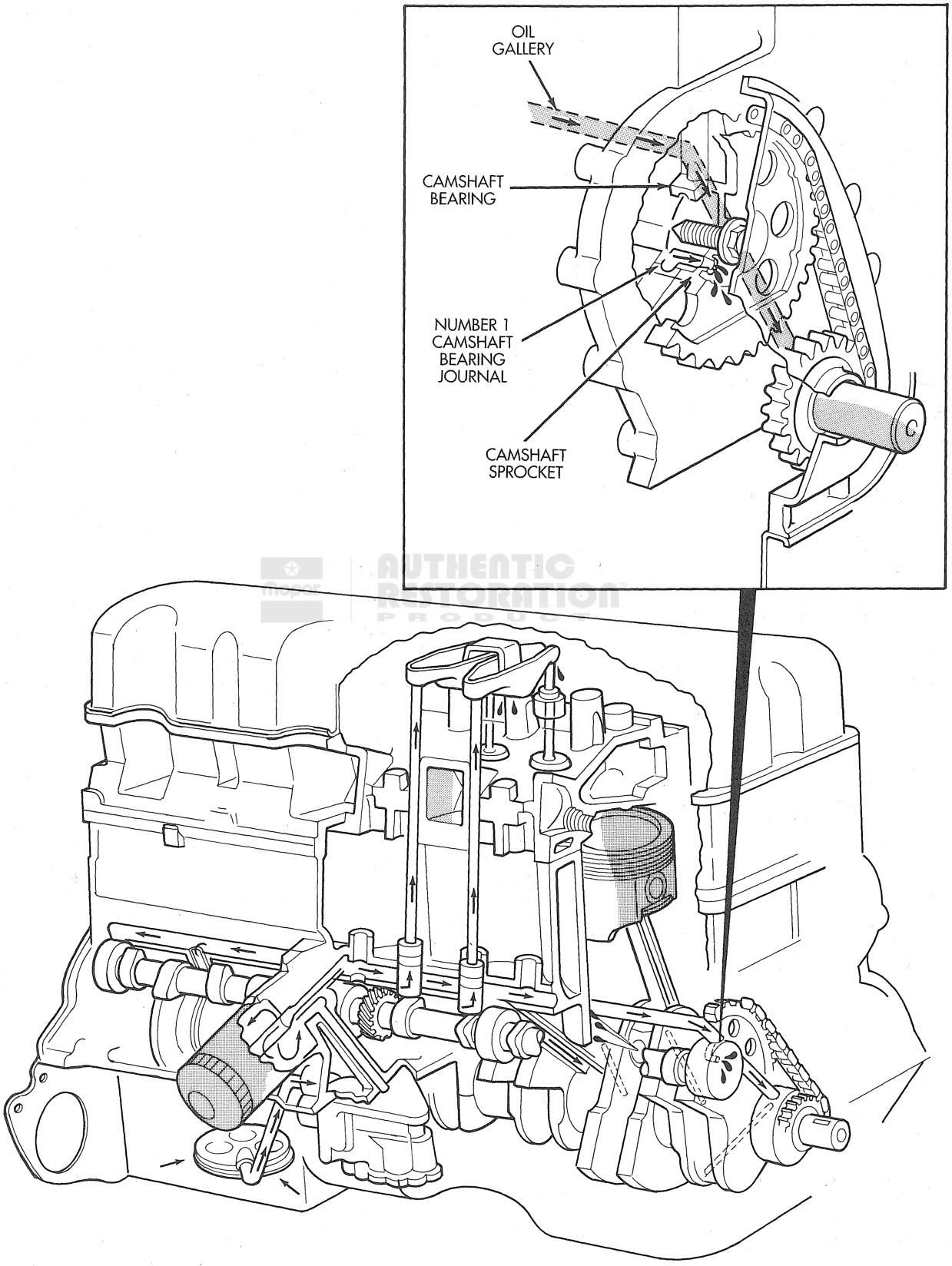
Rotate the crankshaft until the No.4 piston is at top dead center (TDC) on the compression stroke.

Rotate the crankshaft counterclockwise (viewed from the front of the engine) 90°.

Install a dial indicator on the end of the No.1 cylinder intake valve push rod. Use rubber tubing to secure the indicator stem on the push rod.

Set the dial indicator pointer at zero.

SERVICE PROCEDURES (Continued)



Oil Lubrication System

J9509-60

SERVICE PROCEDURES (Continued)

CODE	COMPONENT	UNDERSIZE
P	One or more connecting rod bearing journals	0.254 mm (0.010 in)
M	All crankshaft main bearing journals	0.254 mm (0.010 in)
PM	All crankshaft main bearing journals and one or more connecting rod journals	0.254 mm (0.010 in)
CODE	**COMPONENT**	**OVERSIZE**
B	All cylinder bores	0.254 mm (0.010 in)
C	All camshaft bearing bores	0.254 mm (0.010 in)

J8909-54

Fig. 3 Oversize and Undersize Component Codes

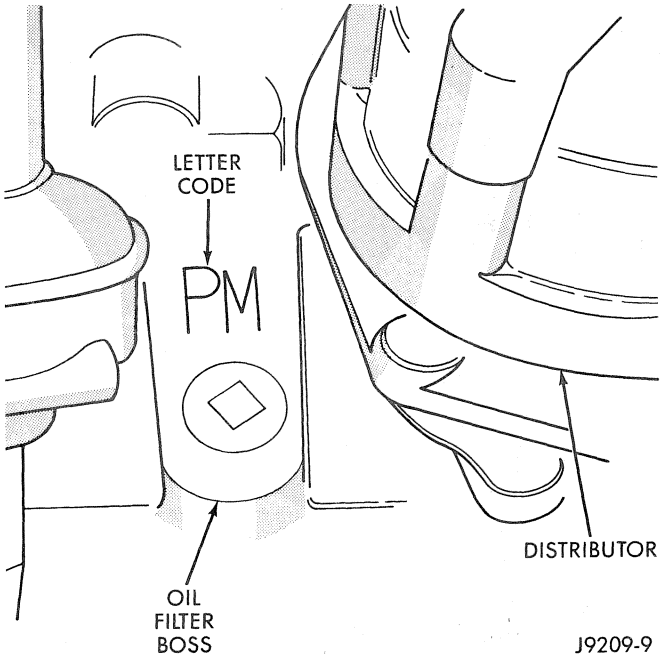


Fig. 4 Oversize and Undersize Component Code Location

Rotate the crankshaft clockwise (viewed from the front of the engine) until the dial indicator pointer indicates 0.305 mm (0.012 inch) travel distance (lift).

The timing notch index on the vibration damper should be aligned with the TDC mark on the timing degree scale.

If the timing notch is more than 13 mm (1/2 inch) away from the TDC mark in either direction, the valve timing is incorrect.

If the valve timing is incorrect, the cause may be a broken camshaft pin. It is not necessary to replace the camshaft because of pin failure. A spring pin is available for service replacement.

PISTON FITTING

BORE GAGE METHOD

(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at a point 49.5 mm (1-15/16 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B (Fig. 5).

(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. **The coated piston connecting rod assembly can be used to service previous built engines and MUST be replaced as complete sets.** Tin coated pistons should not be used as replacements for coated pistons.

(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY.**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.001 mm (.0001 in.) increments is required.

(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

PISTON SIZE CHART

CYLINDER BORE SIZE	PISTON LETTER SIZE
98.438 to 98.448 mm (3.8755 to 3.8759 in.)	A
98.448 to 98.458 mm (3.8759 to 3.8763 in.)	B
98.458 to 98.468 mm (3.8763 to 3.8767 in.)	C
98.468 to 98.478 mm (3.8767 to 3.8771 in.)	D
98.478 to 98.488 mm (3.8771 to 3.8775 in.)	E
98.488 to 98.498 mm (3.8775 to 3.8779 in.)	F

SERVICE PROCEDURES (Continued)

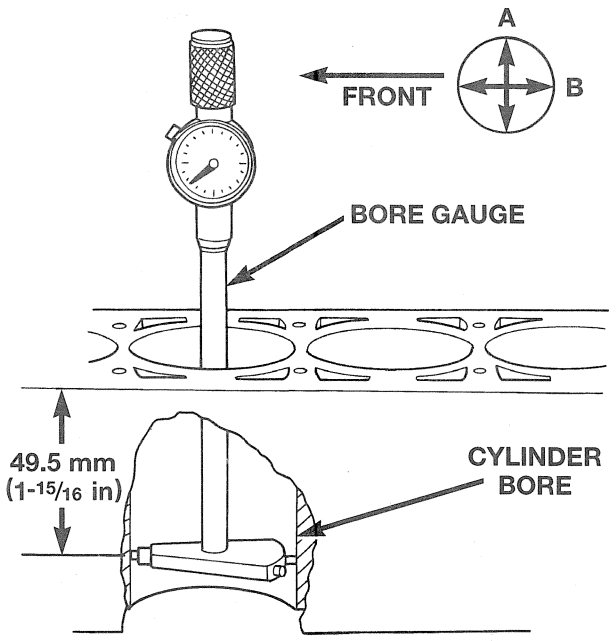


Fig. 5 Bore Gauge

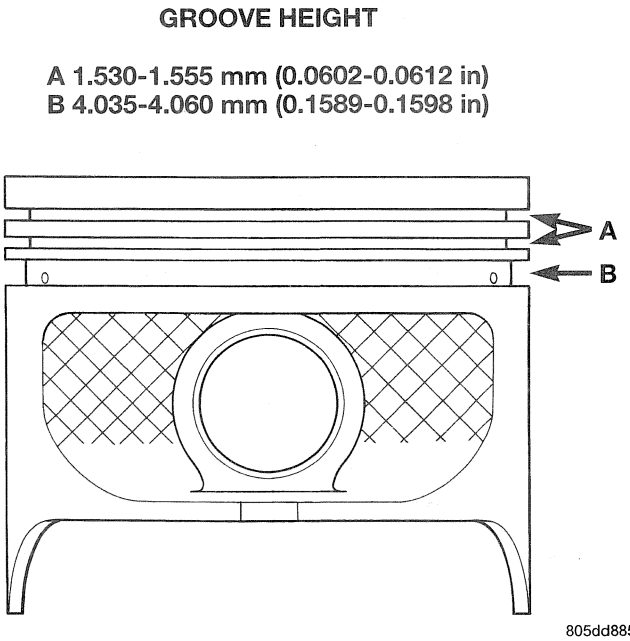


Fig. 6 Piston Dimensions

PISTON RING FITTING

(1) Carefully clean the carbon from all ring grooves. Oil drain openings in the oil ring groove and pin boss must be clear. DO NOT remove metal from the grooves or lands. This will change ring-to-groove clearances and will damage the ring-to-land seating.

(2) Be sure the piston ring grooves are free of nicks and burrs.

(3) Measure the ring side clearance with a feeler gauge fitted snugly between the ring land and ring (Fig. 6) (Fig. 7). Rotate the ring in the groove. It must move freely around circumference of the groove.

Ring Side Clearance Measurement

Top Compression Ring	0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Second Compression Ring	0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Oil Control Ring	0.06 to 0.21 mm (0.0024 to 0.0083 in.)

(4) Place ring in the cylinder bore and push down with inverted piston to position near lower end of the ring travel. Measure ring gap with a feeler gauge fitting snugly between ring ends (Fig. 8).

Ring Gap Measurement

Top Compression Ring	0.229 to 0.610 mm (0.0090 to 0.0240 inch)
Second Compresion Ring	0.483 to 0.965 mm (0.0190 to 0.0380 inch)
Oil Control Ring	0.254 to 1.500 mm (0.010 to 0.060 inch)

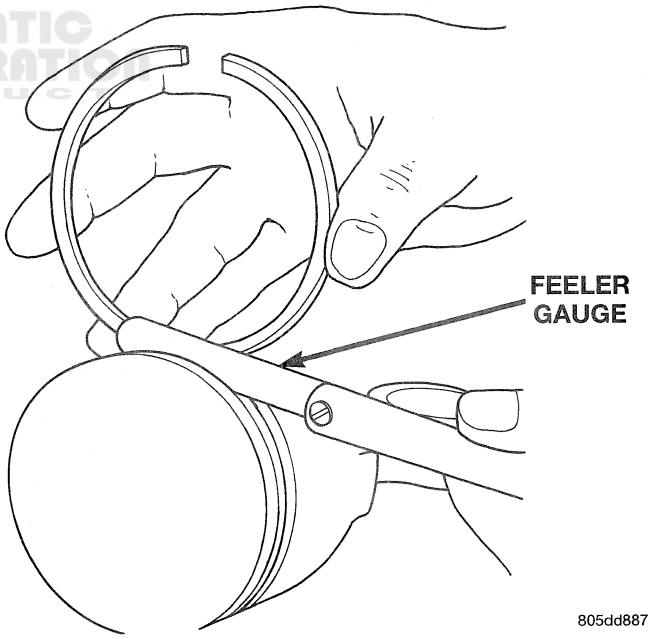


Fig. 7 Ring Side Clearance Measurement

(5) Install the oil control rings according to instructions in the package. It is not necessary to use a tool to install the upper and lower rails. Insert oil rail spacer first, then side rails.

(6) The two compression rings are different and cannot be interchanged. The TOP compression ring can be identified by 1 dot on the top surface of the ring (Fig. 9).

(7) The second compression ring has a chamfer on the BOTTOM of the inside edge (Fig. 10).

SERVICE PROCEDURES (Continued)

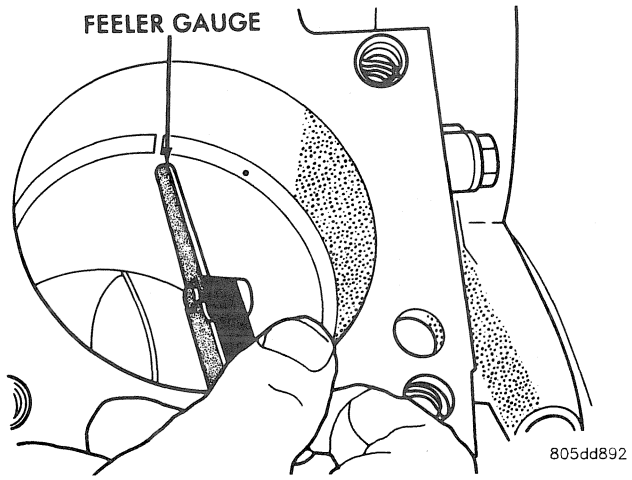


Fig. 8 Gap Measurement

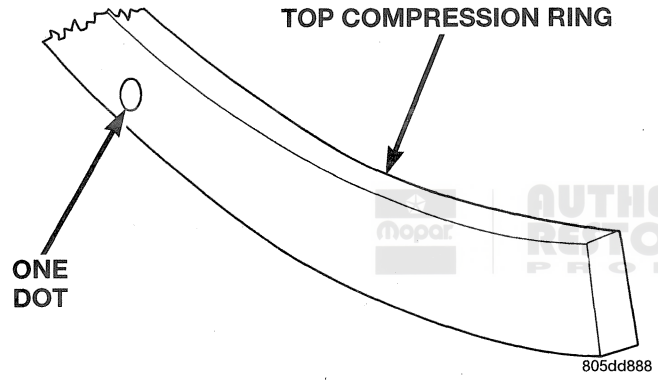


Fig. 9 Top Compression Ring Identification

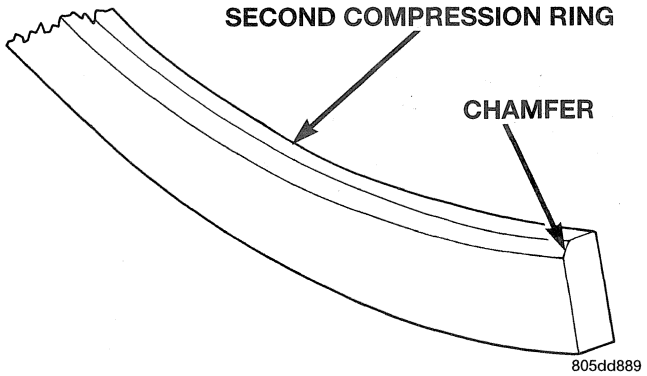


Fig. 10 Second Compression Ring Identification

(8) Using a ring installer, install the second compression ring with the chamfer facing down (Fig. 11) (Fig. 12).

(9) The top compression ring has a dot located on the top surface (Fig. 9).

(10) Using a ring installer, install the top ring with the dot facing up (Fig. 12).

(11) Position the gaps on the piston (Fig. 13):

- Oil spacer - Gap on center line of piston pin bore.

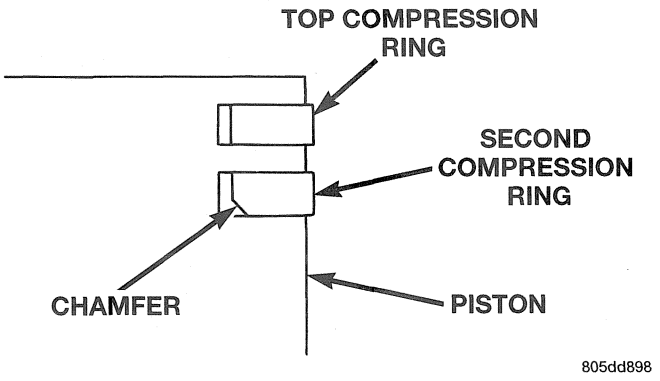


Fig. 11 Compression Ring Chamfer Location

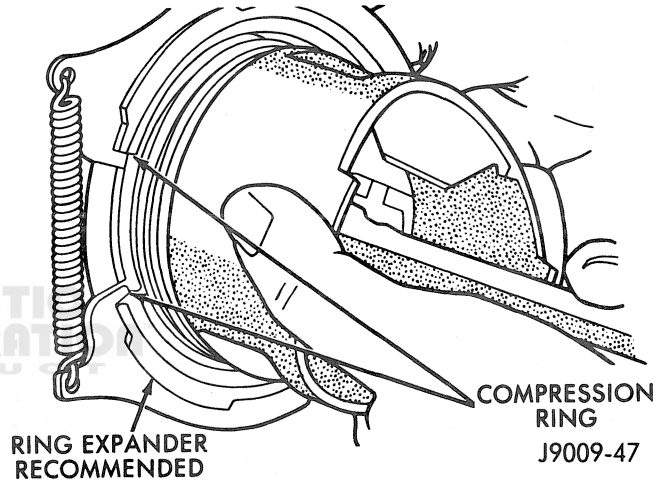


Fig. 12 Compression Ring Installation

- Oil rails - Gap 180° apart on centerline of piston skirt.
- No. 2 Compression ring - Gap 180° from top oil rail gap.
- No. 1 Compression ring - Gap 180° from No. 2 compression ring gap.

FITTING CONNECTING ROD BEARINGS

INSPECTION

BEARINGS

Inspect the connecting rod bearings for scoring and bent alignment tabs (Fig. 14) (Fig. 15). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 16). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

CONNECTING RODS

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to

SERVICE PROCEDURES (Continued)

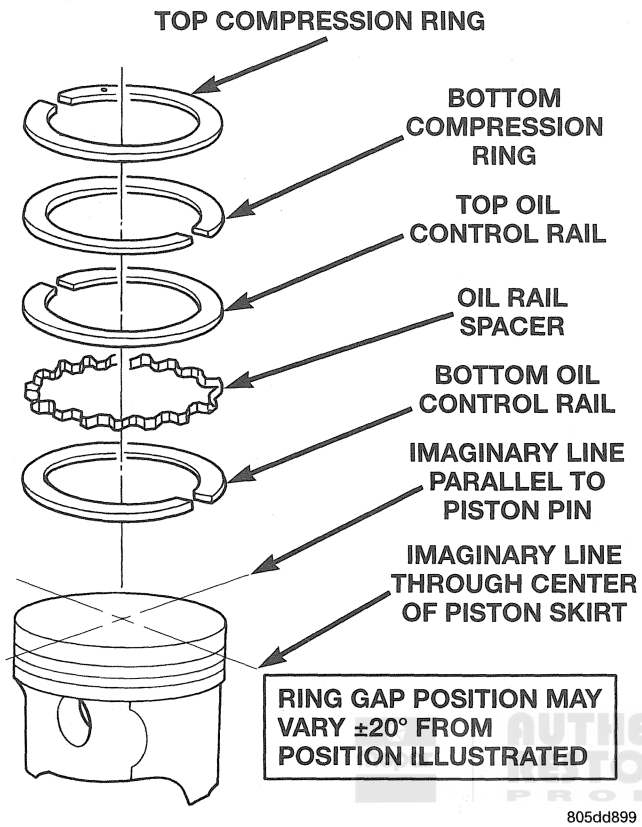


Fig. 13 Ring Gap Position

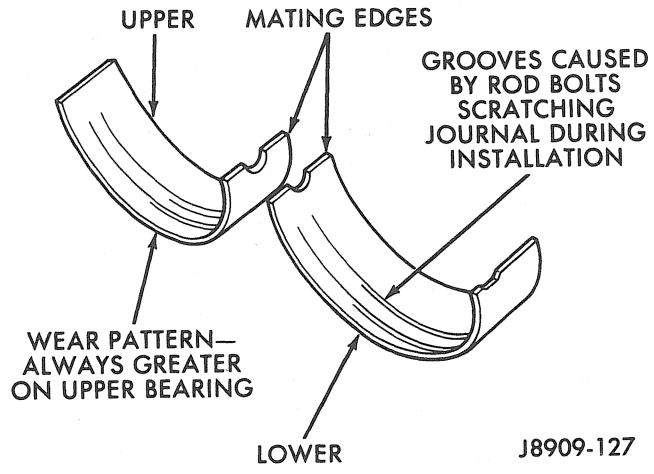


Fig. 14 Connecting Rod Bearing Inspection

any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

BEARING-TO-JOURNAL CLEARANCE

(1) Wipe the oil from the connecting rod journal.

(2) Use short rubber hose sections over rod bolts during installation.

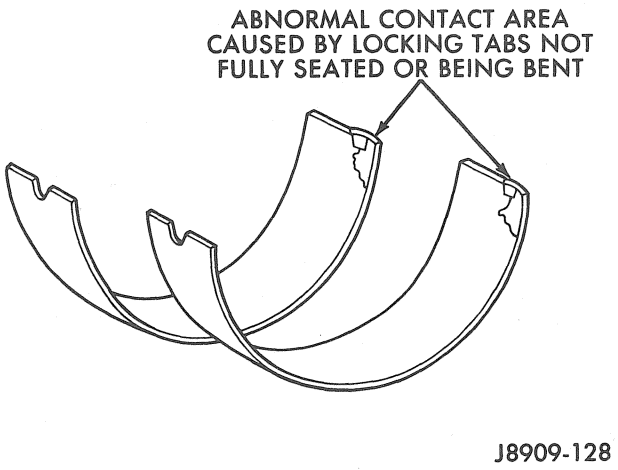


Fig. 15 Locking Tab Inspection

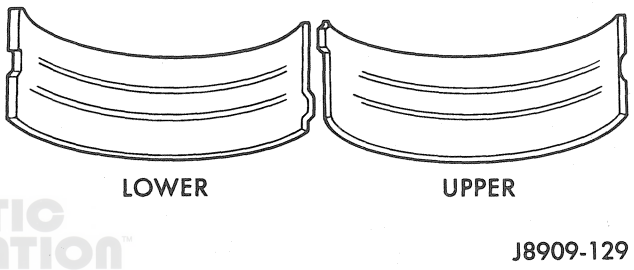


Fig. 16 Scoring Caused by Insufficient Lubrication or by Damaged Crankshaft Pin Journal

(3) Lubricate the upper bearing insert and install in connecting rod.

(4) Use piston ring compressor to install the rod and piston assemblies. The oil squirt holes in the rods must face the camshaft. The arrow on the piston crown should point to the front of the engine (Fig. 17). Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

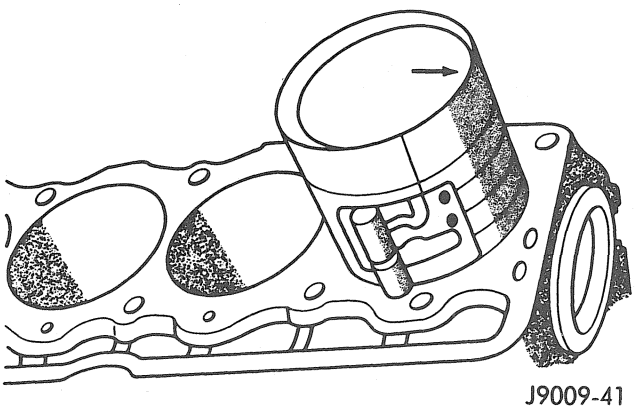


Fig. 17 Rod and Piston Assembly Installation

(5) Install the lower bearing insert in the bearing cap. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the cen-

SERVICE PROCEDURES (Continued)

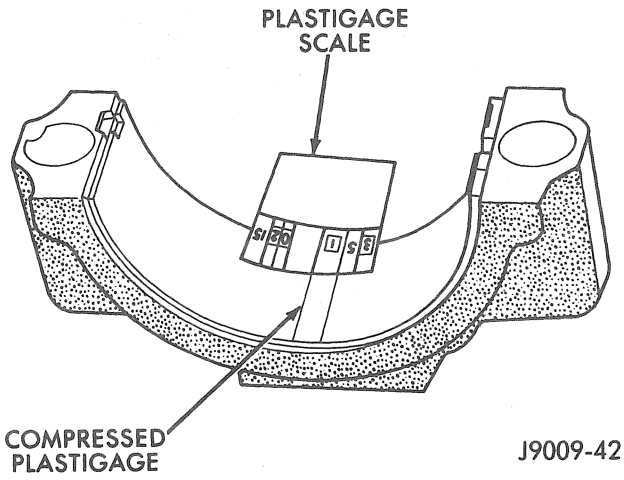


Fig. 18 Measuring Bearing Clearance with Plastigage

ter of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(6) Install bearing cap and connecting rod on the journal and tighten nuts to 45 N·m (33 ft. lbs.) torque. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

(7) Remove the bearing cap and determine amount of bearing-to- journal clearance by measuring the width of compressed Plastigage (Fig. 18). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

(8) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

(9) If bearing-to-journal clearance exceeds the specification, install a pair of 0.0254 mm (0.001 inch) undersize bearing inserts. All the odd size inserts must be on the bottom. The sizes of the service replacement bearing inserts are stamped on the backs of the inserts. Measure the clearance as described in the previous steps.

(10) The clearance is measured with a pair of 0.0254 mm (0.001 inch) undersize bearing inserts installed. This will determine if two 0.0254 mm (0.001 inch) undersize inserts or another combination is needed to provide the correct clearance (refer to Connecting Rod Bearing Fitting Chart).

(11) **FOR EXAMPLE:** If the initial clearance was 0.0762 mm (0.003 inch), 0.025 mm (0.001 inch) undersize inserts would reduce the clearance by 0.025 mm (0.001 inch). The clearance would be 0.002 inch and within specification. A 0.051 mm (0.002 inch) undersize insert would reduce the initial clearance an additional 0.013 mm (0.0005 inch). The clearance would then be 0.038 mm (0.0015 inch).

(12) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

(13) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 45 N·m (33 ft. lbs.) torque.

Crankshaft Journal		Corresponding Connecting Rod Bearing Insert	
Color Code	Diameter	Upper Insert Size	Lower Insert Size
Yellow	53.2257-53.2079 mm (2.0955-2.0948 in.)	Yellow - Standard	Yellow - Standard
Orange	53.2079-53.1901 mm (2.0948-2.0941 in.) 0.0178 mm (0.0007 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	53.1901-53.1724 mm (2.0941-2.0934 in.) 0.0356 mm (0.0014 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Red	52.9717-52.9539 mm (2.0855-2.0848 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

J9409-24

CONNECTING ROD BEARING FITTING CHART

SERVICE PROCEDURES (Continued)

SIDE CLEARANCE MEASUREMENT

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange. Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

FITTING CRANKSHAFT MAIN BEARINGS

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 19).

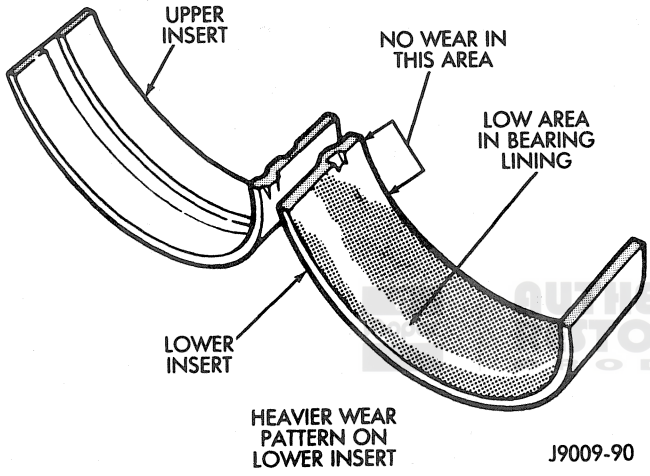


Fig. 19 Main Bearing Wear Patterns

NOTE: If any of the crankshaft journals are scored, remove the engine for crankshaft repair.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

FITTING BEARINGS (CRANKSHAFT INSTALLED)

The main bearing caps, numbered (front to rear) from 1 through 5 have an arrow to indicate the forward position. The upper main bearing inserts are grooved to provide oil channels while the lower inserts are smooth.

Each bearing insert pair is selectively fitted to its respective journal to obtain the specified operating clearance. In production, the select fit is obtained by using various-sized color-coded bearing insert pairs as listed in the Main Bearing Fitting Chart. The bearing color code appears on the edge of the insert. **The size is not stamped on bearing inserts used for engine production.**

The main bearing journal size (diameter) is identified by a color-coded paint mark on the adjacent cheek. The rear main journal, is identified by a color-coded paint mark on the crankshaft rear flange.

When required, upper and lower bearing inserts of different sizes may be used as a pair. A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce the clearance by 0.013 mm (0.0005 inch). **Never use a pair of bearing inserts with greater than a 0.025 mm (0.001 inch) difference in size (Fig. 20).**

Insert	Correct	Incorrect
Upper	Standard	Standard
Lower	0.025 mm (0.001 in.) Undersize	0.051 mm (0.002 in.) Undersize

J9109-179

Fig. 20 Bearing Insert Pairs

NOTE: When replacing inserts, the odd size inserts must be either all on the top (in cylinder block) or all on the bottom (in main bearing cap).

Once the bearings have been properly fitted, proceed to Crankshaft Main Bearing—Installation.

BEARING-TO-JOURNAL CLEARANCE (CRANKSHAFT INSTALLED)

When using Plastigage, check only one bearing clearance at a time.

Install the grooved main bearings into the cylinder block and the non-grooved bearings into the bearing caps.

Install the crankshaft into the upper bearings dry.

Place a strip of Plastigage across full width of the crankshaft journal to be checked.

Install the bearing cap and tighten the bolts to 108 N·m (80 ft. lbs.) torque.

NOTE: DO NOT rotate the crankshaft. This will cause the Plastigage to shift, resulting in an inaccurate reading. Plastigage must not be permitted to crumble. If brittle, obtain fresh stock.

Remove the bearing cap. Determine the amount of clearance by measuring the width of the compressed Plastigage with the scale on the Plastigage envelope (Fig. 21). Refer to Engine Specifications for the proper clearance.

Plastigage should indicate the same clearance across the entire width of the insert. If clearance varies, it may indicate a tapered journal or foreign material trapped behind the insert.

SERVICE PROCEDURES (Continued)

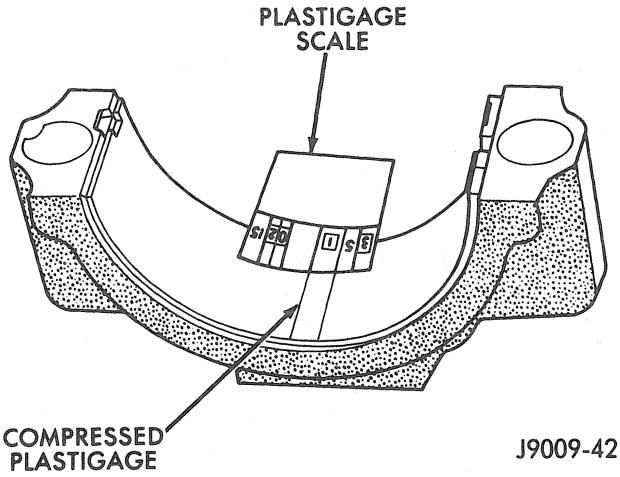


Fig. 21 Measuring Bearing Clearance with Plastigage

If the specified clearance is indicated and there are no abnormal wear patterns, replacement of the bearing inserts is not necessary. Remove the Plastigage from the crankshaft journal and bearing insert. Proceed to Crankshaft Main Bearing—Installation.

If the clearance exceeds specification, install a pair of 0.025 mm (0.001 inch) undersize bearing inserts and measure the clearance as described in the previous steps.

The clearance indicated with the 0.025 mm (0.001 inch) undersize insert pair installed will determine if this insert size or some other combination will provide the specified clearance. **FOR EXAMPLE:** If the clearance was 0.0762 mm (0.003 inch) originally, a pair of 0.0254 mm (0.001 inch) undersize inserts would reduce the clearance by 0.0254 mm (0.001 inch). The clearance would then be 0.0508 mm (0.002 inch) and within the specification. A 0.051 mm (0.002 inch) undersize bearing insert and a 0.0254 mm (0.001 inch) undersize insert would reduce the original clearance an additional 0.0127 mm (0.0005 inch). The clearance would then be 0.0381 mm (0.0015 inch).

CAUTION: Never use a pair of inserts that differ more than one bearing size as a pair.

FOR EXAMPLE: DO NOT use a standard size upper insert and a 0.051 mm (0.002 inch) undersize lower insert.

If the clearance exceeds specification using a pair of 0.051 mm (0.002 inch) undersize bearing inserts, measure crankshaft journal diameter with a micrometer. If the journal diameter is correct, the crankshaft bore in the cylinder block may be misaligned, which requires cylinder block replacement or machining to true bore.

If journals 1 through 5 diameters are less than 63.4517 mm (2.4981 inches), replace crankshaft or grind crankshaft down to accept the appropriate undersize bearing inserts.

Once the proper clearances have been obtained, proceed to Crankshaft Main Bearing—Installation.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block (refer to Cylinder Block - Disassemble).

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper and out of round is 0.013 mm (0.0005 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

Once the proper clearances have been obtained, proceed to Crankshaft Main Bearing—Installation.

SERVICE PROCEDURES (Continued)

MAIN BEARING FITTING CHART

Crankshaft Journals #1 - #4		Corresponding Crankshaft Bearing Insert	
Color Code	Diameter	Upper Insert Size	Lower Insert Size
Yellow	63.5025-63.4898 mm (2.5001-2.4996 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4898-63.4771 mm (2.4996-2.4991 in.) 0.0127 mm (0.0005 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Yellow - Standard
Blue	63.4771-63.4644 mm (2.4991-2.4986 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4644-63.4517 mm (2.4986-2.4981 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2485-63.2358 mm (2.4901-2.4896 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

Crankshaft Journals #5 Only		Corresponding Crankshaft Bearing Insert	
Color Code	Diameter	Upper Insert Size	Lower Insert Size
Yellow	63.4873-63.4746 mm (2.4995-2.4990 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4746-63.4619 mm (2.4990-2.4985 in.) 0.0127 mm (0.0005 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Yellow - Standard
Blue	63.4619-63.4492 mm (2.4985-2.4980 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4492-63.4365 mm (2.4980-2.4975 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2333-63.2206 mm (2.4895-2.4890 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

AUTHENTIC RESTORATION PRODUCT

REMOVAL AND INSTALLATION

ENGINE MOUNTS—FRONT

The front mounts support the engine at each side. These supports are made of resilient rubber.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Raise the vehicle.
(3) Support the engine.
(4) Remove through bolt nut (Fig. 22). DO NOT remove the through bolt.
(5) Remove the retaining bolts and nuts from the support cushions (Fig. 22).
(6) Remove the through bolt.
(7) Remove the support cushions.

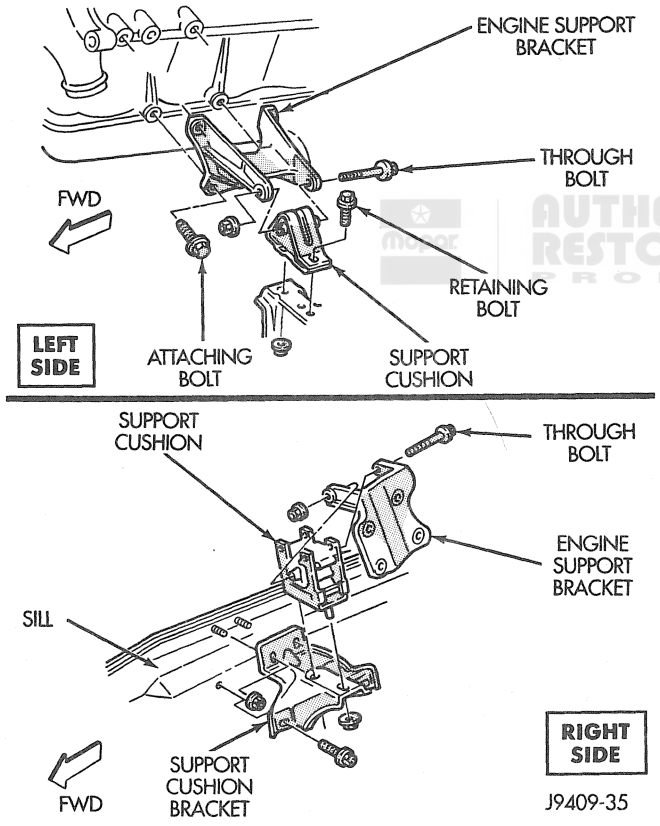


Fig. 22 Front Mounts

INSTALLATION

(1) If the engine support bracket was removed, position the LEFT bracket (Fig. 22) and the RIGHT bracket (Fig. 23) onto the cylinder block. Install the bolts and stud nuts.

(a) RIGHT SIDE (Fig. 23) —Tighten the bolts to 61 N·m (45 ft. lbs.) torque. Tighten the stud nuts to 46 N·m (34 ft. lbs.) torque.

(b) LEFT SIDE (Fig. 22) —Tighten the bolts to 61 N·m (45 ft. lbs.) torque.

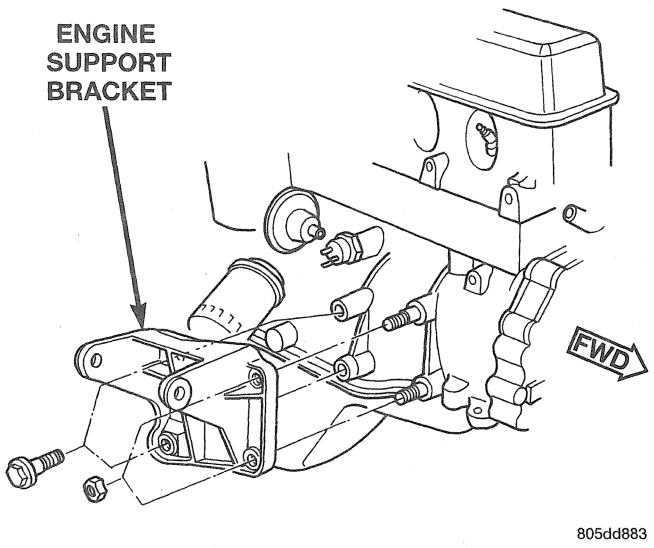


Fig. 23 Engine Support Bracket—Right Side

(2) If the support cushion brackets were removed, position the brackets onto the lower front sill (Fig. 22) (Fig. 24). Install the bolts and stud nuts. Tighten the bolts to 54 N·m (40 ft. lbs.) torque and the stud nuts to 41 N·m (30 ft. lbs.) torque.

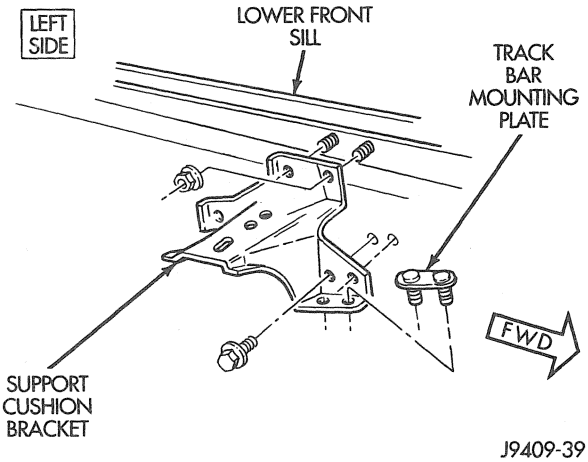


Fig. 24 Support Cushion Bracket—Left Side

(3) Place the support cushions onto the support cushion brackets (Fig. 22). Tighten the right support cushion nuts to 65 N·m (48 ft. lbs.) torque. Tighten the left support cushion bolt and nut to 41 N·m (30 ft. lbs.) torque.

(4) Install the through bolt and the retaining nut (Fig. 22). Tighten the through bolt nut to 65 N·m (48 ft. lbs.) torque.

(5) Remove the engine support.
(6) Lower the vehicle.
(7) Connect negative cable to battery.

REMOVAL AND INSTALLATION (Continued)

ENGINE MOUNT—REAR

A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Raise the vehicle and support the transmission.
(3) Remove the nuts holding the support cushion to the crossmember (Fig. 25) (Fig. 26). Remove the crossmember.

MANUAL TRANSMISSION:

a. Remove the support cushion nuts and remove the cushion.
b. If necessary, remove the bolts holding the transmission support bracket to the transmission (Fig. 25). Remove the bracket.

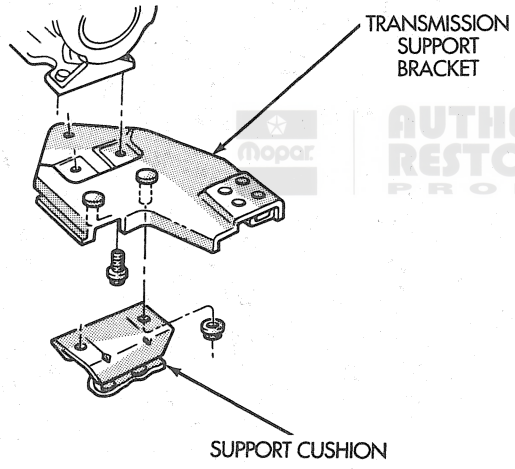


Fig. 25 Rear Mount (Manual Transmission)

AUTOMATIC TRANSMISSION:

a. Remove the support cushion bolts and remove the cushion and the transmission support bracket.
b. If necessary on 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission (Fig. 26). Remove the adaptor bracket.

INSTALLATION

MANUAL TRANSMISSION:

a. If removed, position the transmission support bracket to the transmission and install the bolts. Tighten the bolts to 43 N·m (32 ft. lbs.) torque.
b. Position the support cushion onto the transmission support bracket. Install and tighten the nuts to 46 N·m (34 ft. lbs.) torque.

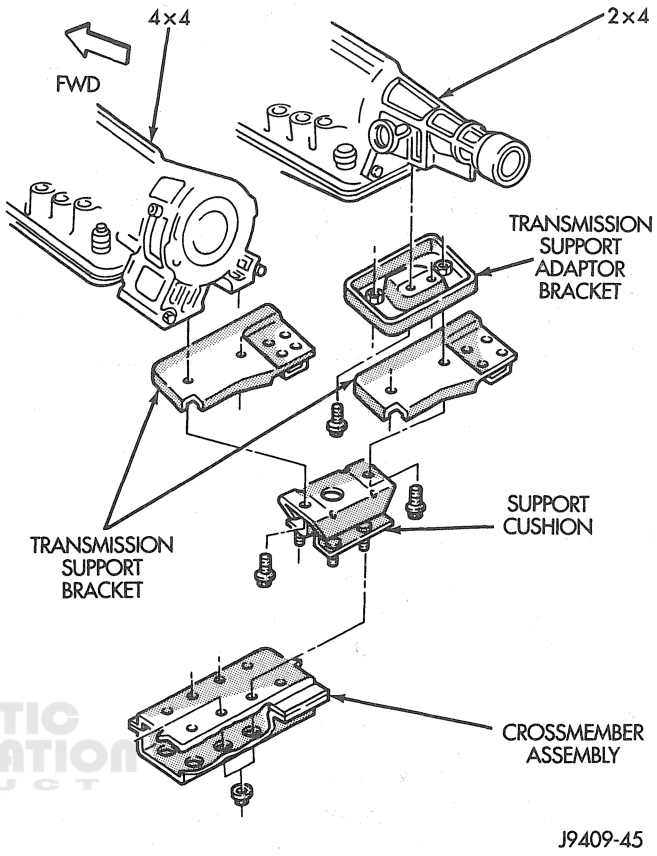


Fig. 26 Rear Mount (Automatic Transmission)

AUTOMATIC TRANSMISSION:

a. If removed, position the transmission support adaptor bracket (2WD vehicles) to the transmission and install the bolts. Tighten the bolts to 75 N·m (55 ft. lbs.) torque.
b. Position the transmission support bracket and support cushion to the transmission and install the bolts. Tighten the bolts to 75 N·m (55 ft. lbs.) torque.
(1) Position the crossmember onto the support cushion studs and install the nuts. Tighten the nuts to 22 N·m (192 in. lbs.) torque.
(2) Install the crossmember to sill bolts and tighten to 41 N·m (30 ft. lbs.) torque.
(3) Remove the transmission support.
(4) Lower the vehicle.
(5) Connect negative cable to battery.

ENGINE DAMPER

REMOVAL

(1) Disconnect negative cable from battery.
(2) Remove the top and bottom damper nuts (Fig. 27).
(3) Remove the outer retainers and bushings (Fig. 27).

REMOVAL AND INSTALLATION (Continued)

(4) Remove the top damper bracket nut and bolts (Fig. 27).

(5) Remove the bracket, inner retainers, bushings and the damper (Fig. 27).

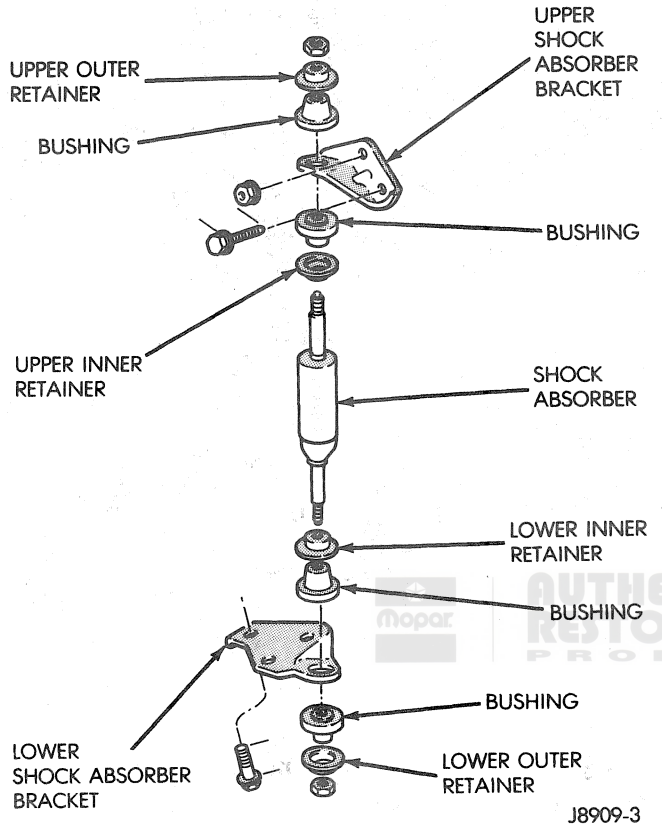


Fig. 27 Engine Damper

INSTALLATION

(1) Install the damper on the lower bracket with the lower inner retainer and bushing in place.

(2) Install the upper inner retainer and bushing on the top of the damper.

(3) Position the upper damper bracket over the damper and install the stud nut and bolts.

(4) Tighten the stud nut to 23 N·m (17 ft. lbs.) torque. Tighten the bracket bolts to 61 N·m (45 ft. lbs.) torque.

(5) Install the bushing, upper outer retainer and damper nut.

(6) Install the bushing, lower outer retainer and damper nut.

(7) Tighten the upper and lower damper nuts.

(8) Connect negative cable to battery.

ENGINE ASSEMBLY

REMOVAL

(1) Disconnect the battery cables. Remove the battery.

(2) Mark the hinge locations on the hood panel for alignment reference during installation. Remove the engine compartment lamp. Remove the hood.

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. USE CARE TO PREVENT SCALDING BY HOT COOLANT. CAREFULLY RELEASE THE PRESSURE BEFORE REMOVING THE RADIATOR DRAIN COCK AND CAP.

(3) Remove the radiator drain cock and radiator cap to drain the coolant. DO NOT waste usable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(4) Remove the lower radiator hose.

(5) Remove the upper radiator hose and coolant recovery hose (Fig. 28).

(6) Remove the fan shroud (Fig. 28).

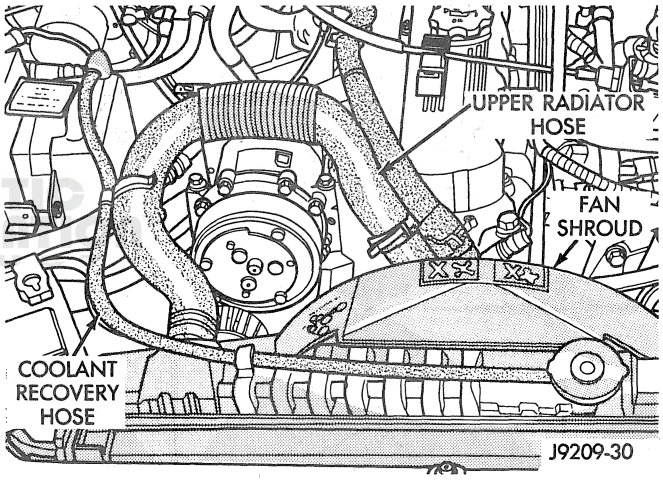


Fig. 28 Upper Radiator Hose, Coolant Recovery Hose & Fan Shroud

(7) Disconnect the transmission fluid cooler tubing (automatic transmission).

(8) Remove the radiator/condenser (if equipped with air conditioning).

(9) Remove fan assembly and install a 5/16 x 1/2-inch SAE capscrew through fan pulley into water pump flange. This will maintain the pulley and water pump in alignment when crankshaft is rotated.

(10) Disconnect the heater hoses.

(11) Disconnect the throttle linkages, speed control cable (if equipped) and throttle valve rod.

(12) Disconnect the oxygen sensor wire connector.

(13) Disconnect the wires from the starter motor solenoid.

(14) Disconnect all fuel injection harness connections.

REMOVAL AND INSTALLATION (Continued)

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE TURNED OFF). BEFORE DISCONNECTING FUEL LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

(15) Disconnect the quick-connect fuel line at the fuel rail (refer to Group 14, Fuel System for the proper procedure).
(16) Remove the fuel line bracket from the intake manifold.
(17) Remove the air cleaner assembly.
(18) If equipped with air conditioning, remove the service valves and cap the compressor ports.
(19) Remove the power brake vacuum check valve from the booster, if equipped.
(20) If equipped with power steering:
(a) Disconnect the power steering hoses from the fittings at the steering gear.
(b) Drain the pump reservoir.
(c) Cap the fittings on the hoses and steering gear to prevent foreign material from entering the system.
(21) Disconnect the coolant hoses from the rear of the intake manifold.
(22) Identify, tag and disconnect all necessary wire connectors and vacuum hoses.
(23) Raise the vehicle.
(24) Remove the oil filter.
(25) Remove the starter motor.
(26) Disconnect the exhaust pipe from the exhaust manifold.
(27) Remove the flywheel and converter housing access cover.
(28) If equipped with an automatic transmission, mark the converter and drive plate location in reference to each other and remove the converter-to-drive plate bolts.
(29) Remove the upper flywheel and converter housing bolts and loosen the bottom bolts.
(30) Remove the engine support cushion-to-engine compartment bracket bolts.
(31) Remove the engine shock damper bracket from the sill.
(32) Lower the vehicle.
(33) Attach a lifting device to the engine.
(34) Raise the engine slightly off the front supports.
(35) Place a support stand under the converter or flywheel housing.
(36) Remove the remaining bottom converter or flywheel housing bolts.
(37) Lift the engine out of the engine compartment and install on an engine stand.
(38) Install the oil filter to keep foreign material out of the engine.

INSTALLATION

(1) Remove the oil filter.
(2) Lift the engine off the stand and lower it into the engine compartment. For easier installation, it may be useful to remove the engine support cushions from the engine support brackets as an aide for alignment of the engine-to-transmission.
(3) If equipped with a manual transmission:
(a) Insert the transmission shaft into the clutch spline.
(b) Align the flywheel housing with the engine.
(c) Install and tighten the flywheel housing lower bolts finger tight.
(4) If equipped with an automatic transmission:
(a) Align the transmission torque converter housing with the engine.
(b) Loosely install the converter housing lower bolts and install the next higher bolt and nut on each side.
(c) Tighten all 4 bolts finger-tight.
(5) Install the engine support cushions (if removed).
(6) Lower the engine and engine support cushions onto the engine compartment brackets.
(7) Remove the engine lifting device.
(8) Raise the vehicle.
(9) If equipped with an automatic transmission:
(a) Install the converter-to-drive plate bolts. Ensure the installation reference marks are aligned. Tighten the bolts to 54 N·m (40 ft. lbs.) torque.
(b) Install the converter-housing access cover.
(c) Install the exhaust pipe support.
(10) Install the remaining converter or flywheel housing bolts.
(11) Install the starter motor and connect the cable. Tighten the bolts to 45 N·m (33 ft. lbs.) torque.
(12) Tighten the engine support cushing through-bolt nuts.
(13) Install the remaining flywheel and converter housing bolts. Tighten the bolts to 38 N·m (28 ft. lbs.) torque.
(14) Connect the exhaust pipe to the manifold.
(15) Install the oil filter.
(16) Lower the vehicle.
(17) Connect the coolant hoses and tighten the clamps.
(18) If equipped with power steering:
(a) Remove the protective caps
(b) Connect the hoses to the fittings at the steering gear. Tighten the nut to 52 N·m (38 ft. lbs.) torque.
(c) Fill the pump reservoir with fluid.
(19) Remove the pulley-to-water pump flange alignment capscrew and install the fan and spacer or Tempatrol fan assembly.

REMOVAL AND INSTALLATION (Continued)

(20) Install the fan shroud and radiator and condenser (if equipped with air conditioning).
(21) Connect the radiator hoses.
(22) Connect the automatic transmission fluid cooler pipes, if equipped.
(23) Connect the oxygen sensor wire connector.
(24) Connect the throttle valve rod and retainer. Connect the throttle cable and install the rod. Install the throttle valve rod spring.
(25) Connect the speed control cable, if equipped.
(26) Connect the fuel supply and return lines to the throttle body.
(27) Connect all the vacuum hoses and wire connectors.
(28) Connect the service valves to the A/C compressor ports, if equipped with air conditioning.
(29) Fill the power steering reservoir.
(30) Connect the battery cables.
(31) Install the hood.
(32) Install the air cleaner.
(33) Start the engine and inspect for leaks.
(34) Fill the cooling system.
(35) Stop the engine and check the fluid levels. Add fluid, as required.

CYLINDER HEAD COVER

A cured gasket is part of the engine cylinder head cover.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Disconnect the Crankcase Ventilation (CCV) vacuum hose from engine cylinder head cover (Fig. 29).
(3) Disconnect the fresh air inlet hose from the engine cylinder head cover (Fig. 29).
(4) Remove the engine cylinder head cover mounting bolts.
(5) Remove the engine cylinder head cover.

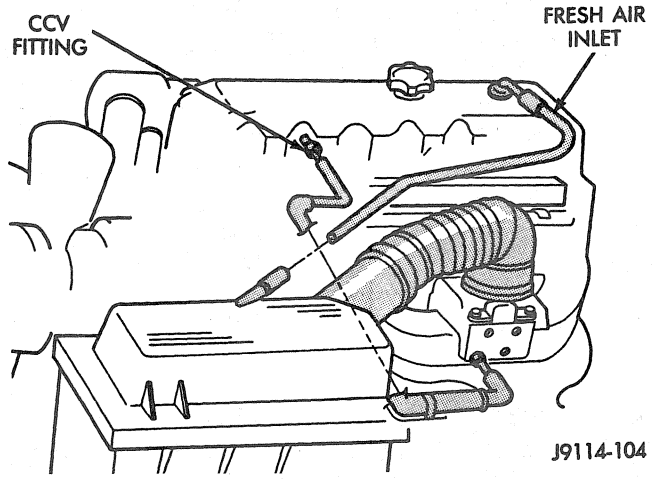


Fig. 29 Engine Cylinder Head Cover

(6) Remove any original sealer from the cover sealing surface of the engine cylinder head and clean the surface using a fabric cleaner.
(7) Remove all residue from the sealing surface using a clean, dry cloth.

INSTALLATION

(1) Inspect the engine cylinder head cover for cracks. Replace the cover, if cracked.

NOTE: The original dark grey gasket material should NOT be removed. If sections of the gasket material are missing or are compressed, replace the engine cylinder head cover. However, sections with minor damage such as small cracks, cuts or chips may be repaired with a hand held applicator. The new material must be smoothed over to maintain gasket height. Allow the gasket material to cure prior to engine cylinder head cover installation.

(2) If a replacement cover is installed, transfer the CCV valve grommet the oil filler cap from the original cover to the replacement cover.
(3) Install engine cylinder head cover. Tighten the mounting bolts to 10 N·m (85 in. lbs.) torque.
(4) Connect the CCV hoses (Fig. 29).
(5) Connect negative cable to battery.

ROCKER ARMS AND PUSH RODS

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Remove the engine cylinder head cover.
(2) Remove the capscrews at each bridge and pivot assembly (Fig. 30). Alternately loosen the capscrews one turn at a time to avoid damaging the bridges.
(3) Check for rocker arm bridges which are causing misalignment of the rocker arm to valve tip area.
(4) Remove the bridges, pivots and corresponding pairs of rocker arms (Fig. 30). Place them on a bench in the same order as removed.
(5) Remove the push rods and place them on a bench in the same order as removed.
(6) Clean all the components with cleaning solvent.
(7) Use compressed air to blow out the oil passages in the rocker arms and push rods.

INSTALLATION

(1) Lubricate the ball ends of the push rods with Mopar Engine Oil Supplement, or equivalent and install push rods in their original locations. Ensure that the bottom end of each push rod is centered in the tappet plunger cap seat.
(2) Using Mopar Engine Oil Supplement, or equivalent, lubricate the area of the rocker arm that the

REMOVAL AND INSTALLATION (Continued)

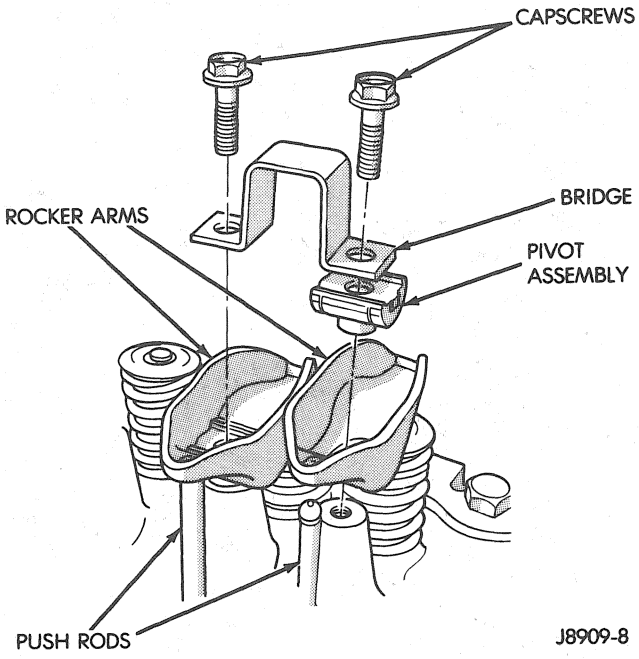


Fig. 30 Rocker Arm Assembly

pivot contacts. Install rocker arms, pivots and bridge above each cylinder in their original position.

(3) Loosely install the capscrews through each bridge.

(4) At each bridge, tighten the capscrews alternately, one turn at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(5) Install the engine cylinder head cover.

VALVE SPRINGS AND OIL SEALS

This procedure can be done with the engine cylinder head installed on the block.

REMOVAL

Each valve spring is held in place by a retainer and a set of conical valve locks. The locks can be removed only by compressing the valve spring.

(1) Remove the engine cylinder head cover.

(2) Remove capscrews, bridge and pivot assemblies and rocker arms for access to each valve spring to be removed.

(3) Remove push rods. Retain the push rods, bridges, pivots and rocker arms in the same order and position as removed.

(4) Inspect the springs and retainer for cracks and possible signs of weakening.

(5) Remove the spark plug(s) adjacent to the cylinder(s) below the valve springs to be removed.

(6) Install a 14 mm (1/2 inch) (thread size) air hose adaptor in the spark plug hole.

(7) Connect an air hose to the adapter and apply air pressure slowly. Maintain at least 621 kPa (90 psi) of air pressure in the cylinder to hold the valves against their seats. For vehicles equipped with an air conditioner, use a flexible air adaptor when servicing the No.1 cylinder.

(8) Tap the retainer or tip with a rawhide hammer to loosen the lock from the retainer. Use Valve Spring Compressor Tool MD-998772A to compress the spring and remove the locks (Fig. 31).

(9) Remove valve spring and retainer (Fig. 31).

(10) Remove valve stem oil seals (Fig. 31). Note the valve seals are different for intake and exhaust valves. The top of each seal is marked either INT (Intake) or EXH (Exhaust). DO NOT mix the seals.

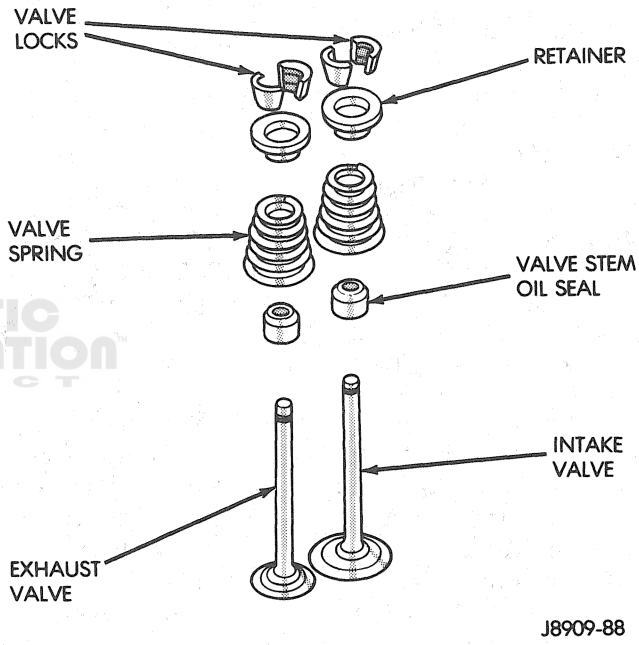


Fig. 31 Valve and Valve Components

INSTALLATION

Inspect the valve stems, especially the grooves. An Arkansas smooth stone should be used to remove nicks and high spots.

CAUTION: Install oil seals carefully to prevent damage from the sharp edges of the valve spring lock grove.

(1) Lightly push the valve seal over the valve stem and valve guide boss. Be sure the seal is completely seated on the valve guide boss.

(2) Install valve spring and retainer.

(3) Compress the valve spring with Valve Spring Compressor Tool MD-998772A and insert the valve locks. Release the spring tension and remove the tool. Tap the spring from side-to-side to ensure that the spring is seated properly on the engine cylinder head.

REMOVAL AND INSTALLATION (Continued)

(4) Disconnect the air hose. Remove the adaptor from the spark plug hole and install the spark plug.

(5) Repeat the procedures for each remaining valve spring to be removed.

(6) Install the push rods. Ensure the bottom end of each rod is centered in the plunger cap seat of the hydraulic valve tappet.

(7) Install the rocker arms, pivots and bridge at their original location.

(8) Tighten the bridge capscrews alternately, one at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(9) Install the engine cylinder head cover.

ENGINE CYLINDER HEAD

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Disconnect negative cable from battery.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(2) Drain the coolant and disconnect the hoses at the engine thermostat housing. DO NOT waste reusable coolant. If the solution is clean and is being drained only to service the engine or cooling system, drain the coolant into a clean container for reuse.

(3) Remove the air cleaner assembly.

(4) Remove the engine cylinder head cover.

(5) Remove the capscrews, bridge and pivot assemblies and rocker arms (Fig. 32).

(6) Remove the push rods (Fig. 32). **Retain the push rods, bridges, pivots and rocker arms in the same order as removed.**

(7) Loosen the serpentine drive belt at the power steering pump, if equipped or at the idler pulley (refer to Group 7, Cooling System for the proper procedure).

(8) If equipped with air conditioning, perform the following:

(a) Remove the bolts from the A/C compressor mounting bracket and set the compressor aside.

(b) Remove the air conditioner compressor bracket bolts from the engine cylinder head.

(c) Loosen the through bolt at the bottom of the bracket.

(9) If equipped, disconnect the power steering pump bracket. Set the pump and bracket aside. DO NOT disconnect the hoses.

(10) Remove the fuel lines and vacuum advance hose.

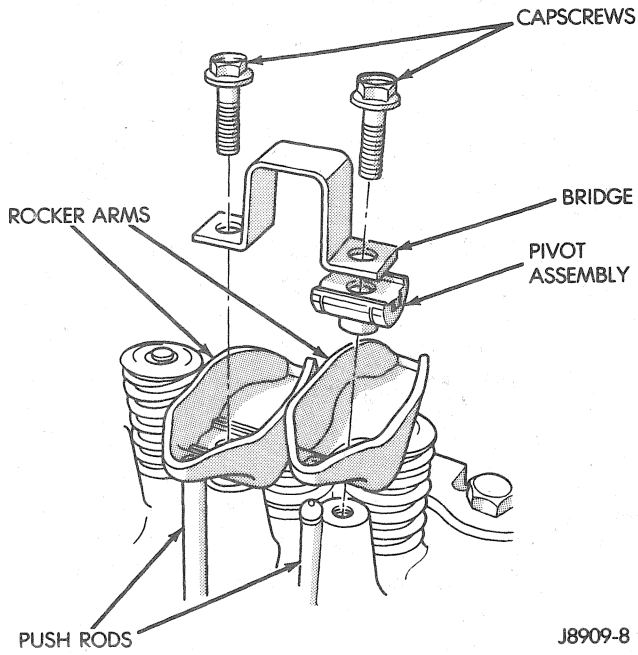


Fig. 32 Rocker Arm Assembly

(11) Remove the intake and engine exhaust manifolds from the engine cylinder head (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).

(12) Disconnect the ignition wires and remove the spark plugs.

(13) Disconnect the temperature sending unit wire connector.

(14) Remove the ignition coil and bracket assembly.

(15) Remove the engine cylinder head bolts.

(16) (16) Remove the engine cylinder head and gasket (Fig. 33).

(17) If this was the first time the bolts were removed, put a paint dab on the top of the bolt. If the bolts have a paint dab on the top of the bolt or it isn't known if they were used before, discard the bolts.

(18) Stuff clean lint free shop towels into the cylinder bores.

INSTALLATION

The engine cylinder head gasket is a composition gasket. The gasket is to be installed DRY. **DO NOT use a gasket sealing compound on the gasket.**

If the engine cylinder head is to be replaced and the original valves used, measure the valve stem diameter. Only standard size valves can be used with a service replacement engine cylinder head unless the replacement head valve stem guide bores are reamed to accommodate oversize valve stems. Remove all carbon buildup and reface the valves.

REMOVAL AND INSTALLATION (Continued)

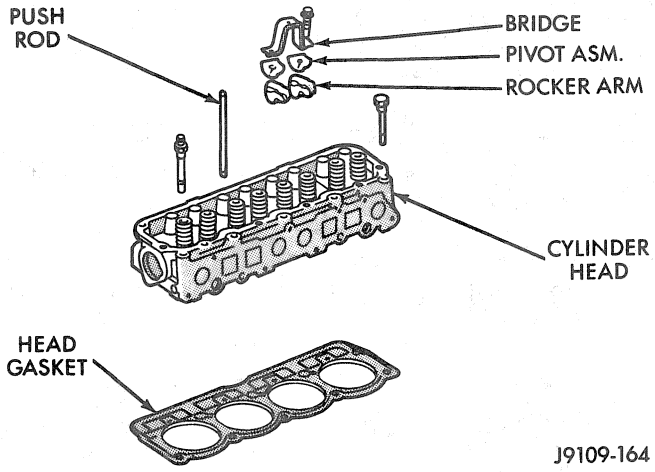


Fig. 33 Engine Cylinder Head Assembly

(1) Fabricate two engine cylinder head alignment dowels from used head bolts (Fig. 34). Use the longest head bolt. Cut the head of the bolt off below the hex head. Then cut a slot in the top of the dowel to allow easier removal with a screwdriver.

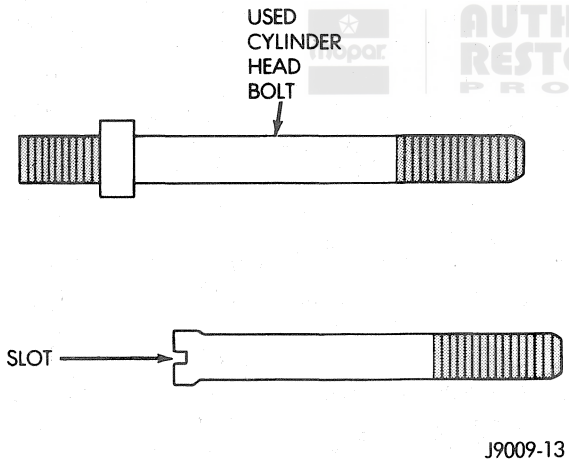


Fig. 34 Fabricate Alignment Dowels

(2) Install one dowel in bolt hole No.10 and the other dowel in bolt hole No.8 (Fig. 35).

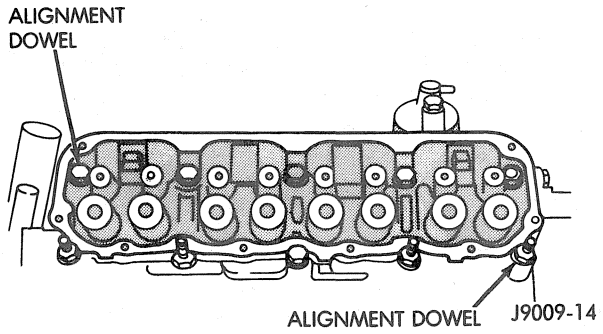


Fig. 35 Alignment Dowel Locations

(3) Remove the shop towels from the cylinder bores. Coat the bores with clean engine oil.

(4) Place the engine cylinder head gasket (with the numbers facing up) over the dowels.

(5) Place the engine cylinder head over the dowels.

CAUTION: Engine cylinder head bolts should be reused only once. Replace the head bolts if they were used before or if they have a paint dab on the top of the bolt.

(6) Coat the threads of bolt No.7, only, with Loctite PST sealant or equivalent.

(7) Install all head bolts, except No.8 and No.10.

(8) Remove the dowels.

(9) Install No.8 and No.10 head bolts.

CAUTION: During the final tightening sequence, bolt No.7 will be tightened to a lower torque than the rest of the bolts. DO NOT overtighten bolt No.7.

(10) Tighten the engine cylinder head bolts in sequence according to the following procedure (Fig. 36):

(a) Tighten all bolts in sequence (1 through 10) to 30 N·m (22 ft. lbs.) torque.

(b) Tighten all bolts in sequence (1 through 10) to 61 N·m (45 ft. lbs.) torque.

(c) Check all bolts to verify they are set to 61 N·m (45 ft. lbs.) torque.

(d) Tighten bolts (in sequence):

- Bolts 1 through 6 to 149 N·m (110 ft. lbs.) torque.
- Bolt 7 to 136 N·m (100 ft. lbs.) torque.
- Bolts 8 through 10 to 149 N·m (110 ft. lbs.) torque.

(e) Check all bolts in sequence to verify the correct torque.

(f) If not already done, clean and mark each bolt with a dab of paint after tightening. Should you encounter bolts which were painted in an earlier service operation, replace them.

(11) Install the ignition coil and bracket assembly.

(12) Connect the temperature sending unit wire connector.

(13) Install the spark plugs and tighten to 37 N·m (27 ft. lbs.) torque. Connect the ignition wires.

(14) Install the intake and exhaust manifolds (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).

(15) Install the fuel lines and the vacuum advance hose.

(16) If equipped, attach the power steering pump and bracket.

(17) Install the push rods, rocker arms, pivots and bridges in the order they were removed.

(18) Install the engine cylinder head cover.

REMOVAL AND INSTALLATION (Continued)

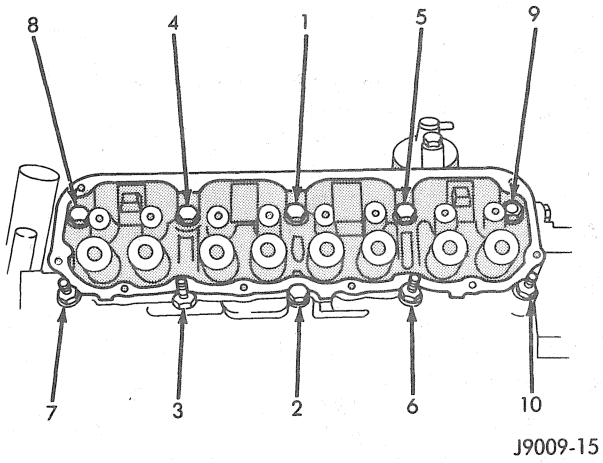


Fig. 36 Engine cylinder head Bolt Tightening Sequence

(19) Attach the air conditioning compressor mounting bracket to the engine cylinder head and block. Tighten the bolts to 40 N·m (30 ft. lbs.) torque.

(20) Attach the air conditioning compressor to the bracket. Tighten the bolts to 27 N·m (20 ft. lbs.) torque.

CAUTION: The serpentine drive belt must be routed correctly. Incorrect routing can cause the water pump to turn in the opposite direction causing the engine to overheat.

(21) Install the serpentine drive belt and correctly tension the belt (refer to Group 7, Cooling System for the proper procedure).

(22) Install the air cleaner and ducting.

(23) Install the engine cylinder head cover.

(24) Connect the hoses to the thermostat housing and fill the cooling system to the specified level (refer to Group 7, Cooling Systems for the proper procedure).

(25) The automatic transmission throttle linkage and cable must be adjusted after completing the engine cylinder head installation (refer to Group 21, Transmissions for the proper procedures).

(26) Install the temperature sending unit and connect the wire connector.

(27) Connect the fuel pipe and vacuum advance hose.

(28) Connect negative cable to battery.

(29) Connect the upper radiator hose and heater hose at the thermostat housing.

(30) Fill the cooling system. Check for leaks.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN DIRECT LINE WITH THE FAN. DO NOT PUT HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(31) Operate the engine with the radiator cap off. Inspect for leaks and continue operating the engine until the thermostat opens. Add coolant, if required.

VALVES AND VALVE SPRINGS

This procedure is done with the engine cylinder head removed from the block.

REMOVAL

(1) Remove the engine cylinder head from the cylinder block.

(2) Use Valve Spring Compressor Tool MD-998772A and compress each valve spring.

(3) Remove the valve locks, retainers, springs and valve stem oil seals. Discard the oil seals.

(4) Use an Arkansas smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.

(5) Remove the valves, and place them in a rack in the same order as removed.

INSTALLATION

(1) Thoroughly clean the valve stems and the valve guide bores.

(2) Lightly lubricate the stem.

(3) Install the valve in the original valve guide bore.

(4) Install the replacement valve stem oil seals on the valve stems. If the 0.381 mm (0.015 inch) oversize valve stems are used, oversize oil seals are required.

(5) Position the valve spring and retainer on the engine cylinder head and compress the valve spring with Valve Spring Compressor Tool MD-998772A.

(6) Install the valve locks and release the tool.

(7) Tap the valve spring from side to side with a hammer to ensure that the spring is properly seated at the engine cylinder head. Also tap the top of the retainer to seat the valve locks.

(8) Install the engine cylinder head.

HYDRAULIC TAPPETS

Retain all the components in the same order as removed.

(1) Remove the engine cylinder head cover.

(2) Remove the bridge and pivot assemblies and rocker arms by removing the capscrews at each bridge. Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridges.

(3) Remove the push rods.

(4) Remove the tappets through the push rod openings in the cylinder head with a Hydraulic Valve Tappet Removal/Installation Tool (Fig. 37).

REMOVAL AND INSTALLATION (Continued)

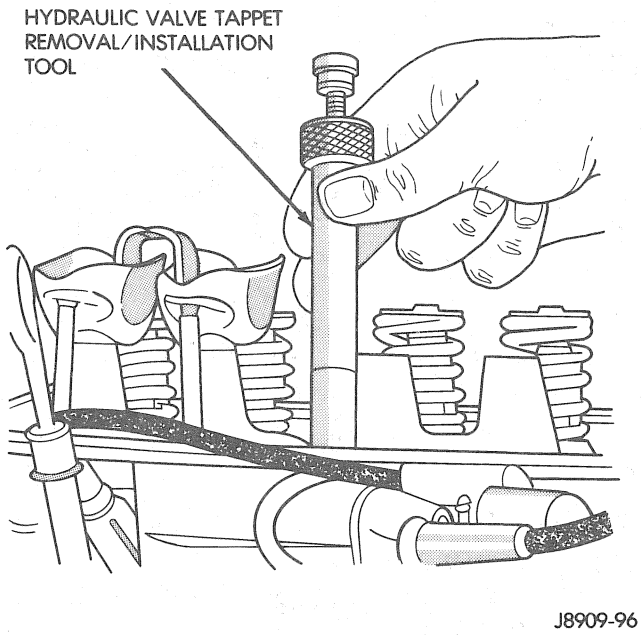


Fig. 37 Hydraulic Valve Tappet Removal/Installation Tool

INSTALLATION

It is not necessary to charge the tappets with engine oil. They will charge themselves within a very short period of engine operation.

(1) Dip each tappet in Mopar Engine Oil Supplement, or equivalent.

(2) Use Hydraulic Valve Tappet Removal/Installation Tool to install each tappet in the same bore from where it was originally removed.

(3) Install the push rods in their original locations.

(4) Install the rocker arms and bridge and pivot assemblies at their original locations. Loosely install the capscrews at each bridge.

(5) Tighten the capscrews alternately, one turn at a time, to avoid damaging the bridges. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(6) Pour the remaining Mopar Engine Oil Supplement, or equivalent over the entire valve actuating assembly. The Mopar Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1 600 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(7) Install the engine cylinder head cover.

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt and fan shroud.

(3) Remove the vibration damper retaining bolt and washer.

(4) Use Vibration Damper Removal Tool 7697 to remove the damper from the crankshaft (Fig. 38).

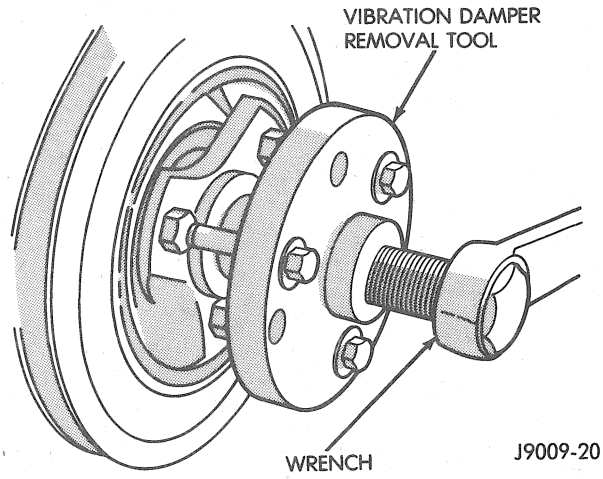


Fig. 38 Vibration Damper Removal Tool 7697

INSTALLATION

(1) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in position, align the keyway on the vibration damper hub with the crankshaft key and tap the damper onto the crankshaft.

(2) Install the vibration damper retaining bolt and washer.

(3) Tighten the damper retaining bolt to 108 N·m (80 ft. lbs.) torque.

(4) Install the serpentine drive belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(5) Connect negative cable to battery.

TIMING CASE COVER OIL SEAL

REMOVAL

This procedure is done with the timing case cover installed.

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt.

(3) Remove the vibration damper.

(4) Remove the radiator shroud.

(5) Carefully remove the oil seal. Make sure seal bore is clean.

INSTALLATION

(1) Position the replacement oil seal on Timing Case Cover Alignment and Seal Installation Tool 6139 with seal open end facing inward. Apply a light film of Perfect Seal, or equivalent, on the outside diameter of the seal. Lightly coat the crankshaft with engine oil.

(2) Position the tool and seal over the end of the crankshaft and insert a draw screw tool into Seal

REMOVAL AND INSTALLATION (Continued)

Installation Tool 6139 (Fig. 39). Tighten the nut against the tool until it contacts the cover.

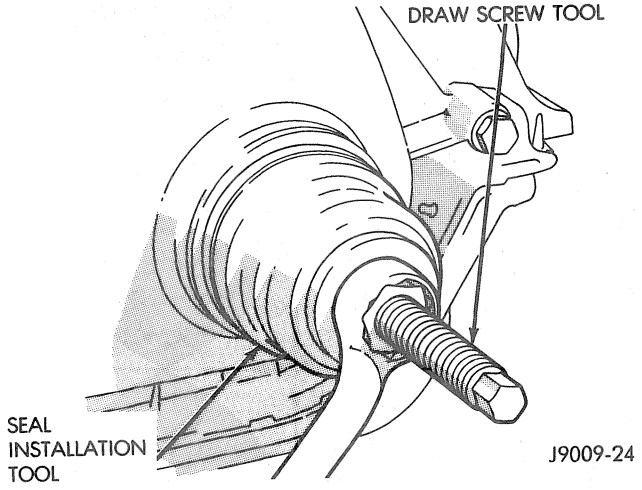


Fig. 39 Timing Case Cover Oil Seal Installation

(3) Remove the tools. Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(4) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(5) Install the serpentine belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(6) Install the radiator shroud.

(7) Connect negative cable to battery.

TIMING CASE COVER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the vibration damper (Fig. 40).

(3) Remove the fan and hub assembly and remove the fan shroud.

(4) Remove the accessory drive brackets that are attached to the timing case cover.

(5) Remove the A/C compressor (if equipped) and generator bracket assembly from the engine cylinder head and move to one side.

(6) Remove the oil pan-to-timing case cover bolts and timing case cover-to-cylinder block bolts.

(7) Remove the timing case cover and gasket from the engine.

(8) Pry the crankshaft oil seal from the front of the timing case cover (Fig. 40).

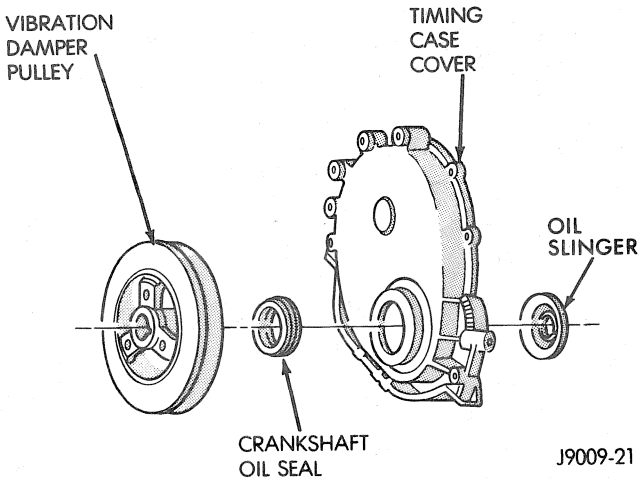


Fig. 40 Timing Case Cover Components

INSTALLATION

(1) Clean the timing case cover, oil pan and cylinder block gasket surfaces.

(2) Install a new crankshaft oil seal in the timing case cover. The open end of the seal should be toward the inside of the cover. Support the cover at the seal area while installing the seal. Force it into position with Seal Installation Tool 6139.

(3) Position the gasket on the cylinder block.

(4) Position the timing case cover on the oil pan gasket and the cylinder block.

(5) Insert Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 41).

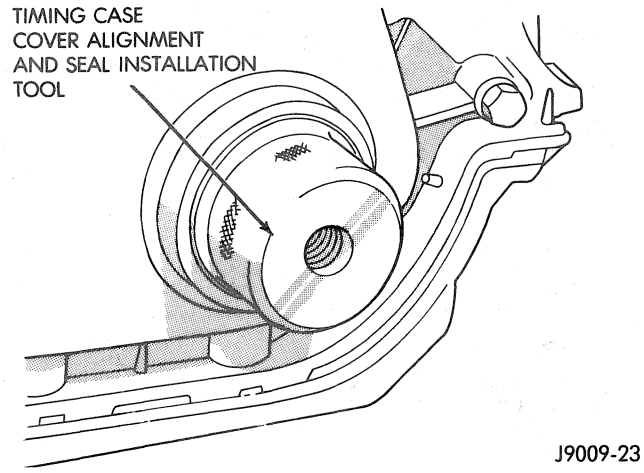


Fig. 41 Timing Case Cover Alignment and Seal Installation Tool 6139

(6) Install the timing case cover-to-cylinder block and the oil pan-to-timing case cover bolts.

(7) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 14 N·m

REMOVAL AND INSTALLATION (Continued)

(120 in. lbs.) torque. Tighten the oil pan-to-cover 5/16 inch bolts to 18 N·m (156 in. lbs.) torque.

(8) Remove the cover alignment tool.

(9) Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(10) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(11) Install the A/C compressor (if equipped) and generator bracket assembly.

(12) Install the engine fan and hub assembly and shroud.

(13) Install the serpentine drive belt and tighten to obtain the specified tension.

(14) Connect negative cable to battery.

TIMING CHAIN AND SPROCKETS

The timing chain tensioner reduces noise and prolongs timing chain life. In addition, it compensates for slack in a worn or stretched chain and maintains the correct valve timing.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the fan and shroud.

(3) Remove the serpentine drive belt.

(4) Remove the crankshaft vibration damper.

(5) Remove the timing case cover.

(6) Rotate crankshaft until the "0" timing mark is closest to and on the center line with camshaft sprocket timing mark (Fig. 42).

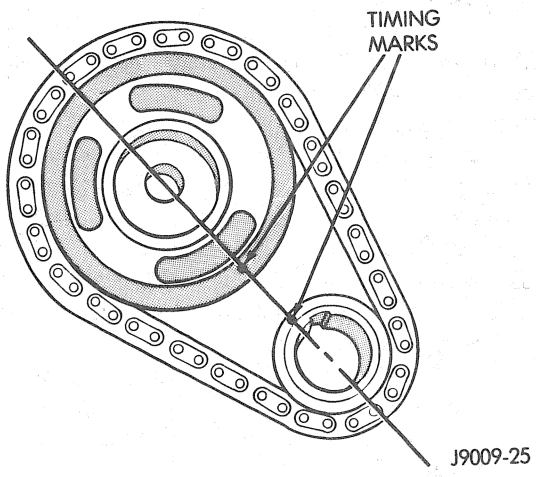


Fig. 42 Crankshaft—Camshaft Alignment

(7) Remove the oil slinger from the crankshaft.

(8) Remove the camshaft retaining bolt and remove the sprockets and chain as an assembly (Fig. 43).

(9) To replace the timing chain tensioner, the oil pan must be removed.

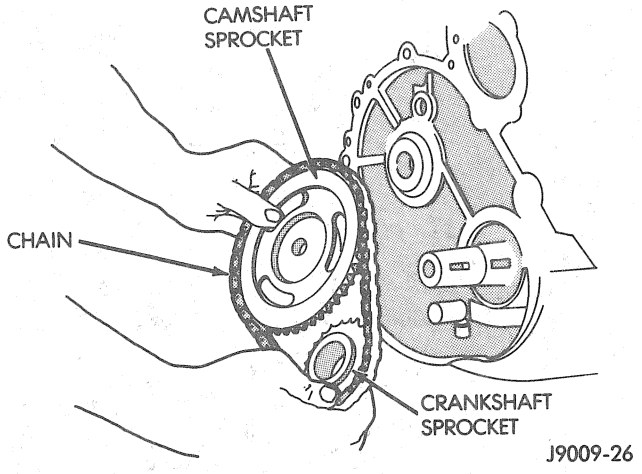


Fig. 43 Camshaft and Crankshaft Sprockets and Chain

INSTALLATION

(1) Turn the tensioner lever to the unlocked (down) position (Fig. 44).

(2) Pull the tensioner block toward the tensioner lever to compress the spring. Hold the block and turn the tensioner lever to the lock position (Fig. 44).

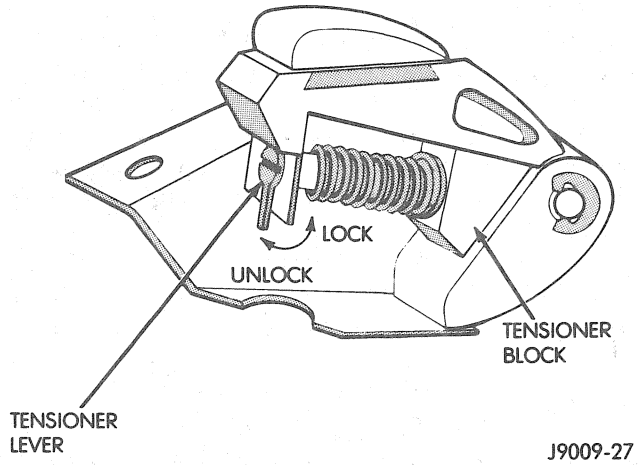


Fig. 44 Loading Timing Chain Tensioner

(3) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in the crankshaft keyway, install the crankshaft, camshaft sprockets and timing chain. Ensure the timing marks on the sprockets are properly aligned (Fig. 42).

(4) Install the camshaft sprocket retaining bolt and washer. Tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(5) To verify correct installation of the timing chain, turn the crankshaft to position the camshaft sprocket timing mark as shown in (Fig. 45). Count

REMOVAL AND INSTALLATION (Continued)

the number of chain pins between the timing marks of both sprockets. There must be 20 pins.

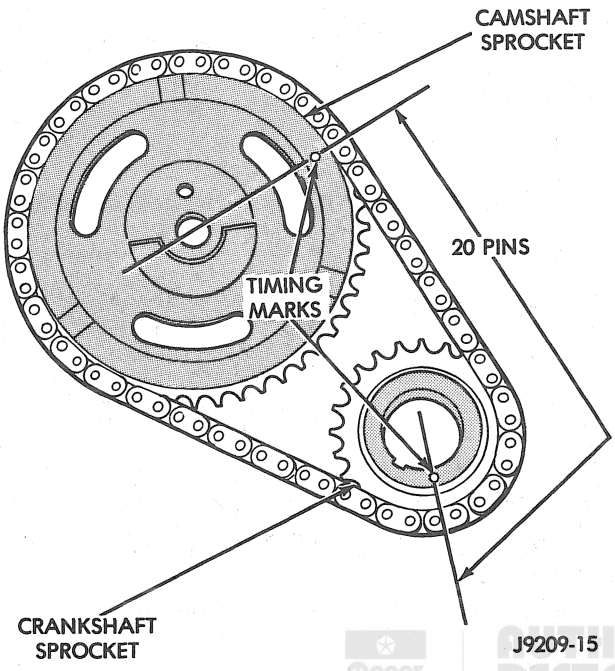


Fig. 45 Verify Sprocket—Chain Installation

(6) Turn the chain tensioner lever to the unlocked (down) position (Fig. 44).

(7) Install the oil slinger.

(8) Replace the oil seal in the timing case cover.

(9) Install the timing case cover and gasket.

(10) With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(11) Install the fan and shroud.

(12) Connect negative cable to battery.

CAMSHAFT

REMOVAL

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. RELEASE THE PRESSURE BEFORE REMOVING THE DRAIN COCK, CAP AND DRAIN PLUGS.

(1) Disconnect negative cable from battery.

(2) Drain the cooling system. DO NOT waste reusable coolant. If the solution is clean, drain it into a clean container for reuse.

(3) Remove the radiator or radiator and condenser, if equipped with A/C.

(4) Scribe a mark on the distributor housing in line with the lip of the rotor.

(5) Scribe a mark on the distributor housing near the clamp and continue the scribe mark on the cylinder block in line with the distributor mark.

(6) For ease of installation, note the position of the rotor and distributor housing in relation to adjacent engine components.

(7) Remove the distributor and ignition wires.

(8) Remove the engine cylinder head cover.

(9) Remove the rocker arms, bridges and pivots.

(10) Remove the push rods.

(11) Remove the hydraulic valve tappets from the engine cylinder head.

(12) Remove the vibration damper.

(13) Remove the timing case cover.

(14) Remove the timing chain and sprockets.

(15) Remove the camshaft (Fig. 46).

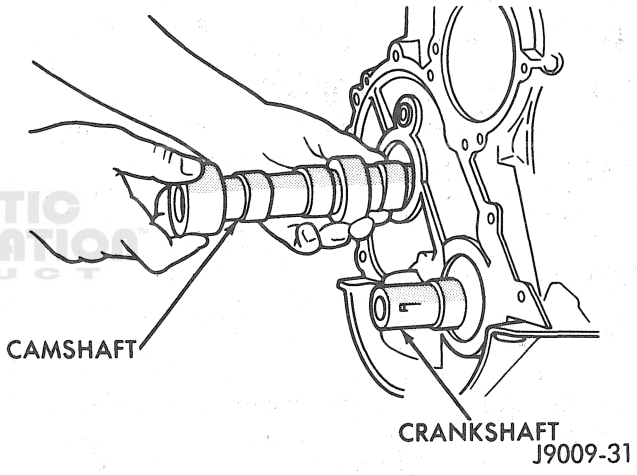


Fig. 46 Camshaft

INSTALLATION

(1) Inspect the cam lobes for wear.

(2) Inspect the bearing journals for uneven wear pattern or finish.

(3) Inspect the bearings for wear.

(4) Inspect the distributor drive gear for wear.

(5) If the camshaft appears to have been rubbing against the timing case cover, examine the oil pressure relief holes in the rear cam journal. The oil pressure relief holes must be free of debris.

(6) Lubricate the camshaft with Mopar Engine Oil Supplement, or equivalent.

(7) Carefully install the camshaft to prevent damage to the camshaft bearings (Fig. 46).

(8) Turn the tensioner lever to the unlocked (down) position (Fig. 47).

NOTE: Pull the tensioner block toward the tensioner lever to compress the spring. Hold the block and turn the tensioner lever to the lock position (Fig. 47).

REMOVAL AND INSTALLATION (Continued)

(9) Install the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned.

(10) Install the camshaft sprocket retaining bolt and washer. Tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(11) Install the timing case cover with a replacement oil seal (Fig. 48). Refer to Timing Case Cover Installation.

(12) Install the vibration damper.

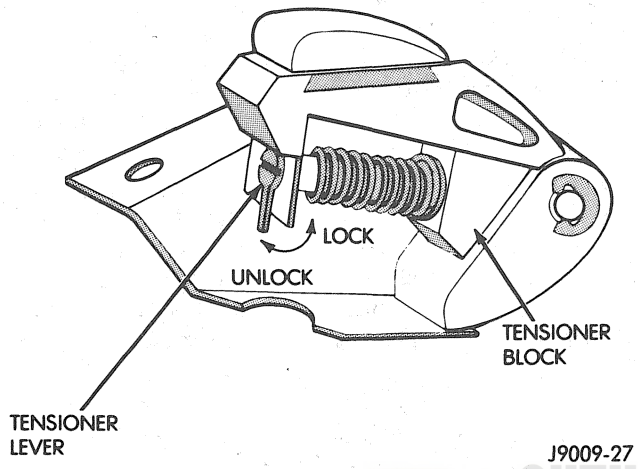


Fig. 47 Loading Timing Chain Tensioner

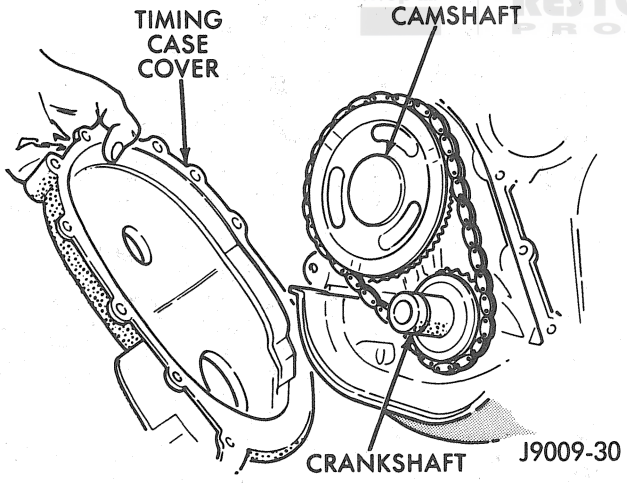


Fig. 48 Timing Case Cover

(13) Install the hydraulic valve tappets.

(14) Install the push rods.

(15) Install the rocker arms, bridges and pivots.

(16) Install the engine cylinder head cover.

(17) Position the oil pump gear. Refer to Distributor in the Component Removal/Installation section of Group 8D, Ignition Systems.

(18) Install the distributor and ignition wires. Refer to Distributor in the Component Removal/Installation section of Group 8D, Ignition Systems.

(19) Install the radiator or radiator and condenser, if equipped with A/C.

(20) Fill the cooling system.

(21) Connect negative cable to battery.

CAMSHAFT PIN REPLACEMENT

REMOVAL

WARNING: DO NOT LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

(1) Disconnect negative cable from battery.

(2) Drain the radiator. DO NOT waste reusable coolant. Drain the coolant into a clean container.

(3) Remove the fan and shroud.

(4) Disconnect the radiator overflow tube, radiator hoses, automatic transmission fluid cooler pipes (if equipped).

(5) Remove the radiator.

(6) If equipped with air conditioning:

CAUTION: DO NOT loosen or disconnect any air conditioner system fittings. Move the condenser and receiver/drier aside as a complete assembly.

(a) Remove the A/C compressor serpentine drive belt idler pulley.

(b) Disconnect and remove the generator.

(c) Remove the A/C condenser attaching bolts and move the condenser and receiver/drier assembly up and out of the way.

(7) Remove the serpentine drive belt.

(8) Remove the crankshaft vibration damper.

(9) Remove the timing case cover. Clean the gasket material from the cover.

(10) Rotate crankshaft until the crankshaft sprocket timing mark is closest to and on the center line with the camshaft sprocket timing mark (Fig. 49).

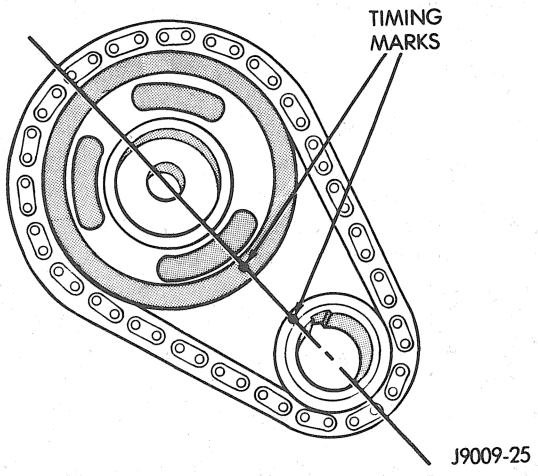


Fig. 49 Timing Chain Alignment

(11) Remove camshaft sprocket retaining bolt.

(12) Remove the crankshaft oil slinger.

REMOVAL AND INSTALLATION (Continued)

(13) Remove the sprockets and chain as an assembly (Fig. 50).

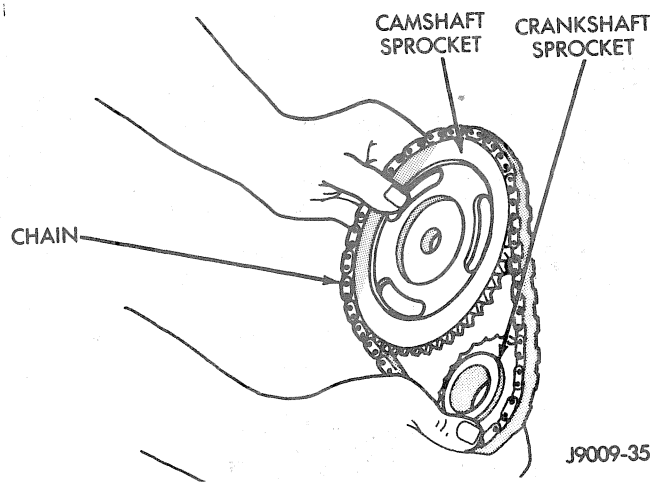


Fig. 50 Camshaft and Crankshaft Sprocket and Chain

CAUTION: The following procedural step must be accomplished to prevent the camshaft from damaging the rear camshaft plug during pin installation.

(14) Inspect the damaged camshaft pin.

(15) If the pin is a spring-type pin, remove the broken pin by inserting a self-tapping screw into the pin and carefully pulling the pin from the camshaft.

(16) If the pin is a dowel-type pin, center-punch it. Ensure the exact center is located when center-punching the pin.

CAUTION: Cover the opened oil pan area to prevent metal chips from entering the pan.

(17) Drill into the pin center with a 4 mm (5/32 inch) drill bit.

(18) Insert a self-tapping screw into the drilled pin and carefully pull the pin from the camshaft.

CAMSHAFT BEARINGS

The camshaft rotates within four steel-shelled, babbitt-lined bearings that are pressed into the cylinder block and then line reamed. The camshaft bearing bores and bearing diameters are not the same size. They are stepped down in 0.254 mm (0.010 inch) increments from the front bearing (largest) to the rear bearing (smallest). This permits easier removal and installation of the camshaft. The camshaft bearings are pressure lubricated.

NOTE: It is not advisable to attempt to replace camshaft bearings unless special removal and installation tools are available.

Camshaft end play is maintained by the load placed on the camshaft by the oil pump and distributor drive gear. The helical cut of the gear holds the camshaft sprocket thrust face against the cylinder block face.

INSTALLATION

(1) Clean the camshaft pin hole.

(2) Compress the center of the replacement spring pin with vise grips.

(3) Carefully drive the pin into the camshaft pin hole until it is seated.

(4) Install the camshaft sprocket, crankshaft sprocket and timing chain with the timing marks aligned (Fig. 49).

(5) To verify correct installation of the timing chain, turn the crankshaft to position the camshaft sprocket timing mark as shown in (Fig. 51). Count the number of chain pins between the timing marks of both sprockets. There must be 20 pins.

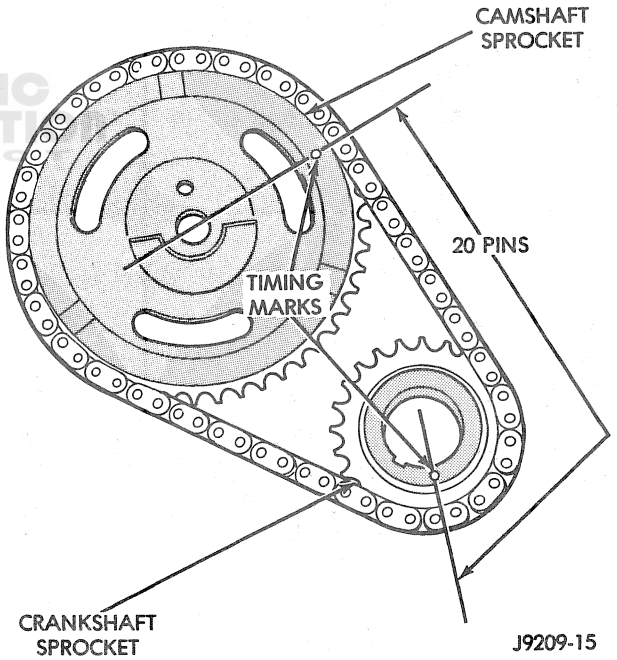


Fig. 51 Verify Crankshaft—Camshaft Installation

(6) Install the crankshaft oil slinger.

(7) Tighten the camshaft sprocket bolt to 108 N·m (80 ft. lbs.) torque.

(8) Check the valve timing.

(9) Coat both sides of the replacement timing case cover gasket with gasket sealer. Apply a 3 mm (1/8 inch) bead of Mopar Silicone Rubber Adhesive Sealant, or equivalent to the joint formed at the timing case cover and cylinder block.

(10) Position the timing case cover on the oil pan gasket and the cylinder block.

REMOVAL AND INSTALLATION (Continued)

(11) Place Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening of the cover (Fig. 52).

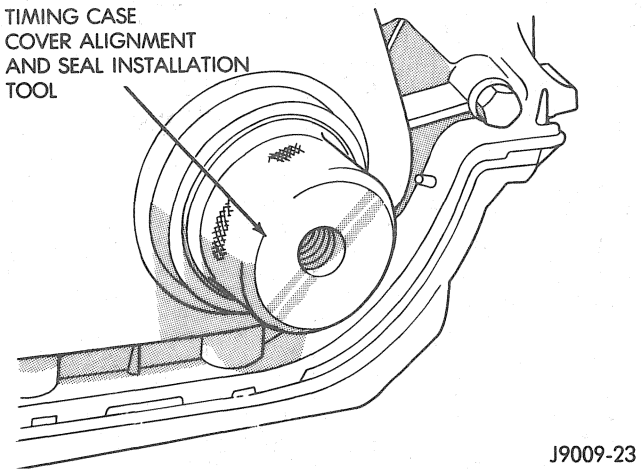


Fig. 52 Timing Case Cover Alignment and Seal Installation Tool 6139

(12) Install the timing case cover-to-cylinder block bolts. Install the oil pan-to-timing case cover bolts.

(13) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 14 N·m (120 in. lbs.) torque. Tighten the oil pan-to-cover 5/16 inch bolts to 18 N·m (156 in. lbs.) torque.

(14) Remove the cover alignment tool and install a replacement oil seal into the cover.

(15) Install the vibration damper on the crankshaft.

(16) Lubricate and tighten the damper bolt to 108 N·m (80 ft. lbs.) torque.

(17) If equipped with air conditioning:

(a) Install the A/C compressor serpentine drive belt idler pulley.

(b) Install the generator.

(c) Install the A/C condenser and receiver/drier assembly.

(18) Install the serpentine drive belt on the pulleys and tighten (refer to Group 7, Cooling System for the specifications and procedures).

(19) Install the radiator. Connect the radiator hoses and automatic transmission fluid cooler pipes, if equipped. Fill the cooling system.

(20) Install the fan and shroud.

(21) Connect negative cable to battery.

CAMSHAFT BEARINGS

The camshaft rotates within four steel-shelled, babbitt-lined bearings that are pressed into the cylinder block and then line reamed. The camshaft bearing bores and bearing diameters are not the same size. They are stepped down in 0.254 mm (0.010 inch) increments from the front bearing (largest) to the rear bearing (smallest). This permits easier removal and installation of the camshaft. The camshaft bearings are pressure lubricated.

NOTE: It is not advisable to attempt to replace camshaft bearings unless special removal and installation tools are available.

Camshaft end play is maintained by the load placed on the camshaft by the oil pump and distributor drive gear. The helical cut of the gear holds the camshaft sprocket thrust face against the cylinder block face.

CRANKSHAFT MAIN BEARINGS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the spark plugs.

(3) Raise the vehicle.

(4) Remove the oil pan and oil pump.

(5) Remove only one main bearing cap and lower insert at a time (Fig. 53).

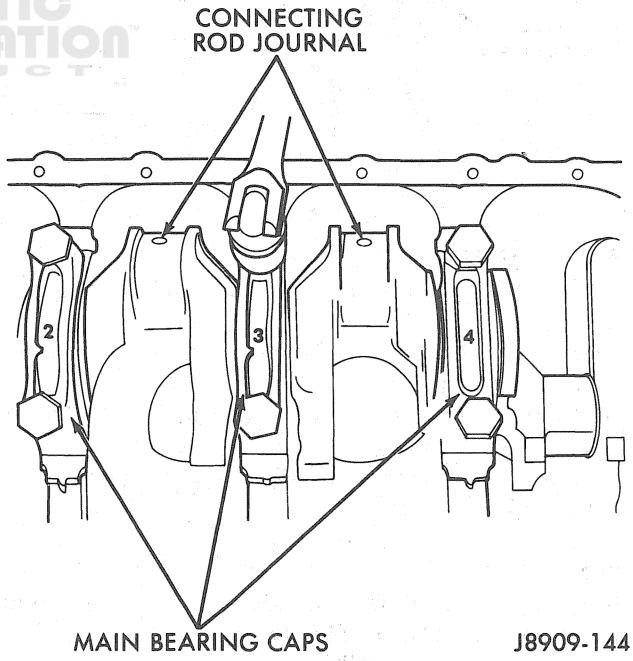


Fig. 53 Removing Main Bearing Caps and Lower Inserts

(6) Remove the lower insert from the bearing cap.

(7) Remove the upper insert by LOOSENING (DO NOT REMOVE) all of the other bearing caps. Now insert a small cotter pin tool in the crankshaft journal oil hole. Bend the cotter pin as illustrated to fabricate the tool (Fig. 54). With the cotter pin tool in place, rotate the crankshaft so that the upper bearing insert will rotate in the direction of its locking

REMOVAL AND INSTALLATION (Continued)

tab. Because there is no hole in the No.3 main journal, use a tongue depressor or similar soft-faced tool to remove the bearing insert (Fig. 54). After moving the insert approximately 25 mm (1 inch), it can be removed by applying pressure under the tab.

(8) Using the same procedure described above, remove the remaining bearing inserts one at a time for inspection.

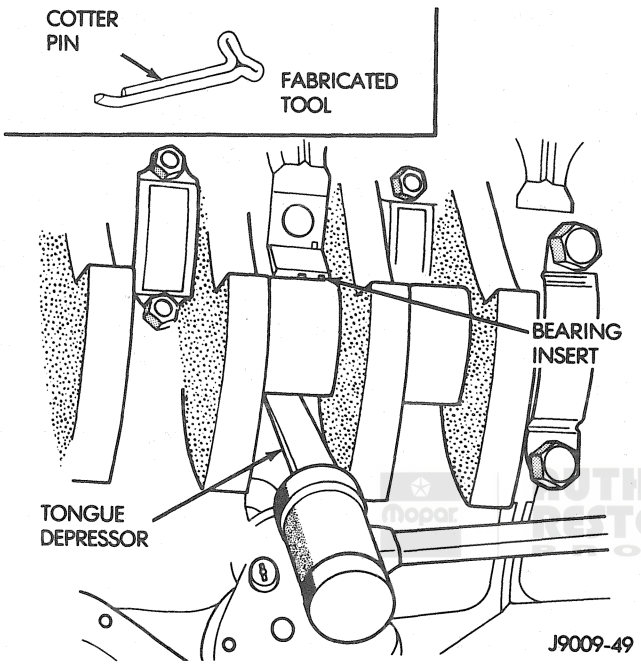


Fig. 54 Removing Upper Inserts

INSTALLATION

(1) Lubricate the bearing surface of each insert with engine oil.

(2) Loosen all the main bearing caps. Install the main bearing upper inserts.

(3) Install the lower bearing inserts into the main bearing caps.

(4) Install the main bearing cap(s) and lower insert(s).

(5) Clean the rear main bearing cap (No.5) mating surfaces.

(6) Apply Loctite 518, or equivalent on the rear bearing cap (Fig. 55). The bead should be 3 mm (0.125 in) thick. DO NOT apply Loctite 518, or equivalent to the lip of the seal.

(7) Install the rear main bearing cap. DO NOT strike the cap more than twice for proper engagement.

(8) Tighten the bolts of caps 1, 3, 4 and 5 to 54 N·m (40 ft. lbs.) torque. Now tighten these bolts to 95 N·m (70 ft. lbs.) torque. Finally, tighten these bolts to 108 N·m (80 ft. lbs.) torque.

(9) Push the crankshaft forward and backward. Load the crankshaft front or rear and tighten cap bolt No.2 to 54 N·m (40 ft. lbs.) torque. Then tighten

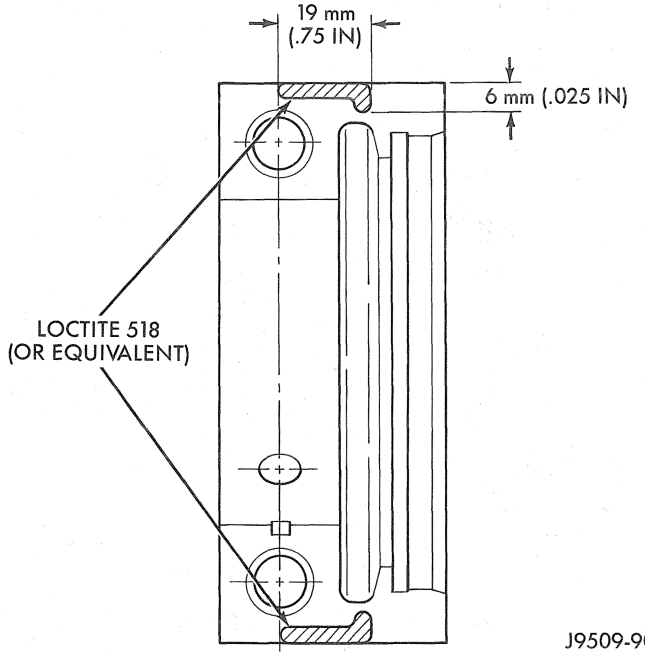


Fig. 55 Location of Loctite 518 (or equivalent)

to 95 N·m (70 ft. lbs.) torque and finally tighten to 108 N·m (80 ft. lbs.) torque.

(10) Rotate the crankshaft after tightening each main bearing cap to ensure the crankshaft rotates freely.

(11) Check crankshaft end play. Crankshaft end play is controlled by the thrust bearing which is flange and installed at the No.2 main bearing position.

(a) Attach a magnetic base dial indicator to the cylinder block at either the front or rear of the engine.

(b) Position the dial indicator rod so that it is parallel to the center line of the crankshaft.

(c) Position the dial indicator rod so that it is parallel to the center line of the crankshaft.

(d) Pry the crankshaft forward, position the dial indicator to zero.

(e) Pry the crankshaft forward and backward. Note the dial indicator readings. End play is the difference between the high and low measurements (Fig. 56). Correct end play is 0.038-0.165 mm (0.0015-0.0065 inch). The desired specifications are 0.051-0.064 mm (0.002-0.0025 inch).

(f) If end play is not within specification, inspect crankshaft thrust faces for wear. If no wear is apparent, replace the thrust bearing and measure end play. If end play is still not within specification, replace the crankshaft.

(12) If the crankshaft was removed, install the crankshaft into the cylinder block (refer to Cylinder Block - Assemble).

(13) Install the oil pan.

REMOVAL AND INSTALLATION (Continued)

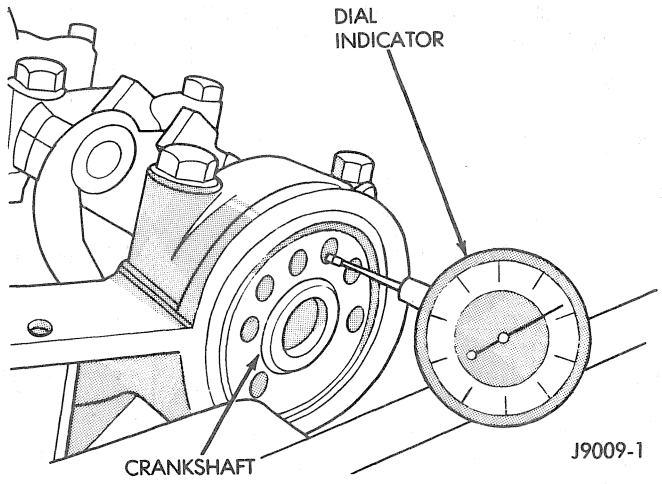


Fig. 56 Crankshaft End Play Measurement

(14) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(15) Lower the vehicle.

(16) Install the spark plugs. Tighten the plugs to 37 N·m (27 ft. lbs.) torque.

(17) Fill the oil pan with engine oil to the full mark on the dipstick level.

(18) Connect negative cable to battery.

OIL PAN

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle.

(3) Remove the oil pan drain plug and drain the engine oil.

(4) Disconnect the exhaust pipe at the engine exhaust manifold.

(5) Disconnect the exhaust hanger at the catalytic converter and lower the pipe.

(6) Remove the engine starter motor.

(7) Remove the flywheel/torque converter housing access cover.

(8) Position a jack stand directly under the engine vibration damper.

(9) Place a piece of wood (2 x 2) between the jack stand and the engine vibration damper.

(10) Remove the engine mount through bolts.

(11) Using the jack stand, raise the engine until adequate clearance is obtained to remove the oil pan.

(12) Remove the oil pan bolts. Carefully remove the oil pan and gasket.

INSTALLATION

(1) Clean the block and pan gasket surfaces.

(2) Fabricate 4 alignment dowels from 1/4 x 1 1/2 inch bolts. Cut the head off the bolts and cut a slot into the top of the dowel. This will allow easier installation and removal with a screwdriver (Fig. 57).

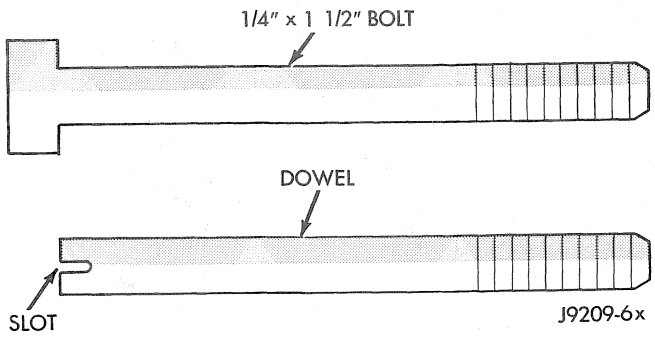


Fig. 57 Fabrication of Alignment Dowels

(3) Install two dowels in the timing case cover. Install the other two dowels in the cylinder block (Fig. 58).

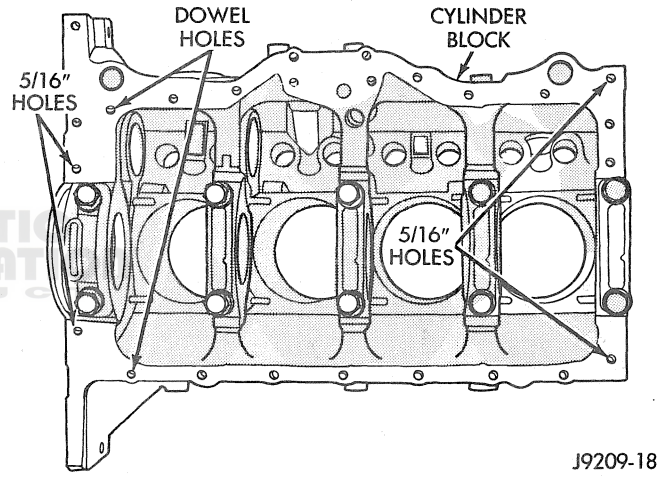


Fig. 58 Position of Dowels in Cylinder Block

(4) Slide the one-piece gasket over the dowels and onto the block and timing case cover.

(5) Position the oil pan over the dowels and onto the gasket.

(6) Install the 1/4 inch oil pan bolts. Tighten these bolts to 14 N·m (120 in. lbs.) torque. Install the 5/16 inch oil pan bolts (Fig. 59). Tighten these bolts to 18 N·m (156 in. lbs.) torque.

(7) Remove the dowels. Install the remaining 1/4 inch oil pan bolts. Tighten these bolts to 14 N·m (120 in. lbs.) torque.

(8) Lower the engine until it is properly located on the engine mounts.

(9) Install the through bolts and tighten the nuts.

(10) Lower the jack stand and remove the piece of wood.

(11) Install the flywheel and torque converter housing access cover.

(12) Install the engine starter motor.

(13) Connect the exhaust pipe to the hanger and to the engine exhaust manifold.

REMOVAL AND INSTALLATION (Continued)

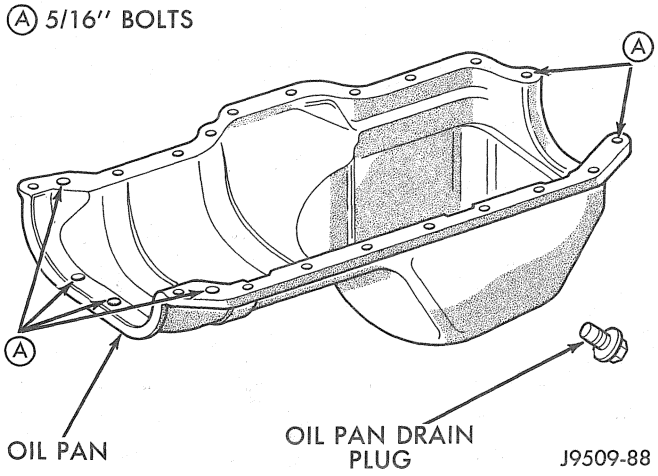


Fig. 59 Position of 5/16 inch Oil Pan Bolts

(14) Install the oil pan drain plug (Fig. 59). Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(15) Lower the vehicle.

(16) Connect negative cable to battery.

(17) Fill the oil pan with engine oil to the specified level.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(18) Start the engine and inspect for leaks.

OIL PUMP

The positive-displacement gear-type oil pump is driven by the distributor shaft, which is driven by a gear on the camshaft. Oil is siphoned into the pump through an inlet tube and strainer assembly that is pressed into the pump body.

The pump incorporates a nonadjustable pressure relief valve to limit maximum pressure to 517 kPa (75 psi). In the relief position, the valve permits oil to bypass through a passage in the pump body to the inlet side of the pump.

Oil pump removal or replacement will not affect the distributor timing because the distributor drive gear remains in mesh with the camshaft gear.

REMOVAL

(1) Drain the engine oil.

(2) Remove the oil pan.

(3) Remove the pump-to-cylinder block attaching bolts. Remove the pump assembly with gasket (Fig. 60).

CAUTION: If the oil pump is not to be serviced, DO NOT disturb position of oil inlet tube and strainer assembly in pump body. If the tube is moved within the pump body, a replacement tube and strainer assembly must be installed to assure an airtight seal.

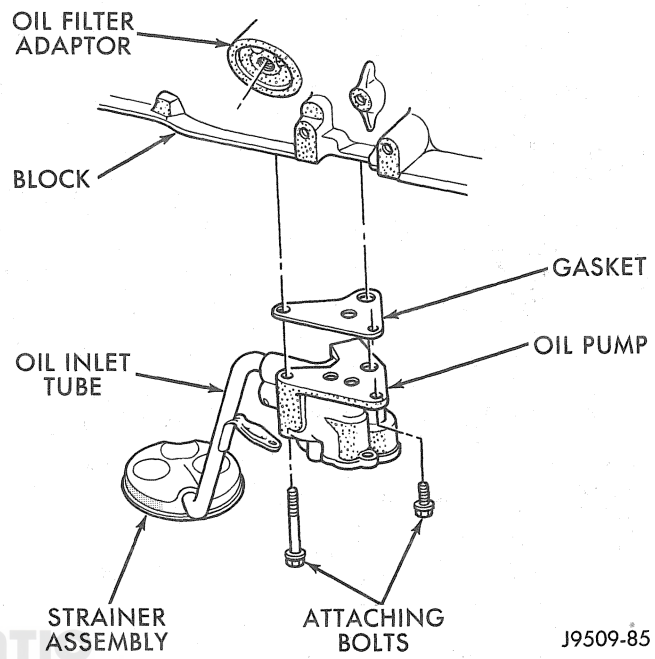


Fig. 60 Oil Pump Assembly

INSTALLATION

(1) Install the oil pump on the cylinder block using a replacement gasket. Tighten the bolts to 23 N·m (17 ft. lbs.) torque.

(2) Install the oil pan and gasket.

(3) Fill the oil pan with oil to the specified level.

PISTONS AND CONNECTING RODS

REMOVAL

(1) Remove the engine cylinder head cover.

(2) Remove the rocker arms, bridges and pivots.

(3) Remove the push rods.

(4) Remove the engine cylinder head.

(5) Position the pistons one at a time near the bottom of the stroke. Use a ridge reamer to remove the ridge from the top end of the cylinder walls. Use a protective cloth to collect the cuttings.

(6) Raise the vehicle.

(7) Drain the engine oil.

(8) Remove the oil pan and gasket.

(9) Remove the connecting rod bearing caps and inserts. Mark the caps and rods with the cylinder bore location. The connecting rods and caps are stamped with a two letter combination (Fig. 61).

(10) Lower the vehicle until it is about 2 feet from the floor.

REMOVAL AND INSTALLATION (Continued)

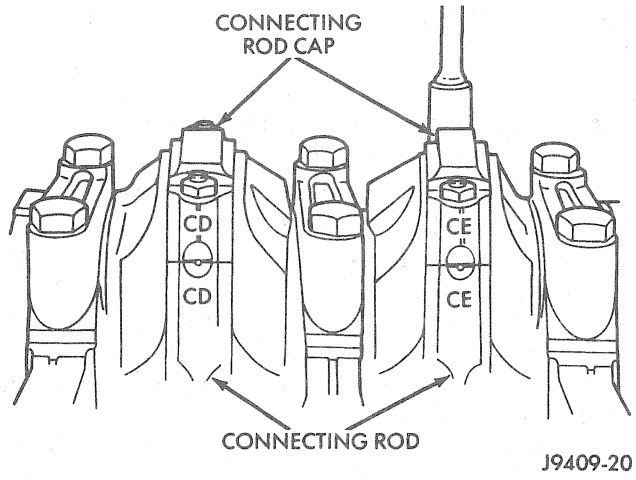


Fig. 61 Stamped Connecting Rods and Caps

CAUTION: Ensure that the connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose, slipped over the rod bolts will provide protection during removal.

(11) Have an assistant push the piston and connecting rod assemblies up and through the top of the cylinder bores (Fig. 62).

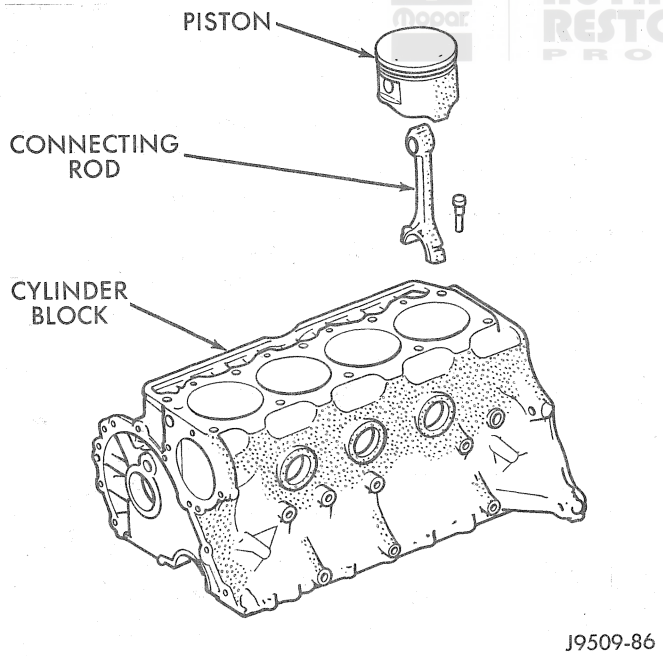


Fig. 62 Removal of Connecting Rod and Piston Assembly

INSTALLATION

(1) Clean the cylinder bores thoroughly. Apply a light film of clean engine oil to the bores with a clean lint-free cloth.

(2) Install the piston rings on the pistons if removed.

(3) Lubricate the piston and rings with clean engine oil.

CAUTION: Ensure that connecting rod bolts do not scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose slipped over the connecting rod bolts will provide protection during installation.

(4) Use a piston ring compressor to install the connecting rod and piston assemblies through the top of the cylinder bores (Fig. 63).

(5) Ensure the arrow on the piston top points to the front of the engine (Fig. 63).

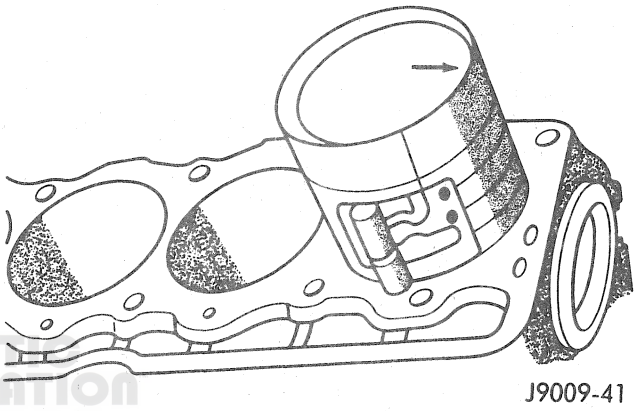


Fig. 63 Rod and Piston Assembly Installation

(6) Raise the vehicle.

(7) Each bearing insert is fitted to its respective journal to obtain the specified clearance between the bearing and the journal. In production, the select fit is obtained by using various-sized, color-coded bearing inserts as listed in the Connecting Rod Bearing Fitting Chart. The color code appears on the edge of the bearing insert. The size is not stamped on inserts used for production of engines.

(8) The rod journal is identified during the engine production by a color-coded paint mark on the adjacent cheek or counterweight toward the flange (rear) end of the crankshaft. The color codes used to indicate journal sizes are listed in the Connecting Rod Bearing Fitting Chart.

(9) When required, upper and lower bearing inserts of different sizes may be used as a pair (refer to Connecting Rod Bearing Fitting Chart). A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce clearance 0.013 mm (0.0005 inch).

CAUTION: DO NOT intermix bearing caps. Each connecting rod and bearing cap are stamped with the cylinder number. The stamp is located on a machined surface adjacent to the oil squirt hole that faces the camshaft side of the cylinder block.

REMOVAL AND INSTALLATION (Continued)

(10) Install the connecting rod bearing caps and inserts in the same positions as removed.

CAUTION: Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

(11) Install the oil pan and gaskets as outlined in the installation procedure.
(12) Lower the vehicle.
(13) Install the engine cylinder head, push rods, rocker arms, bridges, pivots and engine cylinder head cover.
(14) Fill the crankcase with engine oil.

REAR MAIN OIL SEALS

REMOVAL

(1) Remove the flywheel or converter drive plate. Discard the old bolts.
(2) Pry out the seal from around the crankshaft flange (Fig. 64).

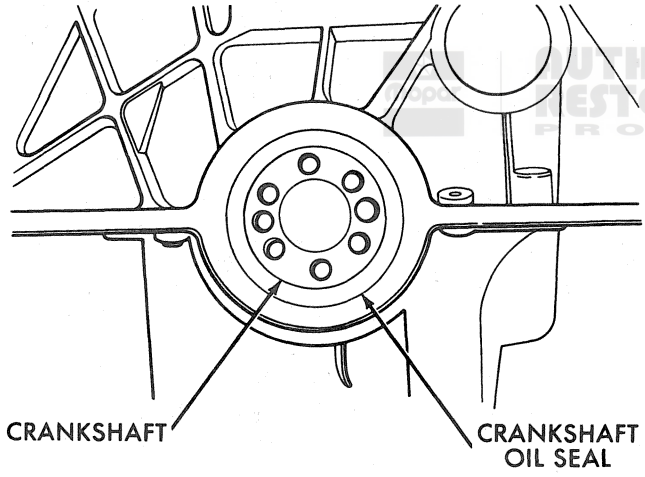


Fig. 64 Replacement of Rear Crankshaft Oil Seal

INSTALLATION

(1) Coat the outer lip of the replacement rear main bearing seal with engine oil.
(2) Carefully position the seal into place. Use rear main Seal Installer Tool 6271A to install the seal flush with the cylinder block.

CAUTION: The felt lip must be located inside the flywheel mounting surface. If the lip is not positioned correctly the flywheel could tear the seal.

(3) Install the flywheel or converter drive plate. New bolts MUST be used when installing the flywheel or converter plate. Tighten the new bolts to 68 N·m (50 ft. lbs.) torque. Turn the bolts an additional 60°.

DISASSEMBLY AND ASSEMBLY

VALVE SERVICE

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.
Clean all grime and gasket material from the engine cylinder head machined gasket surface.
Inspect for cracks in the combustion chambers and valve ports.
Inspect for cracks on the exhaust seat.
Inspect for cracks in the gasket surface at each coolant passage.
Inspect valves for burned, cracked or warped heads.
Inspect for scuffed or bent valve stems.
Replace valves displaying any damage.

VALVE REFACING

(1) Use a valve refacing machine to reface the intake and exhaust valves to the specified angle.
(2) After refacing, a margin of at least 0.787 mm (0.031 inch) must remain (Fig. 65). If the margin is less than 0.787 mm (0.031 inch), the valve must be replaced.

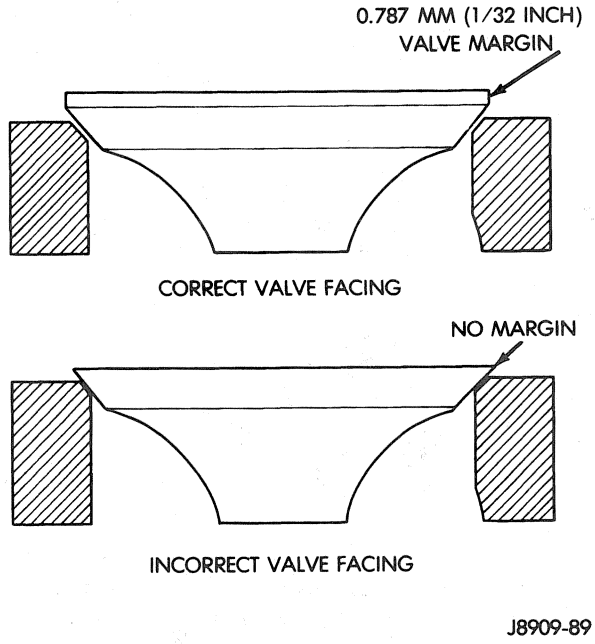


Fig. 65 Valve Facing Margin

VALVE SEAT REFACING

(1) Install a pilot of the correct size in the valve guide bore. Reface the valve seat to the specified angle with a good dressing stone. Remove only enough metal to provide a smooth finish.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Use tapered stones to obtain the specified seat width when required.

(3) (3) Control valve seat runout to a maximum of 0.0635 mm (0.0025 in.)— (Fig. 66).

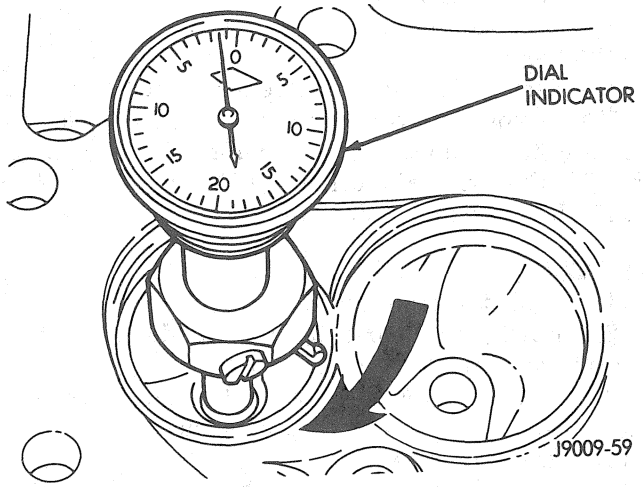


Fig. 66 Measurement of Valve Seat Runout

VALVE STEM OIL SEAL REPLACEMENT

Valve stem oil seals are installed on each valve stem to prevent rocker arm lubricating oil from entering the combustion chamber through the valve guide bores. One seal is marked INT (intake valve) and the other is marked EXH (exhaust valve).

Replace the oil seals whenever valve service is performed or if the seals have deteriorated.

VALVE GUIDES

The valve guides are an integral part of the engine cylinder head and are not replaceable.

When the valve stem guide clearance is excessive, the valve guide bores must be reamed oversize. Service valves with oversize stems are available in 0.076 mm (0.003 inch) and 0.381 mm (0.015 inch) increments.

Corresponding oversize valve stem seals are also available and must be used with valves having 0.381 mm (0.015 inch) oversize stems, 0.076mm (.003in.) oversize stems do not require oversize seals.

NOTE: If the valve guides are reamed oversize, the valve seats must be ground to ensure that the valve seat is concentric to the valve guide.

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

Valve stem-to-guide clearance may be measured by either of the following two methods.

PREFERRED METHOD:

(1) Remove the valve from the head.

(2) Clean the valve stem guide bore with solvent and a bristle brush.

(3) Insert a telescoping gauge into the valve stem guide bore approximately 9.525 mm (.375 inch) from the valve spring side of the head (Fig. 67).

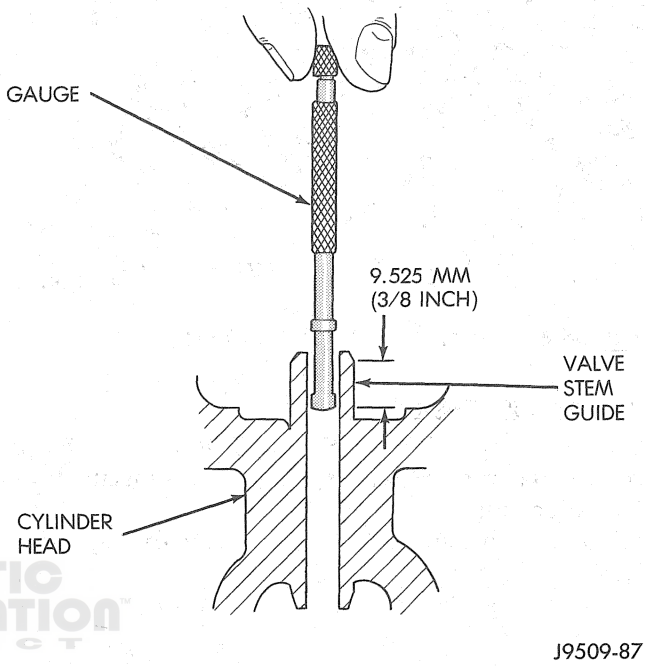


Fig. 67 Measurement of Valve Guide Bore Diameter

(4) Remove and measure telescoping gauge with a micrometer.

(5) Repeat the measurement with contacts lengthwise to engine cylinder head.

(6) Compare the crosswise to lengthwise measurements to determine out-of-roundness. If the measurements differ by more than 0.0635 mm (0.0025 in.), ream the guide bore to accommodate an oversize valve stem.

(7) Compare the measured valve guide bore diameter with specifications (7.95-7.97 mm or 0.313-0.314 inch). If the measurement differs from specification by more than 0.076 mm (0.003 inch), ream the guide bore to accommodate an oversize valve stem.

ALTERNATIVE METHOD:

(1) Use a dial indicator to measure the lateral movement of the valve stem (stem-to-guide clearance). This must be done with the valve installed in its guide and just off the valve seat (Fig. 68).

(2) Correct clearance is 0.025-0.0762 mm (0.001-0.003 inch). If indicated movement exceeds the specification ream the valve guide to accommodate an oversize valve stem.

NOTE: Valve seats must be ground after reaming the valve guides to ensure that the valve seat is concentric to the valve guide.

DISASSEMBLY AND ASSEMBLY (Continued)

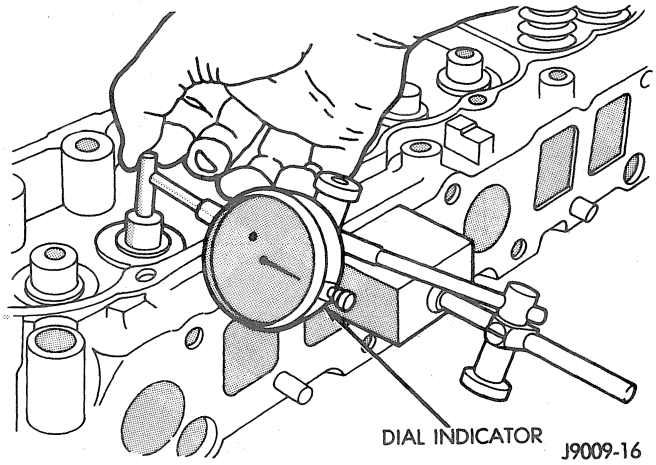


Fig. 68 Measurement of Lateral Movement Of Valve Stem

VALVE SPRING TENSION TEST

Use a Universal Valve Spring Tester and a torque wrench to test each valve spring for the specified tension value (Fig. 69).

Replace valve springs that are not within specifications.

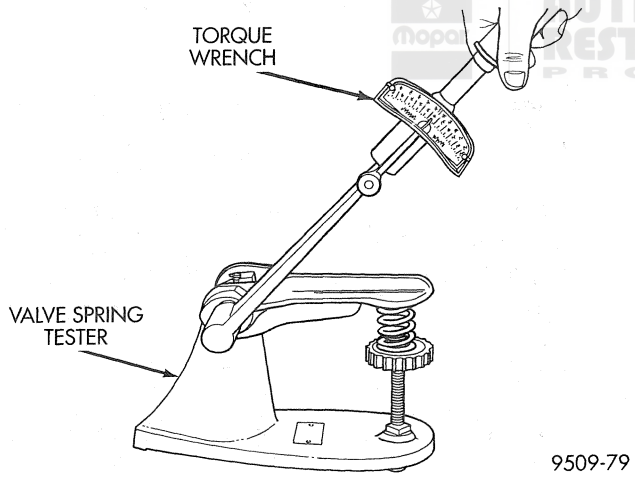


Fig. 69 Valve Spring Tester

CYLINDER BLOCK

Remove the Engine Assembly from the vehicle.

DISASSEMBLY

(1) Drain the engine oil. Remove and discard the oil filter.

(2) Remove the water pump from the cylinder block.

(3) Remove the distributor from the cylinder block.

(4) Remove the vibration damper.

(5) Remove the timing case cover and lay the cover upside down.

(6) Position a drift punch into the slot in the back of the cover and tap the old seal out.

(7) Remove the timing chain bumper.

(8) Remove the oil slinger from crankshaft.

(9) Remove the camshaft retaining bolt and remove the sprockets and chain as an assembly.

(10) Remove the camshaft.

(11) Remove the oil pan and gasket.

(12) Remove the timing chain tensioner.

(13) Remove the front and rear oil galley plugs.

(14) Remove the connecting rods and the pistons. Remove the connecting rod and piston assemblies through the top of the cylinder bores.

(15) Remove the crankshaft.

ASSEMBLY

(1) Install the crankshaft.

(2) Install the connecting rods and the pistons through the top of the cylinder bores.

(3) Install the front and rear oil galley plugs.

(4) Install the timing chain tensioner.

(5) Install the camshaft.

(6) Install the sprockets and chain as an assembly.

(7) Install the oil slinger to the crankshaft.

(8) Install the timing chain bumper.

(9) Install the timing case cover seal.

(10) Install the timing case cover.

(11) Install the oil pan gasket and oil pan.

(12) Install the vibration damper.

(13) Install the water pump. Tighten the mounting bolts to 31 N·m (270 in. lbs.) torque.

(14) Remove the distributor from the cylinder block.

(15) Lubricate the oil filter seal with clean engine oil. Tighten oil filter to 18 N·m (13 ft. lbs.) torque.

(16) Install the engine into the vehicle.

(17) Fill the engine with clean lubrication oil.

(18) Fill the cooling system.

CLEANING AND INSPECTION

ROCKER ARMS AND PUSH RODS

CLEANING

Clean all the components with cleaning solvent.

Use compressed air to blow out the oil passages in the rocker arms and push rods.

INSPECTION

Inspect the pivot surface area of each rocker arm. Replace any that are scuffed, pitted, cracked or excessively worn.

Inspect the valve stem tip contact surface of each rocker arm and replace any rocker arm that is deeply pitted.

Inspect each push rod end for excessive wear and replace as required. If any push rod is excessively

CLEANING AND INSPECTION (Continued)

worn because of lack of oil, replace it and inspect the corresponding hydraulic tappet for excessive wear.

Inspect the push rods for straightness by rolling them on a flat surface or by shining a light between the push rod and the flat surface.

A wear pattern along the length of the push rod is not normal. Inspect the engine cylinder head for obstruction if this condition exists.

ENGINE CYLINDER HEAD

CLEANING

Thoroughly clean the engine cylinder head and cylinder block mating surfaces. Clean the intake and exhaust manifold and engine cylinder head mating surfaces. Remove all gasket material and carbon.

Check to ensure that no coolant or foreign material has fallen into the tappet bore area.

Remove the carbon deposits from the combustion chambers and top of the pistons.

INSPECTION

Use a straightedge and feeler gauge to check the flatness of the engine cylinder head and block mating surfaces.

CYLINDER BLOCK

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole, the filter bypass hole (Fig. 70).

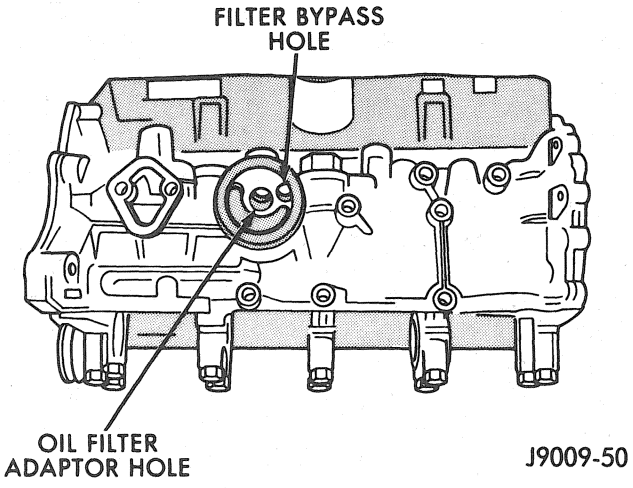


Fig. 70 Oil Filter Adaptor Hole

- The front and rear oil galley holes (Fig. 71) (Fig. 72).
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 41 N·m (30 ft. lbs.) torque.

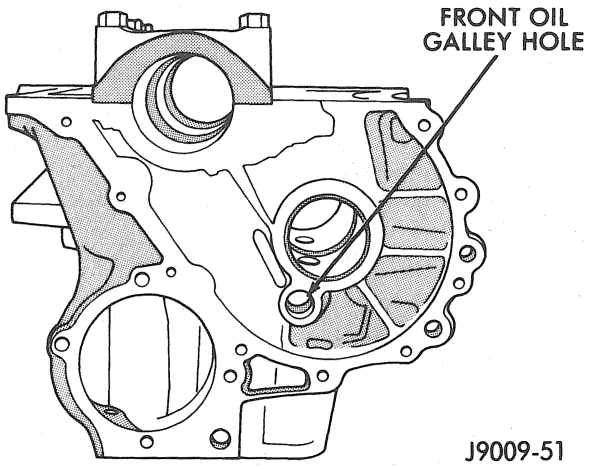


Fig. 71 Front Oil Galley Hole

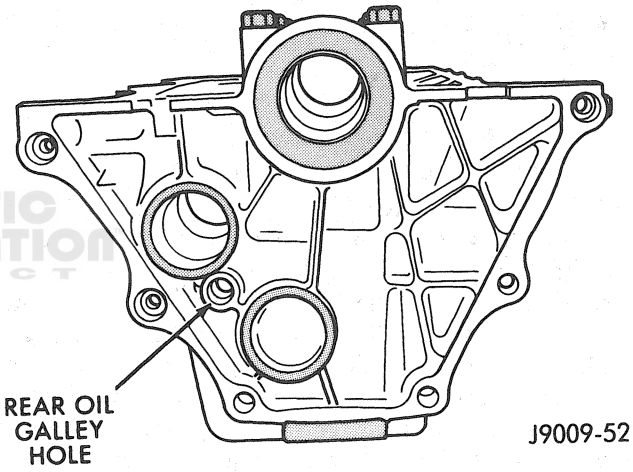


Fig. 72 Rear Oil Galley Hole

INSPECTION—CYLINDER BORE

(1) It is mandatory to use a dial bore gauge to measure each cylinder bore diameter (Fig. 73). To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.

(3) Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.

(4) Determine taper by subtracting the smaller diameter from the larger diameter.

(5) Rotate measuring device 90° and repeat steps above.

CLEANING AND INSPECTION (Continued)

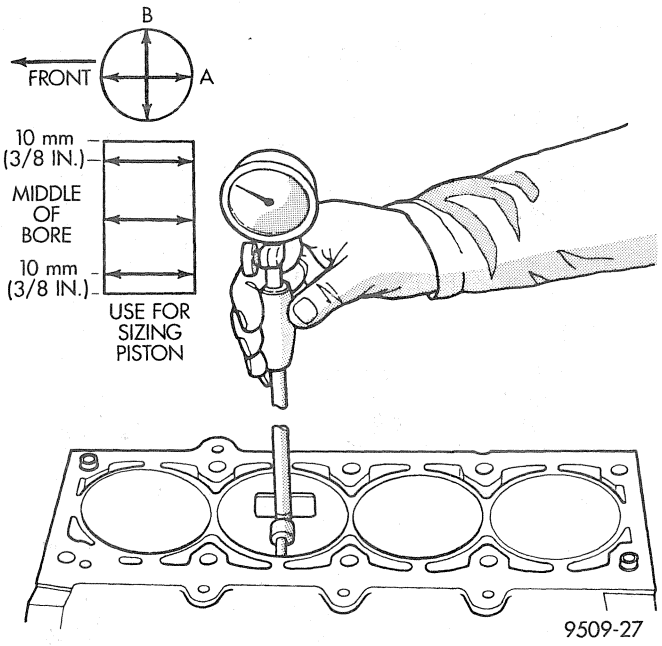


Fig. 73 Cylinder Bore Measurement

(6) Determine out-of-roundness by comparing the difference between each measurement.

(7) If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder must be bored and then honed to accept an oversize piston. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

HONING—CYLINDER BORE

The honing operation should be closely coordinated with the fitting of pistons and rings. This will ensure specified clearances are maintained.

SPECIFICATIONS

2.5L ENGINE SPECIFICATIONS

Camshaft
Hydraulic Tappet Clearance . . . . . .Zero Lash
Bearing Clearance. . . . . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Bearing Journal Diameter
No. 1. . . . . .51.54 to 51.56 mm (2.029 to 2.030 in.)
No. 2. . . . . .51.28 to 51.31 mm (2.019 to 2.020 in.)
No. 3. . . . . .51.03 to 51.05 mm (2.009 to 2.010 in.)
No. 4. . . . . .50.78 to 50.80 mm (1.999 to 2.000 in.)
Base Circle Runout . . . . . .0.03 mm - max. (0.001 in. - max.)
Camshaft Lobe Lift
Exhaust . . . . . .6.579 mm (0.259 in.)
Intake . . . . . .6.477 mm (0.255 in.)
Valve Lift
Exhaust . . . . . .10.528 mm (0.4145 in.)
Intake. . . . . .10.350 mm (0.4075 in.)
Intake Valve Timing
Opens . . . . . .15.4° BTDC
Closes. . . . . .58° ABDC
Exhaust Valve Timing
Opens . . . . . .52.8 BBDC
Closes. . . . . .26.2° ATDC
Valve Overlap. . . . . .41.6°
Intake Duration . . . . . .253.3°
Exhaust Duration. . . . . .259.°
Crankshaft
End Play . . . . . .0.038 to 0.165 mm (0.0015 to 0.0065 in.)
Main Bearing Journal Diameter . . . . . .63.489 to 63.502 mm (2.4996 to 2.5001 in.)
Main Bearing Journal Width No. 1 . . . . . .27.58 to 27.89 mm (1.086 to 1.098 in.)
Main Bearing Journal Width
No. 2 . . . . . .32.28 to 32.33 mm (1.271 to 1.273 in.)
Main Bearing Journal Width
No. 3-4-5 . . .30.02 to 30.18 mm (1.182 to 1.188 in.)
Main Bearing Clearance . . . . . .0.03 to 0.06 mm (0.001 to 0.0025 in.)
Main Bearing Clearance (Preferred) . . . . . .0.051 mm (0.002 in.)
Connecting Rod Journal
Diameter .53.17 to 53.23 mm (2.0934 to 2.0955 in.)
Connecting Rod Journal Width . . .27.18 to 27.33 mm (1.070 to 1.076 in.)
Out-of-Round (Max. All Journals) . . . . . .0.013 mm (0.0005 in.)
Taper (Max. – All Journals) . . .0.013 mm (0.0005 in.)
Cylinder Block
Deck Height . . . . . .236.73 mm (9.320 in.)
Deck Clearance . . . . . .0.000 mm (0.000 in.)
Cylinder Bore Diameter—
Standard .98.45 to 98.48 mm (3.8759 to 3.8775 in.)
Cylinder Bore Diameter—
Taper (Max.). . . . . .0.025 mm (0.001 in.)
Cylinder Bore Diameter—
Out-of-Round (Max.). . . . . .0.025 mm (0.001 in.)
Tappet Bore Diameter . . . . . .23.000 to 23.025 mm (0.9055 to 0.9065 in.)
Flatness. . . .0.03 mm per 25 mm (0.001 in. per 1 in.)
Flatness. . .0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max. . . . . .0.20 mm for total length (0.008 in. for total length)
Main Bearing Bore Diameter.68.3514 to 68.3768 mm (2.691 to 2.692 in.)

SPECIFICATIONS (Continued)

Connecting Rods
Total Weight (Less Bearing) . . . . . .657 to 665 grams (23.17 to 23.45 oz.)
Length (Center-to-Center) . . . . .155.52 to 155.62 mm (6.123 to 6.127 in.)
Piston Pin Bore Diameter . . . . . .23.59 to 23.62 mm (0.9288 to 0.9298 in.)
Bore (Less Bearings) . . . . . .56.08 to 56.09 mm (2.2080 to 2.2085 in.)
Bearing Clearance . . . . . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Bearing Clearance (Preferred) . . . .0.044 to 0.050 mm (0.0015 to 0.0020 in.)
Side Clearance . .0.25 to 0.48 mm (0.010 to 0.019 in.)
Twist (Max.) . .0.001 mm per mm (0.001 in. per inch)
Bend Max.) . .0.001 mm per mm (0.001 in. per inch.)
Cylinder Compression Pressure
Ratio 9.1:1
Pressure Range . . . .827 to 1,034 kPa (120 to 150 psi)
Max. Variation Between Cylinders . .206 kPa (30 psi)
Cylinder Head
Combustion Chamber . . . . . .49.9 to 52.9 cc (3.04 to 3.23 cu. in.)
Valve Guide I.D. (Integral) . . . . . .7.95 to 7.97 mm (0.313 to 0.314 in.)
Valve Stem-to-Guide Clearance . . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Intake Valve Seat Angle . . . . . .44.5°
Exhaust Valve Seat Angle . . . . . .44.5°
Valve Seat Width . . . . . .1.01 to 1.52 mm (0.040 to 0.060 in.)
Valve Seat Runout . . . . . .0.064 mm (0.0025 in.)
Flatness . . . .0.03 mm per 25 mm (0.001 in. per 1 in.)
Flatness . . .0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max. . . . . .0.20 mm for total length (0.008 in. for total length)
Rocker Arms, Push Rods & Tappets
Rocker Arm Ratio 1.6:1
Push Rod Length . . . . . .241.300 to 241.808 mm (9.500 to 9.520in.)
Push Rod Diameter . . . . . .7.92 to 8.00 mm (0.312 to 0.315 in.)
Hydraulic Tappet Diameter . . . .22.962 to 22.974 mm (0.904 to 0.9045 in.)
Tappet-to-Bore Clearance . . . . . .0.025 to 0.063 mm (0.001 to 0.0025 in.)

Valves
Length (Tip-to-Gauge Dimension Line)
Intake . . . . . .124.435 to 125.070 mm (4.899 to 4.924 in.)
Length (Tip-to-Gauge Dimension Line)
Exhaust . . . . . .125.120 to 125.755 mm (4.927 to 4.952 in.)
Valve Stem Diameter . . . . . .7.899 to 7.925 mm (0.311 to 0.312 in.)
Stem-to-Guide Clearance . . . . . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Valve Head Diameter—Intake . .48.387 to 48.641 mm (1.905 to 1.915 in.)
Valve Head Diameter—Exhaust . . . .37.973 to 38.227 mm (1.495 to 1.505 in.)
Valve Face Angle—Intake . . . . . .45°
Valve Face Angle—Exhaust . . . . . .45°
Tip Refinishing (Max. Allowable) .0.25 mm (0.010 in.)
Valve Springs
Free Length (Approx.) . . . . . .47.65 mm (1.876 in.)
Spring Tension—Valve Closed . . . . . .271 to 307 N @ 41.656 mm (61 to 69 lbf. @ 1.64 in.)
Spring Tension—Valve Open . . . .818.5 to 871.9 N @ 30.89 mm (184 to 196 lbf @ 1.216 in.)
Inside Diameter . . . . . .21.0 mm to 21.51 mm (0.827 to 0.847 in.)

Pistons
Weight (Less Pin) . . . . . .563 to 567 grams (19.86 to 20.00 oz.)
Piston Pin Bore (Centerline to Piston Top). .40.61 to 40.72 mm (1.599 to 1.603 in.)
Piston-to-Bore Clearance . . . . . .0.033 to 0.053 mm (0.0013 to 0.0021 in.)
Piston-to-Bore Clearance (Preferred) . .0.033 to 0.038 mm (0.0013 to 0.0015 in.)
Ring Gap Clearance—Top Compression Ring . . . .0.229 to 0.610 mm (0.0090 to 0.0240 in.)
Ring Gap Clearance—2nd Compression Ring . . . .0.483 to 0.965 mm (0.0190 to 0.0380 in.)
Ring Gap Clearance—Oil Control Steel Rails . . . . .0.254 to 1.500 mm (0.010 to 0.060 in.)
Ring Side Clearance—Compression Rings . . . .0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Ring Side Clearance—Oil Control Ring . . . . . .0.06 to 0.21 mm (0.0024 to 0.0083 in.)
Piston Ring Groove Height—Compression Rings . . . .1.530 to 1.555mm (0.0602 to 0.0612 in.)
Piston Ring Groove Height—Oil Control Ring . . . .4.035 to 4.060 mm (0.1589 to 0.1598 in.)
Piston Ring Groove Diameter—Compression Rings . . . . .87.78 to 87.90 mm (3.456 to 3.461 in.)
Piston Ring Groove Diameter—Oil Control Ring . . . . . .87.50 to 87.75 mm (3.445 to 3.455 in.)
Piston Pin Bore Diameter . . . .23.647 to 23.655 mm (0.9310 to 0.9313 in.)
Piston Pin Diameter . . . . . .23.637 to 23.640 mm (0.9306 to 0.9307 in.)
Piston-to-Pin Clearance . . . . . .0.0076 to 0.0178 mm (0.0003 to 0.0007 in.)
Piston-to-Pin Clearance (Preferred) . . . .0.015 mm—Loose (0.0006 in.—Loose)
Piston-to-Pin Connecting Rod (Press Fit) . . . .8.9 kN (2000 lbf.)

SPECIFICATIONS (Continued)

Oil Pump
Gear-to-Body Clearance (Radial) . .0.051 to 0.102 mm (0.002 to 0.004 in.)
Gear-to-Body Clearance (Radial) (Preferred) . . . . . .0.051 mm (0.002 in.)
Gear End Clearance—Plastigage. .0.051 to 0.152 mm (0.002 to 0.006 in.)
Gear End Clearance—Plastigage (Preferred) . . . . . .0.051 mm (0.002 in.)
Gear End Clearance—Feeler Gauge .0.1016 to 0.2032 mm (0.004 to 0.008 in.)
Gear End Clearance—Feeler Gauge (Preferred) . . . . . .0.1778 mm (0.007 in.)
Oil Pressure
Min. Pressure (600 rpm) . . . . . .89.6 kPa (13 psi)
At Idle Speed (800 rpm) . . . . . .172 to 241 kPa (25 to 35 psi)
At 1600 rpm & Higher . . . . . .255 to 517 kPa (37 to 75 psi)
Oil Pressure Relief . . . . . .517 kPa (75 psi)

Mopar AUTHENTIC RESTORATION PRODUCT

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
A/C Compressor Bracket-to-Engine Bolts	34 N·m (25 ft. lbs.)
A/C Compressor Mounting Bolts	27 N·m (20 ft. lbs.)
A/C Low Pressure Service Valve Nut	38 N·m (28 ft. lbs.)
Block Heater Nut	1.8 N·m (16 in. lbs.)
Camshaft Sprocket Bolt	108 N·m (80 ft. lbs.)
Connecting Rod Nuts	45 N·m (33 ft. lbs.)
Converter Plate Bolts	68 N·m +60° (50 ft. lbs. +60°)
Cylinder Block Drain Plugs	41 N·m (30 ft. lbs.)
Cylinder Head Bolts #1–10 & #12–14	149 N·m (110 ft. lbs.)
Bolt #11	135 N·m (100 ft. lbs.)
Cylinder Head Cover Bolts	13 N·m (115 in. lbs.)
Drive Plate-to-Torque Converter Bolts	54 N·m (40 ft. lbs.)
Engine Shock Damper Stud Nuts	23 N·m (17 ft. lbs.)
Engine Mounts—Front Support Bracket Bolts	61 N·m (45 ft. lbs.)
Support BracketStud Nuts	46 N·m (34 ft. lbs.)
Support Cushion Nuts— Right Side	65 N·m (48 ft. lbs.)
Support Cushion Bolts/Nuts—Left Side	41 N·m (30 ft. lbs.)
Support Cushion Bracket Bolts	54 N·m (40 ft. lbs.)
Support Cushion Bracket Stud Nuts	41 N·m (30 ft. lbs.)
Support Cushion Thru-Bolt	65 N·m (48 ft. lbs.)
Engine Mounts—Rear Crossmember-to-Sill Bolts (Automatic)	41 N·m (30 ft. lbs.)
Support Cushion/Crossmember Nuts	22 N·m (192 in. lbs.)
Support Cushion/Bracket Nuts (Manual)	46 N·m (34 ft. lbs.)
Transmission Support Bracket Bolt (Manual)	43N·m (32 ft. lbs.)
Transmission Support Bracket/ Cushion Bolt (4WD Auto)	75N·m (55 ft. lbs.)
Transmission Support Adaptor Bracket Bolts (2WD Auto)	75N·m (55 ft. lbs.)
Exhaust Manifold/Pipe Nuts	27 N·m (20 ft. lbs.)
Flywheel/Converter Housing Bolts	38 N·m (28 ft. lbs.)

TORQUE SPECIFICATIONS

Flywheel/Crankshaft Bolts	143 N·m (105 ft. lbs.)
Front Cover-to-Block Bolts 1/4–20	7N·m (60 in. lbs.)
Bolts 5/16–18	22N·m (192 in. lbs.)
Fuel Pump Bolts	22 N·m (16 ft. lbs.)
Generator Adjusting Bolt	24 N·m (18 ft. lbs.)
Pivot Bolt/Nut	38 N·m (28 ft. lbs.)
Mounting Bracket-to–Engine Bolts	38 N·m (28 ft. lbs.)
Mounting/Head Bolts	45 N·m (33 ft. lbs.)
Main Bearing Bolts	108 N·m (80 ft. lbs.)
Oil Filter Filter	18 N·m (13 ft. lbs.)
Oil Filter Connector	54 N·m (40 ft. lbs.)
Oil Galley Plug	41 N·m (30 ft. lbs.)
Oil Pan 1/4–20 Bolts	14 N·m (129 in. lbs.)
5/16–18 Bolts	18 N·m (156 in. lbs.)
Drain Plug	34 N·m (25 ft. lbs.)
Oil Pump Short Attaching Bolts	14 N·m (10 ft. lbs.)
Long Attaching Bolts	23 N·m (17 ft. lbs.)
Cover Bolts	8 N·m (70 in. lbs.)
Power Steering Pump Pressure Hose Nut	52 N·m (38 ft. lbs.)
Rocker Arm Assembly-to-Cylinder Head Capscrews	28 N·m (21ft. lbs.)
Spark Plugs Plugs	37 N·m (27 ft. lbs.)
Starting Motor Mounting Bolts	45 N·m (33 ft. lbs.)
Thermostat Housing Bolts	18 N·m (13 ft. lbs.)
Vibration Damper Bolts	108 N·m (80 ft. lbs.)
Water Pump/Block Bolts	31 N·m (270 in. lbs.)

4.0L ENGINE

INDEX

page

DESCRIPTION AND OPERATION
ENGINE DESCRIPTION 54
LUBRICATION SYSTEM 55
OIL PUMP PRESSURE 57
OVERSIZE AND UNDERSIZE COMPONENT CODES 57
SERVICE PROCEDURES
FITTING CONNECTING ROD BEARINGS 60
FITTING CRANKSHAFT MAIN BEARINGS 62
PISTON FITTING 57
PISTON RING FITTING 58
VALVE TIMING 57
REMOVAL AND INSTALLATION
CAMSHAFT PIN REPLACEMENT 78
CAMSHAFT 77
CRANKSHAFT MAIN BEARINGS 80
ENGINE ASSEMBLY 67
ENGINE CYLINDER HEAD COVER 70
ENGINE CYLINDER HEAD 71
ENGINE MOUNTS—FRONT 66
ENGINE MOUNT—REAR 66
HYDRAULIC TAPPETS 74
OIL PAN 81

page

OIL PUMP 84
PISTONS AND CONNECTING RODS 82
REAR MAIN OIL SEALS 83
ROCKER ARMS AND PUSH RODS 70
TIMING CASE COVER OIL SEAL 84
TIMING CASE COVER 75
TIMING CHAIN AND SPROCKETS 75
VALVE STEM SEAL AND SPRING 71
VALVES AND VALVE SPRINGS 73
VIBRATION DAMPER 74
DISASSEMBLY AND ASSEMBLY
CYLINDER BLOCK 87
VALVE SERVICE 85
CLEANING AND INSPECTION
CYLINDER BLOCK 88
ENGINE CYLINDER HEAD COVER 88
ENGINE CYLINDER HEAD 87
HYDRAULIC TAPPETS 88
ROCKER ARMS AND PUSH RODS 88
SPECIFICATIONS
4.0L ENGINE SPECIFICATIONS 90
SPECIAL TOOLS
4.0L ENGINE 93

DESCRIPTION AND OPERATION

ENGINE DESCRIPTION

The 4.0 Liter (242 CID) six-cylinder engine is an In-line, lightweight, overhead valve engine.

Engine Type . . . . . .In-line 6 Cylinder
Bore and Stroke . .98.4 x 86.69 mm (3.88 x 3.413 in.)
Displacement . . . . . .4.0 (242 cu. in.)
Compression Ratio 8.7:1
Torque . . . . . .305 N·m (225 ft. lbs.) @ 4000 rpm
Firing Order 1–5–3–6–2–4
Lubrication . . . . .Pressure Feed–Full Flow Filtration
Engine Oil Capacity . . . . . .5.7 L (6 Quarts)
Cooling System . . .Liquid Cooled–Forced Circulation
Cooling System Capacity . . . . . .11.4 L (12 Quarts)
Cylinder Block . . . . . .Cast Iron
Crankshaft . . . . . .Cast Nodular Iron
Cylinder Head . . . . . .Cast Iron
Camshaft . . . . . .Cast Iron
Pistons . . . . . .Aluminum Alloy (with Struts)
Pistons Combustion Cavity . . . . . .Double Quench
Connecting Rods . . . . . .Cast Iron

This engine is designed for unleaded fuel.

The engine cylinder head has dual quench-type combustion chambers that create turbulence and fast burning of the air/fuel mixture. This results in good fuel economy.

The cylinders are numbered 1 through 6 from front to rear. The firing order is 1-5-3-6-2-4 (Fig. 1).

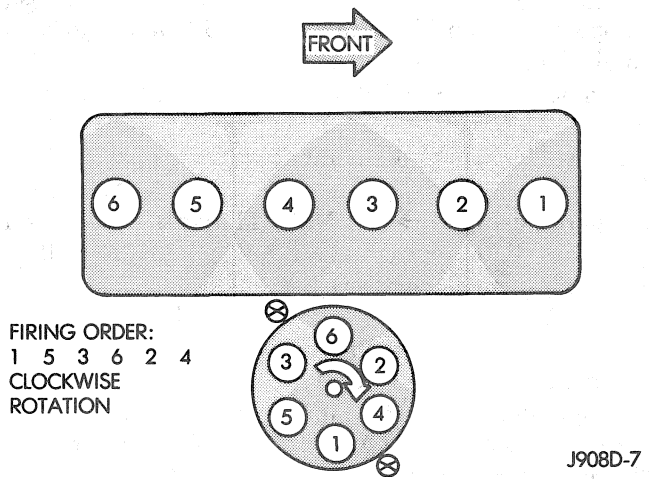


Fig. 1 Engine Firing Order

DESCRIPTION AND OPERATION (Continued)

The crankshaft rotation is clockwise, when viewed from the front of the engine. The crankshaft rotates within seven main bearings. The camshaft rotates within four bearings.

BUILD DATE CODE

The engine Build Date Code is located on a machined surface on the right side of the cylinder block between the No.2 and No.3 cylinders (Fig. 2).

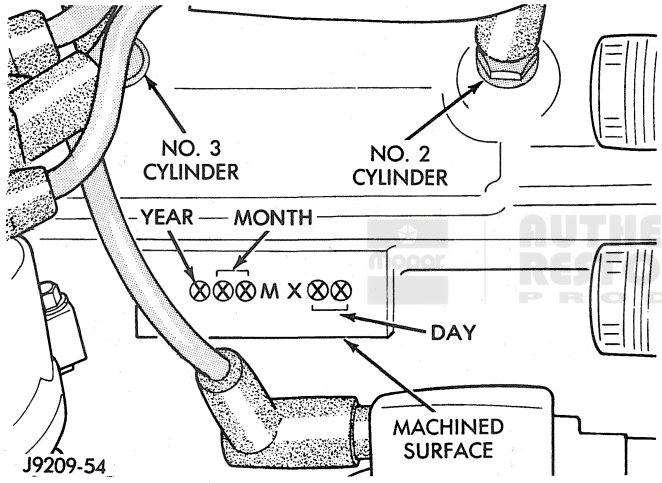


Fig. 2 Build Date Code Location

The digits of the code identify:

- 1st Digit—The year (5 = 1995).
- 2nd & 3rd Digits—The month (01 - 12).
- 4th & 5th Digits—The engine type/fuel system/ compression ratio (MX = A 4.0 Liter (242 CID) 8.7:1 compression ratio engine with a multi-point fuel injection system).
- 6th & 7th Digits—The day of engine build (01 - 31).

(1) **FOR EXAMPLE:** Code * 501MX12 * identifies a 4.0 Liter (242 CID) engine with a multi-point fuel injection system, 8.7:1 compression ratio and built on January 12, 1995.

LUBRICATION SYSTEM

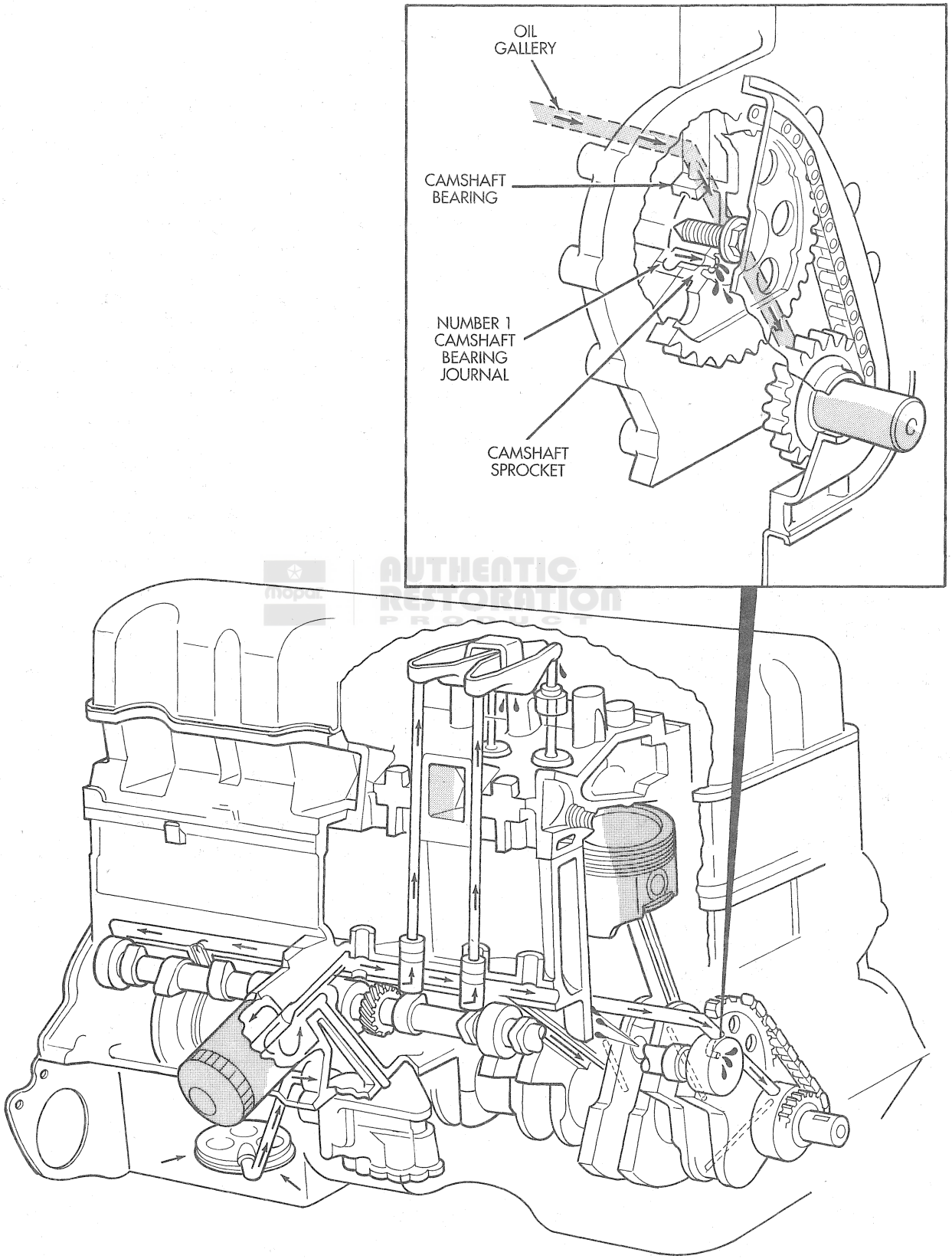
A gear—type positive displacement pump is mounted at the underside of the block opposite the No. 4 main bearing. The pump draws oil through the screen and inlet tube from the sump at the rear of the oil pan. The oil is driven between the drive and idler gears and pump body, then forced through the outlet to the block. An oil gallery in the block channels the oil to the inlet side of the full flow oil filter. After passing through the filter element, the oil passes from the center outlet of the filter through an oil gallery that channels the oil up to the main gallery which extends the entire length of the block.

Galleries extend downward from the main oil gallery to the upper shell of each main bearing. The crankshaft is drilled internally to pass oil from the main bearing journals (except number 4 main bearing journal) to the connecting rod journals. Each connecting rod bearing cap has a small squirt hole, oil passes through the squirt hole and is thrown off as the rod rotates. This oil throwoff lubricates the camshaft lobes, distributor drive gear, cylinder walls, and piston pins.

The hydraulic valve tappets receive oil directly from the main oil gallery. Oil is provided to the camshaft bearing through galleries. The front camshaft bearing journal passes oil through the camshaft sprocket to the timing chain. Oil drains back to the oil pan under the number one main bearing cap.

The oil supply for the rocker arms and bridged pivot assemblies is provided by the hydraulic valve tappets which pass oil through hollow push rods to a hole in the corresponding rocker arm. Oil from the rocker arm lubricates the valve train components, then passes down through the push rod guide holes in the cylinder head past the valve tappet area, and returns to the oil pan.

DESCRIPTION AND OPERATION (Continued)



Oil Lubrication System

J9509-60

DESCRIPTION AND OPERATION (Continued)

OIL PUMP PRESSURE

The MINIMUM oil pump pressure is 89.6 kPa (13 psi) at 600 rpm. The MAXIMUM oil pump pressure is 255-517 kPa (37-75 psi) at 1600 rpm or more.

OVERSIZE AND UNDERSIZE COMPONENT CODES

Some engines may be built with oversize or undersize components such as:

- Oversize cylinder bores.
- Oversize camshaft bearing bores.
- Undersize crankshaft main bearing journals.
- Undersize connecting rod journals.

These engines are identified by a letter code (Fig. 3) stamped on a boss between the ignition coil and the distributor (Fig. 4).

CODE	COMPONENT	UNDERSIZE
P	One or more connecting rod bearing journals	0.254 mm (0.010 in)
M	All crankshaft main bearing journals	0.254 mm (0.010 in)
PM	All crankshaft main bearing journals and one or more connecting rod journals	0.254 mm (0.010 in)
CODE	**COMPONENT**	**OVERSIZE**
B	All cylinder bores	0.254 mm (0.010 in)
C	All camshaft bearing bores	0.254 mm (0.010 in)

J8909-54

Fig. 3 Oversize and Undersize Component Codes

SERVICE PROCEDURES

VALVE TIMING

Disconnect the spark plug wires and remove the spark plugs.

Remove the engine cylinder head cover.

Remove the capscrews, bridge and pivot assembly, and rocker arms from above the No.1 cylinder.

Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridge.

Rotate the crankshaft until the No.6 piston is at top dead center (TDC) on the compression stroke.

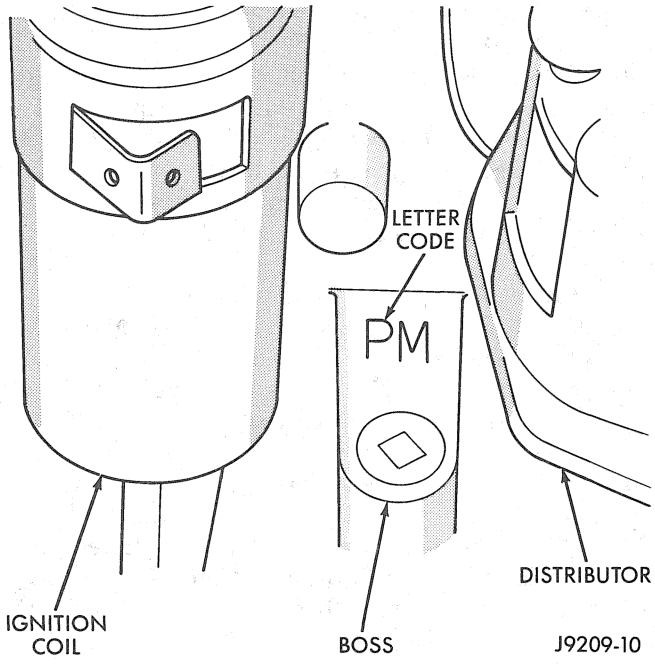


Fig. 4 Oversize and Undersize Component Code Location

Rotate the crankshaft counterclockwise (viewed from the front of the engine) 90°.

Install a dial indicator on the end of the No.1 cylinder intake valve push rod. Use rubber tubing to secure the indicator stem on the push rod.

Set the dial indicator pointer at zero.

Rotate the crankshaft clockwise (viewed from the front of the engine) until the dial indicator pointer indicates 0.305 mm (0.012 inch) travel distance (lift).

The timing notch index on the vibration damper should be aligned with the TDC mark on the timing degree scale.

If the timing notch is more than 13 mm (1/2 inch) away from the TDC mark in either direction, the valve timing is incorrect.

If the valve timing is incorrect, the cause may be a broken camshaft pin. It is not necessary to replace the camshaft because of pin failure. A spring pin is available for service replacement.

PISTON FITTING

BORE GAGE METHOD

(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at a point 49.5 mm (1-15/16 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take

SERVICE PROCEDURES (Continued)

an additional bore reading 90 degrees to that at point B (Fig. 5).

(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. **The coated piston connecting rod assembly can be used to service previous built engines and MUST be replaced as complete sets.** Tin coated pistons should not be used as replacements for coated pistons.

(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY.**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.

(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

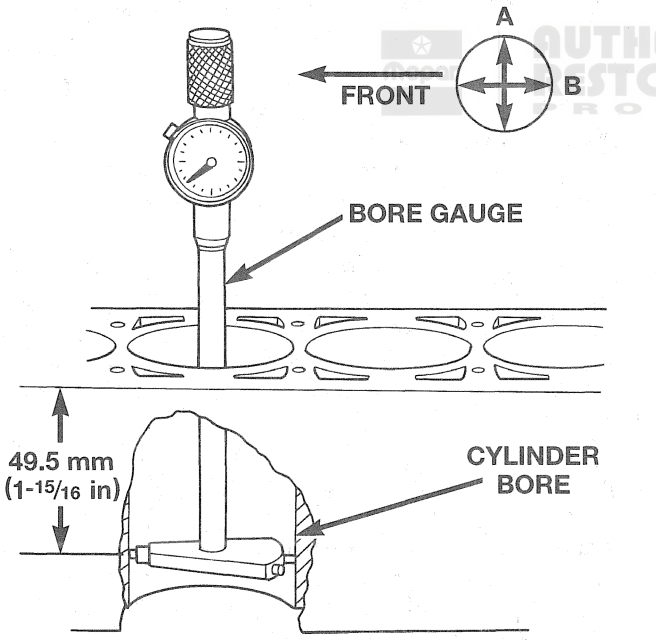


Fig. 5 Bore Gauge

PISTON SIZE CHART

CYLINDER BORE SIZE	PISTON LETTER SIZE
98.438 to 98.448 mm (3.8755 to 3.8759 in.)	.A
98.448 to 98.458 mm (3.8759 to 3.8763 in.)	.B
98.458 to 98.468 mm (3.8763 to 3.8767 in.)	.C
98.468 to 98.478 mm (3.8767 to 3.8771 in.)	.D
98.478 to 98.488 mm (3.8771 to 3.8775 in.)	.E
98.488 to 98.498 mm (3.8775 to 3.8779 in.)	.F

PISTON RING FITTING

(1) Carefully clean the carbon from all ring grooves. Oil drain openings in the oil ring groove and pin boss must be clear. DO NOT remove metal from the grooves or lands. This will change ring-to- groove clearances and will damage the ring-to-land seating.

(2) Be sure the piston ring grooves are free of nicks and burrs.

(3) Measure the ring side clearance with a feeler gauge fitted snugly between the ring land and ring (Fig. 6) (Fig. 7). Rotate the ring in the groove. It must move freely around circumference of the groove.

Ring Side Clearance Measurement	
Top Compression Ring	.0.042to 0.084 mm (0.0017 to 0.0033 in.)
Second Compression Ring	.0.042to 0.084 mm (0.0017 to 0.0033 in.)
Oil Control Ring	.0.06 to 0.21 mm (0.0024 to 0.0083 in.)

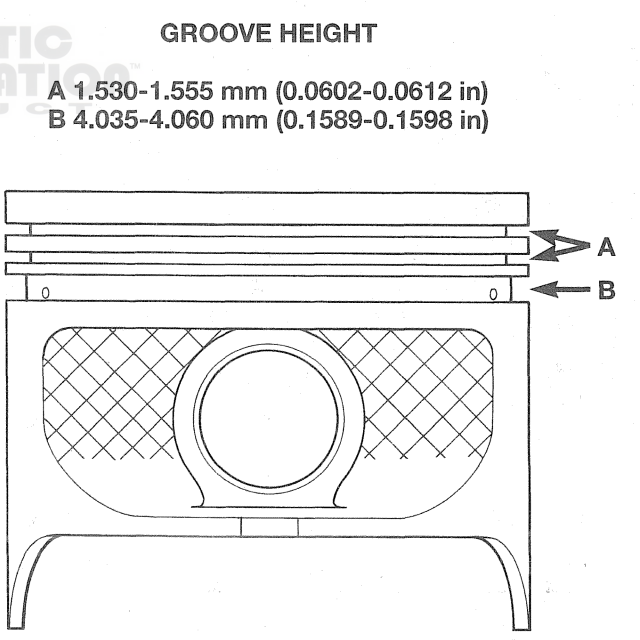


Fig. 6 Piston Dimensions

SERVICE PROCEDURES (Continued)

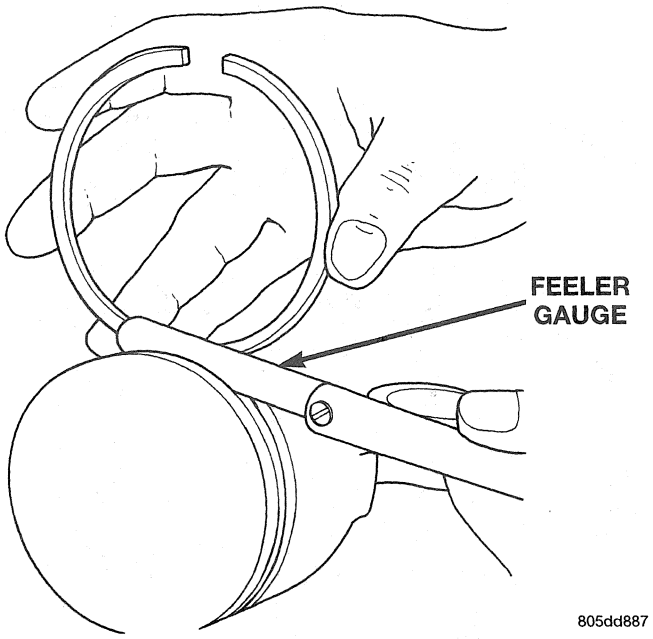


Fig. 7 Ring Side Clearance Measurement

(4) Place ring in the cylinder bore and push down with inverted piston to position near lower end of the ring travel. Measure ring gap with a feeler gauge fitting snugly between ring ends (Fig. 8).

Ring Gap Measurement

Top Compression Ring . . . . . 0.229 to 0.610 mm (0.0090 to 0.0240 inch)

Second Compresion Ring. . . . . .0.483 to 0.965 mm (0.0190 to 0.0380 inch)

Oil Control Ring . . . . . .0.254 to 1.500 mm (0.010 to 0.060 inch)

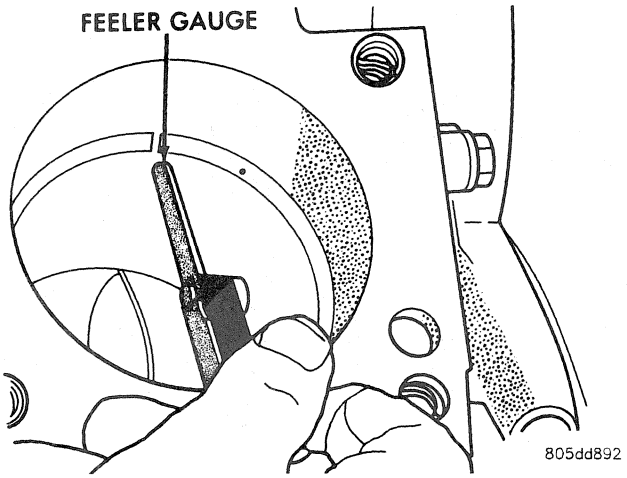


Fig. 8 Gap Measurement

(5) Install the oil control rings according to instructions in the package. It is not necessary to use a tool to install the upper and lower rails. Insert oil rail spacer first, then side rails.

(6) The two compression rings are different and cannot be interchanged. The TOP compression ring can be identified by 1 dot on the top surface of the ring (Fig. 9).

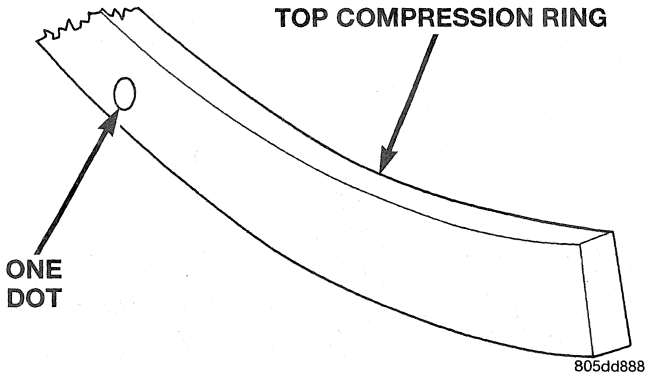


Fig. 9 Top Compression Ring Identification

(7) The second compression ring has a chamfer on the BOTTOM of the inside edge (Fig. 10).

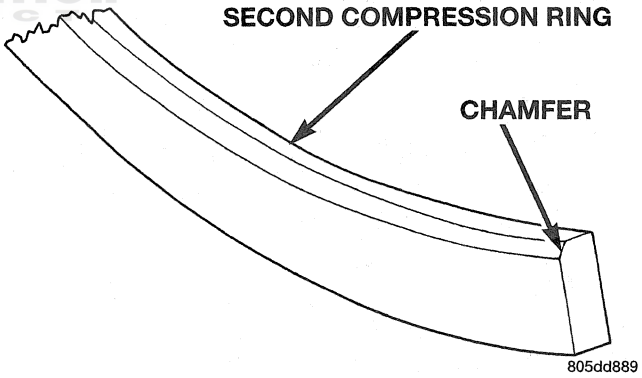


Fig. 10 Second Compression Ring Identification

(8) Using a ring installer, install the second compression ring with the chamfer facing down (Fig. 11) (Fig. 12).

(9) The top compression ring has a dot located on the top surface (Fig. 9).

(10) Using a ring installer, install the top ring with the dot facing up (Fig. 12).

(11) Position the gaps on the piston (Fig. 13):

- Oil spacer - Gap on center line of piston pin bore.
- Oil rails - Gap 180° apart on centerline of piston skirt.
- No. 2 Compression ring - Gap 180° from top oil rail gap.
- No. 1 Compression ring - Gap 180° from No. 2 compression ring gap.

SERVICE PROCEDURES (Continued)

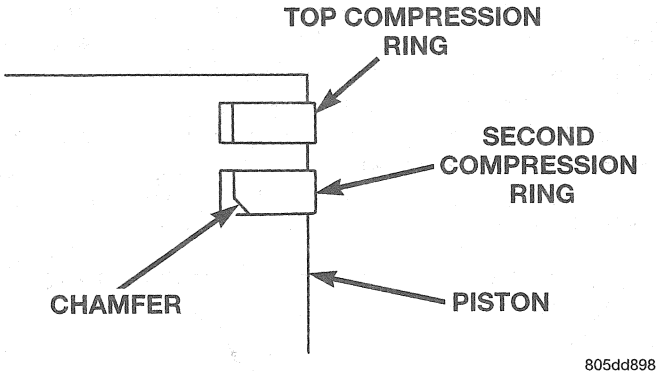


Fig. 11 Compression Ring Chamfer Location

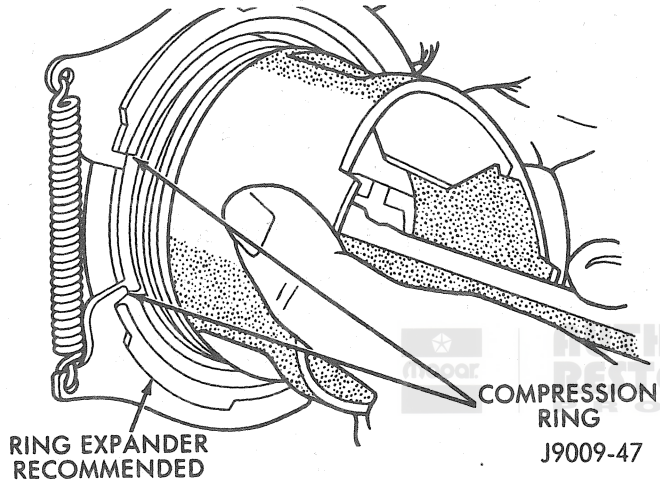


Fig. 12 Compression Ring Installation

FITTING CONNECTING ROD BEARINGS

INSPECTION

BEARINGS

Inspect the connecting rod bearings for scoring and bent alignment tabs (Fig. 14) (Fig. 15). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 16). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

CONNECTING RODS

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

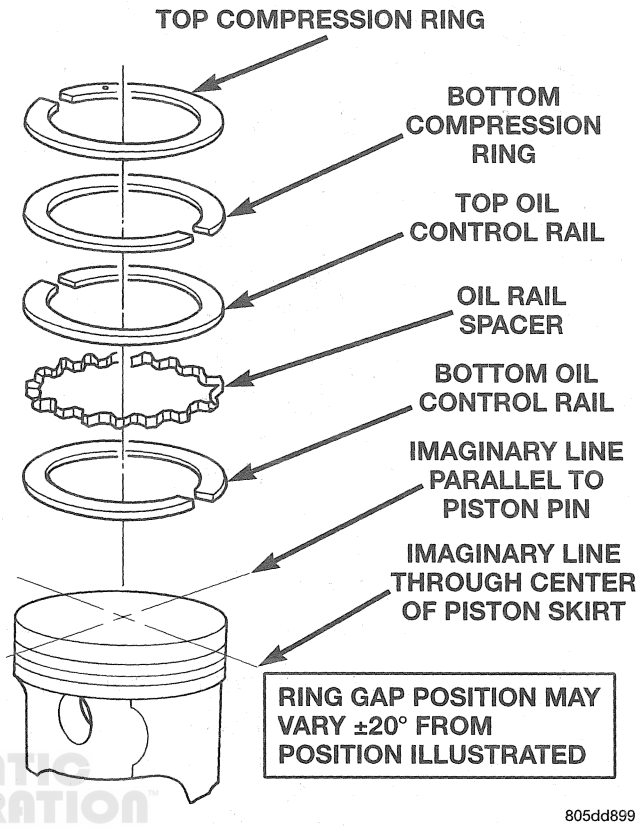


Fig. 13 Ring Gap Position

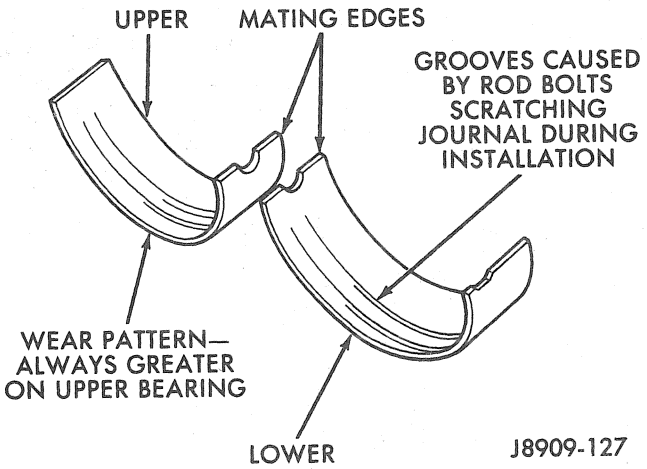


Fig. 14 Connecting Rod Bearing Inspection

BEARING-TO-JOURNAL CLEARANCE

(1) Wipe the oil from the connecting rod journal.

(2) Use short rubber hose sections over rod bolts during installation.

(3) Lubricate the upper bearing insert and install in connecting rod.

(4) Use piston ring compressor to install the rod and piston assemblies. The oil squirt holes in the rods must face the camshaft. The arrow on the piston crown should point to the front of the engine (Fig.

SERVICE PROCEDURES (Continued)

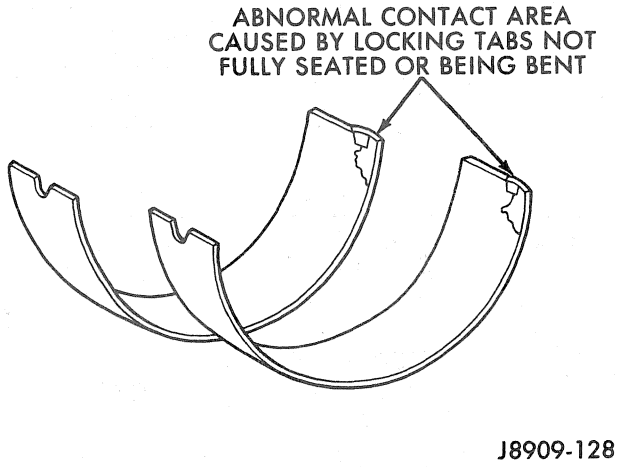


Fig. 15 Locking Tab Inspection

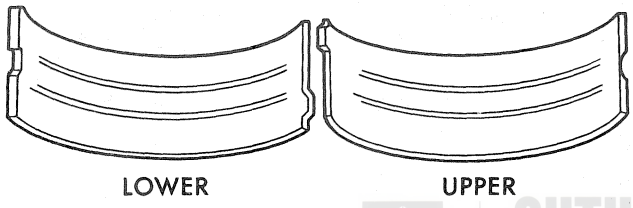


Fig. 16 Scoring Caused by Insufficient Lubrication or by Damaged Crankshaft Pin Journal

17). Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

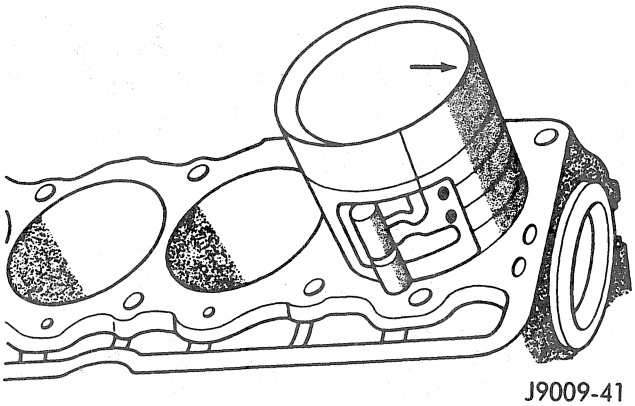


Fig. 17 Rod and Piston Assembly Installation

(5) Install the lower bearing insert in the bearing cap. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(6) Install bearing cap and connecting rod on the journal and tighten nuts to 45 N·m (33 ft. lbs.) torque. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

(7) Remove the bearing cap and determine amount of bearing-to- journal clearance by measuring the width of compressed Plastigage (Fig. 18). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

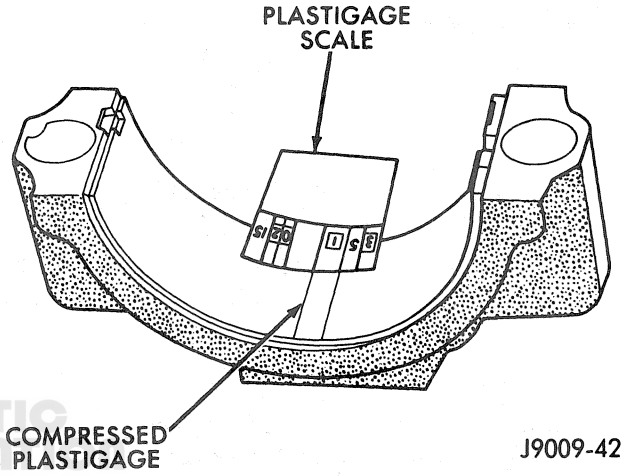


Fig. 18 Measuring Bearing Clearance with Plastigage

(8) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

(9) If bearing-to-journal clearance exceeds the specification, install a pair of 0.0254 mm (0.001 inch) undersize bearing inserts. All the odd size inserts must be on the bottom. The sizes of the service replacement bearing inserts are stamped on the backs of the inserts. Measure the clearance as described in the previous steps.

(10) The clearance is measured with a pair of 0.0254 mm (0.001 inch) undersize bearing inserts installed. This will determine if two 0.0254 mm (0.001 inch) undersize inserts or another combination is needed to provide the correct clearance (refer to Connecting Rod Bearing Fitting Chart).

(11) **FOR EXAMPLE:** If the initial clearance was 0.0762 mm (0.003 inch), 0.025 mm (0.001 inch) undersize inserts would reduce the clearance by 0.025 mm (0.001 inch). The clearance would be 0.002 inch and within specification. A 0.051 mm (0.002 inch) undersize insert would reduce the initial clearance an additional 0.013 mm (0.0005 inch). The clearance would then be 0.038 mm (0.0015 inch).

(12) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

SERVICE PROCEDURES (Continued)

Crankshaft Journal		Corresponding Connecting Rod Bearing Insert	
Color Code	Diameter	Upper Insert Size	Lower Insert Size
Yellow	53.2257-53.2079 mm (2.0955-2.0948 in.)	Yellow - Standard	Yellow - Standard
Orange	53.2079-53.1901 mm (2.0948-2.0941 in.) 0.0178 mm (0.0007 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	53.1901-53.1724 mm (2.0941-2.0934 in.) 0.0356 mm (0.0014 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Red	52.9717-52.9539 mm (2.0855-2.0848 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

J9409-24

CONNECTING ROD BEARING FITTING CHART

(13) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 45 N·m (33 ft. lbs.) torque.

SIDE CLEARANCE MEASUREMENT

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange. Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

FITTING CRANKSHAFT MAIN BEARINGS

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 19).

NOTE: If any of the crankshaft journals are scored, remove the engine for crankshaft repair.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

FITTING BEARINGS (CRANKSHAFT INSTALLED)

The main bearing caps, numbered (front to rear) from 1 through 7 have an arrow to indicate the forward position. The upper main bearing inserts are grooved to provide oil channels while the lower inserts are smooth.

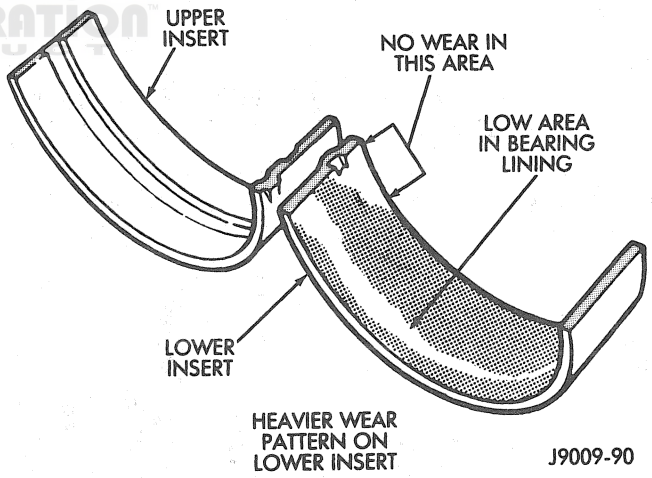


Fig. 19 Main Bearing Wear Patterns

Each bearing insert pair is selectively fitted to its respective journal to obtain the specified operating clearance. In production, the select fit is obtained by using various-sized color-coded bearing insert pairs as listed in the Main Bearing Fitting Chart. The bearing color code appears on the edge of the insert. **The size is not stamped on bearing inserts used for engine production.**

The main bearing journal size (diameter) is identified by a color-coded paint mark on the adjacent cheek. The rear main journal, is identified by a color-coded paint mark on the crankshaft rear flange.

SERVICE PROCEDURES (Continued)

When required, upper and lower bearing inserts of different sizes may be used as a pair. A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce the clearance by 0.013 mm (0.0005 inch). **Never use a pair of bearing inserts with greater than a 0.025 mm (0.001 inch) difference in size (Fig. 20).**

Insert	Correct	Incorrect
Upper	Standard	Standard
Lower	0.025 mm (0.001 in.) Undersize	0.051 mm (0.002 in.) Undersize

J9109-179

Fig. 20 Bearing Insert Pairs

NOTE: When replacing inserts, the odd size inserts must be either all on the top (in cylinder block) or all on the bottom (in main bearing cap).

Once the bearings have been properly fitted, proceed to Crankshaft Main Bearing—Installation.

BEARING-TO-JOURNAL CLEARANCE (CRANKSHAFT INSTALLED)

When using Plastigage, check only one bearing clearance at a time.

Install the grooved main bearings into the cylinder block and the non-grooved bearings into the bearing caps.

Install the crankshaft into the upper bearings dry.

Place a strip of Plastigage across full width of the crankshaft journal to be checked.

Install the bearing cap and tighten the bolts to 108 N·m (80 ft. lbs.) torque.

NOTE: DO NOT rotate the crankshaft. This will cause the Plastigage to shift, resulting in an inaccurate reading. Plastigage must not be permitted to crumble. If brittle, obtain fresh stock.

Remove the bearing cap. Determine the amount of clearance by measuring the width of the compressed Plastigage with the scale on the Plastigage envelope (Fig. 21). Refer to Engine Specifications for the proper clearance.

Plastigage should indicate the same clearance across the entire width of the insert. If clearance varies, it may indicate a tapered journal or foreign material trapped behind the insert.

If the specified clearance is indicated and there are no abnormal wear patterns, replacement of the bearing inserts is not necessary. Remove the Plastigage

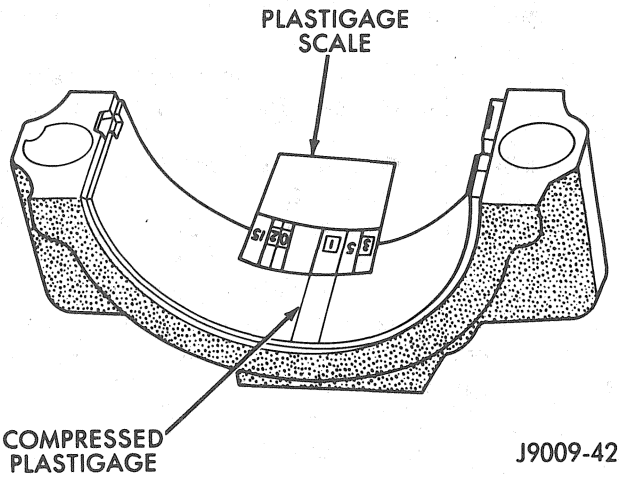


Fig. 21 Measuring Bearing Clearance with Plastigage

from the crankshaft journal and bearing insert. Proceed to Crankshaft Main Bearing—Installation.

If the clearance exceeds specification, install a pair of 0.025 mm (0.001 inch) undersize bearing inserts and measure the clearance as described in the previous steps.

The clearance indicate with the 0.025 mm (0.001 inch) undersize insert pair installed will determine if this insert size or some other combination will provide the specified clearance. **FOR EXAMPLE:** If the clearance was 0q762 mm (0.003 inch) originally, a pair of 0.0254 mm (0.001 inch) undersize inserts would reduce the clearance by 0.0254 mm (0.001 inch). The clearance would then be 0.0508 mm (0.002 inch) and within the specification. A 0.051 mm (0.002 inch) undersize bearing insert and a 0.0254 mm (0.001 inch) undersize insert would reduce the original clearance an additional 0.0127 mm (0.0005 inch). The clearance would then be 0.0381 mm (0.0015 inch).

CAUTION: Never use a pair of inserts that differ more than one bearing size as a pair.

FOR EXAMPLE: DO NOT use a standard size upper insert and a 0.051 mm (0.002 inch) undersize lower insert.

If the clearance exceeds specification using a pair of 0.051 mm (0.002 inch) undersize bearing inserts, measure crankshaft journal diameter with a micrometer. If the journal diameter is correct, the crankshaft bore in the cylinder block may be misaligned, which requires cylinder block replacement or machining to true bore.

Replace the crankshaft or grind to accept the appropriate undersize bearing inserts if:

- Journal diameters 1 through 6 are less than 63.4517 mm (2.4981 inches)

SERVICE PROCEDURES (Continued)

• Journal 7 diameter is less than 63.4365 mm (2.4975 inches).

Once the proper clearances have been obtained, proceed to Crankshaft Main Bearing—Installation.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block (refer to Cylinder Block - Disassemble).

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper and out of round is 0.013 mm (0.0005 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

Install the crankshaft into the cylinder block (refer to Cylinder Block - Assemble and Crankshaft Main Bearings - Installation).

AUTHENTIC RESTORATION PRODUCT

SERVICE PROCEDURES (Continued)

MAIN BEARING FITTING CHART

Crankshaft Journals #1 - #6		Corresponding Crankshaft Bearing Insert	
Color Code	Diameter	Upper Insert Size	Lower Insert Size
Yellow	63.5025-63.4898 mm (2.5001-2.4996 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4898-63.4771 mm (2.4996-2.4991 in.) 0.0127 mm (0.0005 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Yellow - Standard
Blue	63.4771-63.4644 mm (2.4991-2.4986 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4644-63.4517 mm (2.4986-2.4981 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2485-63.2358 mm (2.4901-2.4896 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

Crankshaft Journals #7 Only		Corresponding Crankshaft Bearing Insert	
Color Code	Diameter	Upper Insert Size	Lower Insert Size
Yellow	63.4873-63.4746 mm (2.4995-2.4990 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4746-63.4619 mm (2.4990-2.4985 in.) 0.0127 mm (0.0005 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Yellow - Standard
Blue	63.4619-63.4492 mm (2.4985-2.4980 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4492-63.4365 mm (2.4980-2.4975 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2333-63.2206 mm (2.4895-2.4890 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

AUTHENTIC RESTORATION PRODUCT

REMOVAL AND INSTALLATION

ENGINE MOUNTS—FRONT

The front mounts support the engine at each side. These supports are made of resilient rubber.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Raise the vehicle.
(3) Support the engine.
(4) Remove the nut from the through bolt (Fig. 22). DO NOT remove the through bolt.
(5) Remove the retaining bolts and nuts from the support cushions (Fig. 22).
(6) Remove the through bolt.
(7) Remove the support cushions.

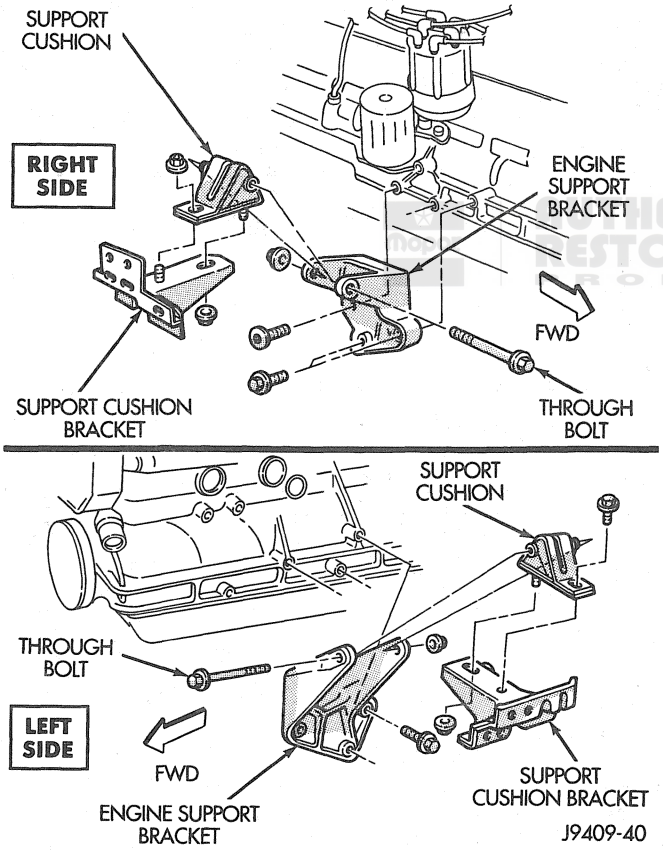


Fig. 22 Front Mounts

INSTALLATION

(1) If the engine support bracket was removed, position the bracket onto the block and install the attaching bolts (Fig. 22). Tighten the engine support bracket bolts to 61 N·m (45 ft. lbs.) torque.

(2) If the support cushion bracket was removed, position the bracket onto the lower front sill (Fig. 23). Install support cushion bracket bolts and nuts. Tighten the bolts to 54 N·m (40 ft. lbs.) torque. Tighten the nuts to 41 N·m (30 ft. lbs.) torque.

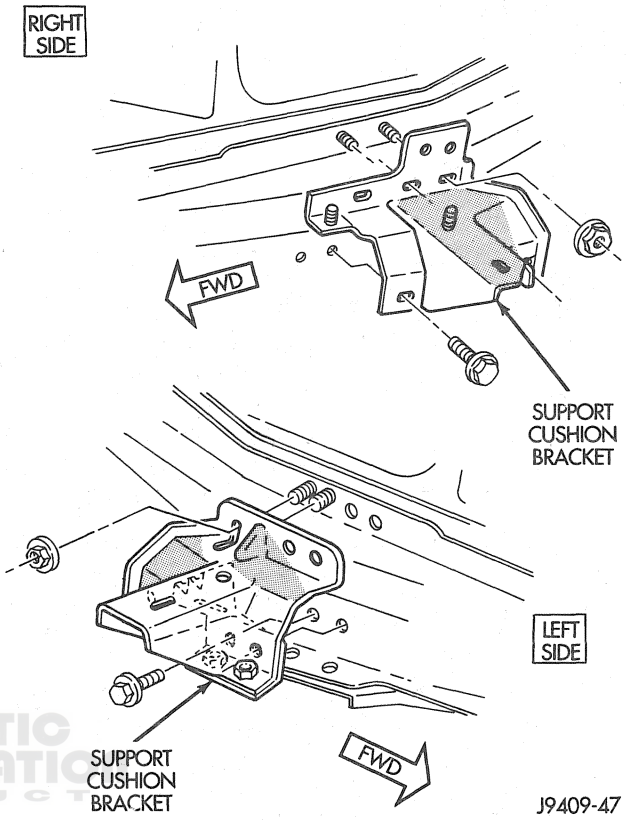


Fig. 23 Support Cushion Bracket

(3) Place the support cushion into position on the support cushion bracket (Fig. 22). Install and tighten the bolts and nuts to 41 N·m (30 ft. lbs.) torque.

(4) Install the through bolt and the retaining nut (Fig. 22). Tighten the through bolt nut to 65 N·m (48 ft. lbs.) torque.

(5) Remove the engine support.
(6) Lower the vehicle.
(7) Connect negative cable to battery.

ENGINE MOUNT—REAR

A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Raise the vehicle and support the transmission.
(3) Remove the nuts holding the support cushion to the crossmember (Fig. 24) (Fig. 25). Remove the crossmember.

MANUAL TRANSMISSION

(Fig. 24)

a. Remove the support cushion nuts and remove the cushion.

REMOVAL AND INSTALLATION (Continued)

b. Remove the transmission support bracket bolts and remove the bracket from the transmission.

AUTOMATIC TRANSMISSION

(Fig. 24)

a. Remove the support cushion bolts and remove the cushion and the support bracket from the transmission (4WD) or from the adaptor bracket (2WD).

b. On 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission (Fig. 25). Remove the adaptor bracket.

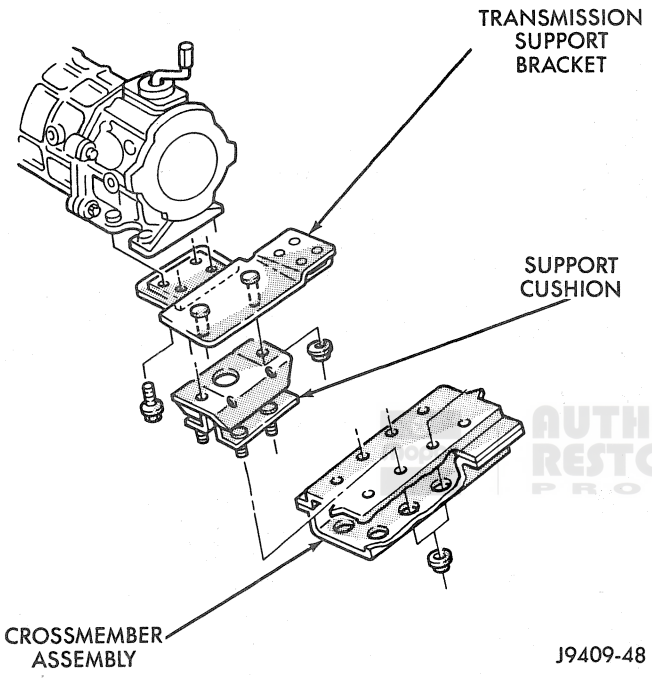


Fig. 24 Rear Mount(Manual Transmission)

INSTALLATION

MANUAL TRANSMISSION:

a. Install the transmission support bracket to the transmission. Install the bolts and tighten to 46 N·m (34 ft. lbs.) torque.

b. Install the support cushion to the support bracket. Install the nuts and tighten to 75 N·m (55 ft. lbs.) torque.

AUTOMATIC TRANSMISSION:

a. On 2WD vehicles, position the transmission support adaptor bracket to the transmission. Install the bolts and tighten to 75 N·m (55 ft. lbs.) torque.

b. Position the transmission support bracket and support cushion to the adaptor bracket (2WD) or the transmission (4WD). Install the bolts and tighten to 75 N·m (55 ft. lbs.) torque.

(1) Position the crossmember onto the support cushion studs. Install the stud nuts and tighten to 22 N·m (192 in. lbs) torque.

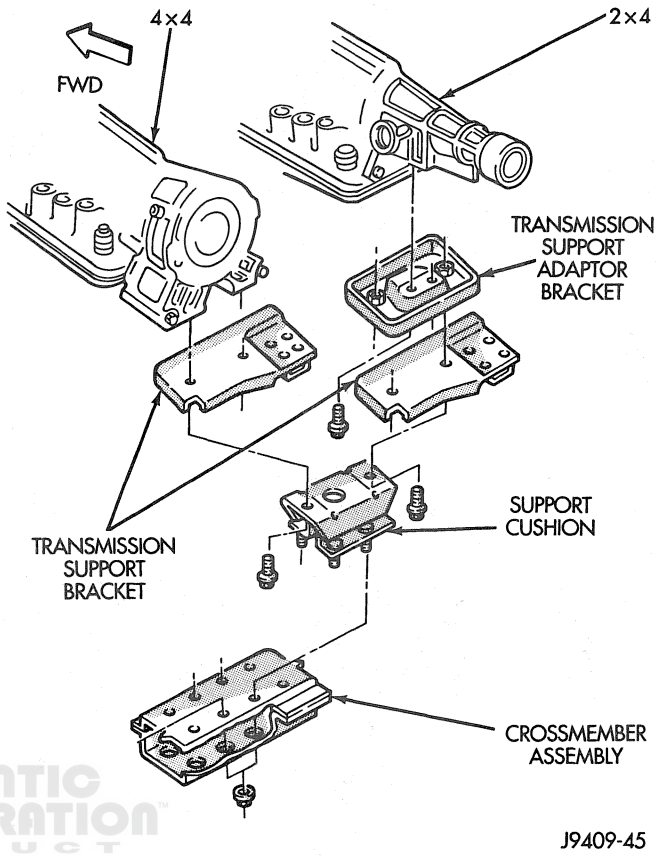


Fig. 25 Rear Mount(Automatic Transmission)

(2) Install crossmember-to-sill bolts and tighten to 41 N·m (30 ft. lbs.) torque.

(3) Remove the transmission support.

(4) Lower the vehicle.

(5) Connect negative cable to battery.

ENGINE ASSEMBLY

REMOVAL

(1) Disconnect the battery cables. Remove the battery.

(2) Mark the hinge locations on the hood panel for alignment reference during installation. Remove the engine compartment lamp. Remove the hood.

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. USE CARE TO PREVENT SCALDING BY HOT COOLANT. CAREFULLY RELEASE THE PRESSURE BEFORE REMOVING THE RADIATOR DRAIN COCK AND CAP.

(3) Remove the radiator drain cock and radiator cap to drain the coolant. DO NOT waste usable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(4) Remove the lower radiator hose.

(5) Remove the upper radiator hose and coolant recovery hose (Fig. 26).

REMOVAL AND INSTALLATION (Continued)

(6) Remove upper radiator support retaining bolts and remove radiator support.

(7) Remove the fan shroud (Fig. 26) and electric cooling fan.

(8) Disconnect the transmission fluid cooler tubing (automatic transmission).

(9) Disconnect radiator fan switch wire connector.

(10) **Vehicles with Air Conditioning:**

(a) Discharge the A/C condenser.

(b) Remove the service valves and cap the compressor ports.

(11) Remove the radiator or radiator and condenser (if equipped with A/C).

(12) Remove the fan assembly from the idler pulley.

(13) Disconnect the heater hoses at the engine thermostat housing and water pump (Fig. 26) (Fig. 27).

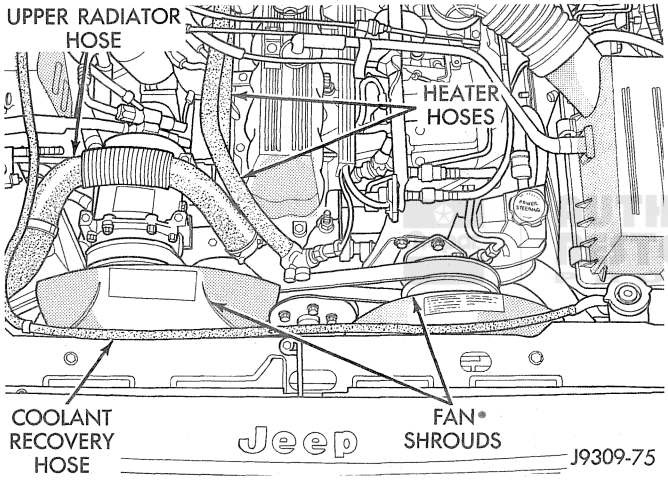


Fig. 26 Upper Radiator Hose, Coolant Recovery Hose, Fan Shroud & Heater hoses

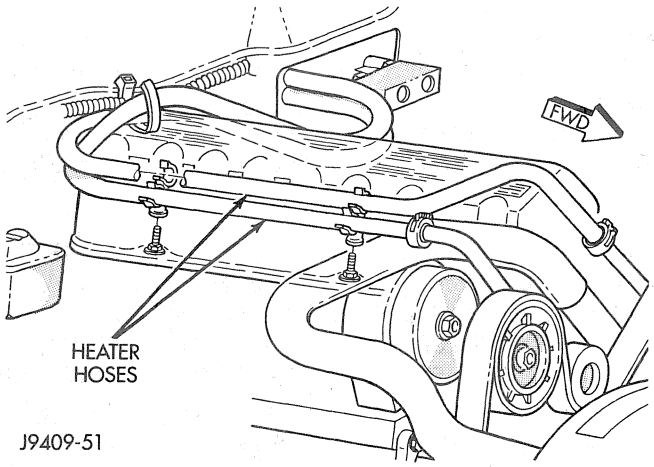


Fig. 27 Heater Hoses (RH Drive Vehicle)

(14) Disconnect the throttle linkages.

(15) Disconnect the speed control cable (if equipped).

(16) Disconnect the line pressure cable (if equipped with automatic transmission).

(17) Disconnect injection system wire harness connector at the dash panel.

(18) Disconnect the distributor electrical connection and the oil pressure switch connector.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE TURNED OFF). BEFORE DISCONNECTING FUEL LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

(19) Perform the Fuel System Pressure Release procedure (refer to Group 14, Fuel System).

(20) Disconnect the quick-connect fuel line at the fuel rail (refer to Group 14, Fuel System for the proper procedure).

(21) Remove the fuel line bracket from the intake manifold.

(22) Remove the air cleaner assembly.

(23) Remove the power brake vacuum check valve from the booster, if equipped.

(24) If equipped with power steering:

(a) Disconnect the hoses from the fittings at the steering gear.

(b) Drain the pump reservoir.

(c) Cap the fittings on the hoses and steering gear to prevent foreign objects from entering the system.

(25) Identify, tag and disconnect all necessary wire connectors and vacuum hoses.

(26) Raise and support the vehicle.

(27) Disconnect the wires from the starter motor solenoid.

(28) Remove the starter motor.

(29) Disconnect the exhaust pipe from the manifold.

(30) Disconnect the engine speed sensor wire connection.

(31) Remove the exhaust pipe support.

(32) Remove the flywheel and converter housing access cover.

(33) **Vehicles with Automatic Transmission:**

(a) Mark the converter and drive plate location.

(b) Remove the converter-to-drive plate bolts.

(34) Remove the upper flywheel and converter housing bolts and loosen the bottom bolts.

(35) Remove the engine mount cushion-to-engine compartment bracket bolts.

(36) Lower the vehicle.

(37) Attach a lifting device to the engine.

(38) Raise the engine off the front supports.

(39) Place a support or floor jack under the converter (or flywheel) housing.

REMOVAL AND INSTALLATION (Continued)

(40) Remove the remaining converter (or flywheel) housing bolts.

(41) Lift the engine out of the engine compartment.

INSTALLATION

CAUTION: When installing the engine into a vehicle equipped with an automatic transmission, be careful not to damage the trigger wheel on the flywheel.

(1) Attach a lifting device to the engine and lower the engine into the engine compartment. For easier installation, it may be necessary to remove the engine mount cushions from the engine mount bracket as an aide in alignment of the engine to the transmission.

(2) **Vehicles with Manual Transmission:**

(a) Insert the transmission shaft into the clutch spline.

(b) Align the flywheel housing with the engine.

(c) Install and tighten the flywheel housing lower bolts finger tight.

(3) **Vehicles with Automatic Transmission:**

(a) Align the transmission torque converter housing with the engine.

(b) Loosely install the converter housing lower bolts and install the next higher bolt and nut on each side.

(c) Tighten all 4 bolts finger tight.

(4) Install the engine mount cushions (if removed).

(5) Lower the engine and engine mount cushions onto the engine compartment brackets. Install the bolts and finger tighten the nuts.

(6) Remove the engine lifting device.

(7) Raise and support the vehicle.

(8) Install the remaining flywheel and converter housing bolts. Tighten all bolts to 38 N·m (28 ft. lbs.) torque.

(9) **Vehicles with Automatic Transmission:**

(a) Install the converter-to-drive plate bolts.

(b) Ensure the installation reference marks are aligned.

(10) Install the flywheel and converter housing access cover.

(11) Install the exhaust pipe support and tighten the screw.

(12) Tighten the engine mount-to-bracket bolts.

(13) Connect the engine speed sensor wire connections and tighten the screws.

(14) Connect the exhaust pipe to the manifold.

(15) Install the starter motor and connect the cable.

(16) Connect the wires to the starter motor solenoid.

(17) Lower the vehicle.

(18) Connect all the vacuum hoses and wire connectors identified during engine removal.

(19) **Vehicles with Power Steering:**

(a) Remove the protective caps

(b) Connect the hoses to the fittings at the steering gear. Tighten the nut to 52 N·m (38 ft. lbs.) torque.

(c) Fill the pump reservoir with fluid.

(20) Install the power brake vacuum check valve to the booster, if equipped.

(21) Connect the fuel inlet and return hoses at the fuel rail. Verify that the quick-connect fitting assembly fits securely over the fuel lines by giving the fuel lines a firm tug.

(22) Install the fuel line bracket to the intake manifold.

(23) Connect the distributor electrical connector and oil pressure switch connector.

(24) Connect the injection system wire harness connector on the dash panel.

(25) Connect the line pressure cable (if equipped with automatic transmission).

(26) Connect the speed control cable, if equipped.

(27) Connect the throttle cable linkages.

(28) Connect the heater hoses at the engine thermostat housing and water pump.

(29) Install the fan assembly to the idler pulley.

(30) Install the radiator or radiator and condenser (if equipped with A/C).

(31) Connect the service valves to the A/C compressor ports, if equipped with A/C.

(32) Charge the air conditioner system.

(33) Connect radiator fan switch wire.

(34) Connect automatic transmission fluid cooler lines, if equipped.

(35) Install the fan shroud, electric cooling fan and radiator and condenser (if equipped with A/C).

(36) Install upper radiator support.

(37) Connect the upper radiator hose.

(38) Connect the lower radiator hose.

(39) Fill the cooling system with reusable coolant and/or new coolant.

(40) Align the hood to the scribe marks. Install the hood.

(41) Connect the vacuum harness connector.

(a) Firmly push the connectors together ensuring that the retaining tabs are engaged.

(b) Insert the vacuum connector assembly into the retaining bracket on the intake manifold.

(42) Install the air cleaner assembly.

(43) Install the battery and connect the battery cable.

REMOVAL AND INSTALLATION (Continued)

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(44) Start the engine, inspect for leaks and correct the fluid levels, as necessary.

ENGINE CYLINDER HEAD COVER

The cylinder head cover is isolated from the cylinder head via grommets and a molded rubber gasket. The grommet and limiter are retained in the cylinder head cover.

There are two cylinder head bolts that have a pin to locate the cylinder head cover, they are located at position 8 and 9 (Fig. 29)

REMOVAL

(1) Disconnect negative cable from battery.

(2) Disconnect the Crankcase Ventilation (CCV) vacuum hose from engine cylinder head cover (Fig. 28).

(3) Disconnect the fresh air inlet hose from the engine cylinder head cover (Fig. 28).

(4) Remove the engine cylinder head cover mounting bolts.

(5) Remove the engine cylinder head cover.

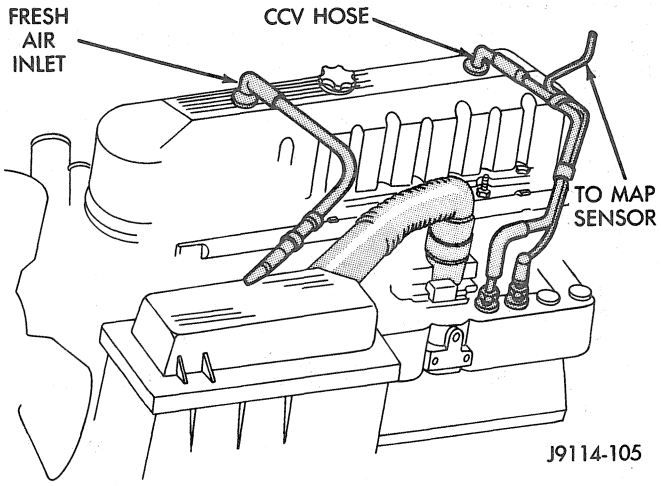


Fig. 28 Engine Cylinder Head Cover

INSTALLATION

(1) If a replacement cover is installed, transfer the CCV valve grommet and oil filler cap from the original cover to the replacement cover.

(2) Install engine cylinder head cover. Tighten the mounting bolts to 13 N·m (115 in. lbs.) torque.

(3) Connect the CCV hoses (Fig. 28).

(4) Connect negative cable to battery.

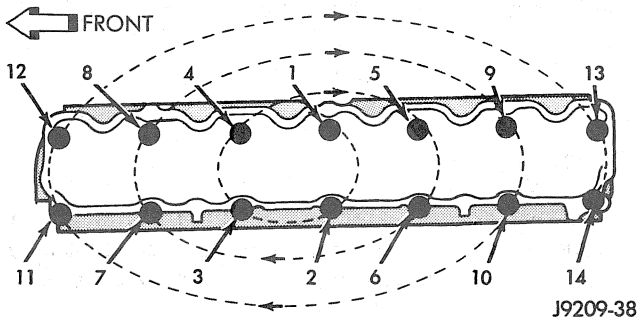


Fig. 29 Cylinder Head Cover Locater Pins at #8 & #9

ROCKER ARMS AND PUSH RODS

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Remove the engine cylinder head cover.

(2) Remove the capscrews at each bridge and pivot assembly (Fig. 30). Alternately loosen the capscrews one turn at a time to avoid damaging the bridges.

(3) Check for rocker arm bridges which are causing misalignment of the rocker arm to valve tip area.

(4) Remove the bridges, pivots and corresponding pairs of rocker arms (Fig. 30). Place them on a bench in the same order as removed.

(5) Remove the push rods and place them on a bench in the same order as removed.

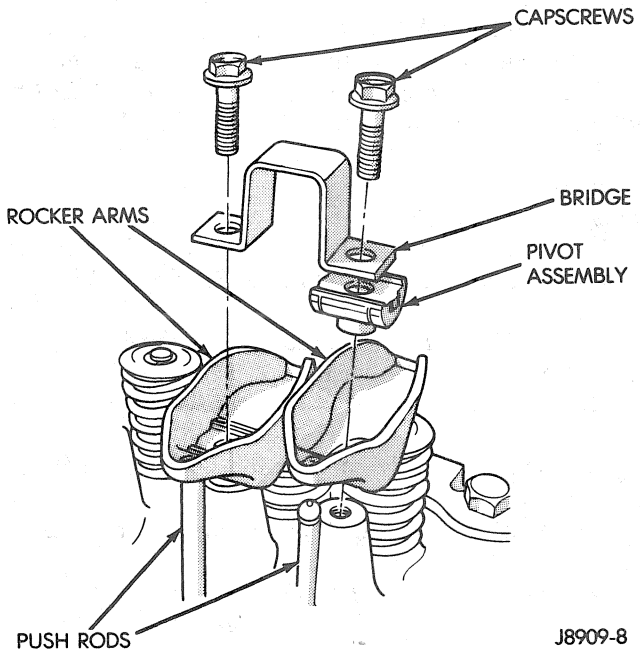


Fig. 30 Rocker Arm Assembly

INSTALLATION

(1) Lubricate the ball ends of the push rods with Mopar Engine Oil Supplement, or equivalent and install push rods in their original locations. Ensure

REMOVAL AND INSTALLATION (Continued)

that the bottom end of each push rod is centered in the tappet plunger cap seat.

(2) Using Mopar Engine Oil Supplement, or equivalent, lubricate the area of the rocker arm that the pivot contacts. Install rocker arms, pivots and bridge above each cylinder in their originally position.

(3) Loosely install the capscrews through each bridge.

(4) At each bridge, tighten the capscrews alternately, one turn at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(5) Install the engine cylinder head cover.

VALVE STEM SEAL AND SPRING

This procedure can be done with the engine cylinder head installed on the block.

REMOVAL

Inspect the valve stems, especially the grooves. An Arkansas smooth stone should be used to remove nicks and high spots.

Each valve spring is held in place by a retainer and a set of conical valve locks. The locks can be removed only by compressing the valve spring.

(1) Remove the engine cylinder head cover.

(2) Remove capscrews, bridge and pivot assemblies and rocker arms for access to each valve spring to be removed.

(3) Remove push rods. Retain the push rods, bridges, pivots and rocker arms in the same order and position as removed.

(4) Inspect the springs and retainer for cracks and possible signs of weakening.

(5) Remove the spark plug(s) adjacent to the cylinder(s) below the valve springs to be removed.

(6) Connect an air hose to the adapter and apply air pressure slowly. Maintain at least 621 kPa (90 psi) of air pressure in the cylinder to hold the valves against their seats. For vehicles equipped with an air conditioner, use a flexible air adaptor when servicing the No.1 cylinder.

(7) Tap the retainer or tip with a rawhide hammer to loosen the lock from the retainer. Use Valve Spring Compressor Tool MD-998772A to compress the spring and remove the locks (Fig. 31).

(8) Remove valve spring and retainer (Fig. 31).

(9) Remove valve stem oil seals (Fig. 31). Note the valve seals are different for intake and exhaust valves. The top of each seal is marked either INT (Intake) or EXH (Exhaust). DO NOT mix the seals.

INSTALLATION

CAUTION: Install oil seals carefully to prevent damage from the sharp edges of the valve spring lock grove.

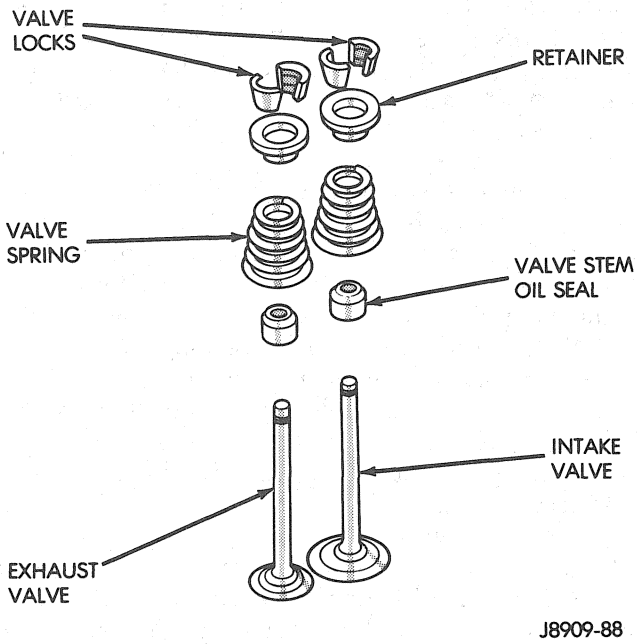


Fig. 31 Valve and Valve Components

(1) Lightly push the valve seal over the valve stem and valve guide boss. Be sure the seal is completely seated on the valve guide boss.

(2) Install valve spring and retainer.

(3) Compress the valve spring with Valve Spring Compressor Tool MD-998772A and insert the valve locks. Release the spring tension and remove the tool. Tap the spring from side-to-side to ensure that the spring is seated properly on the engine cylinder head.

(4) Disconnect the air hose. Remove the adaptor from the spark plug hole and install the spark plug.

(5) Repeat the procedures for each remaining valve spring to be removed.

(6) Install the push rods. Ensure the bottom end of each rod is centered in the plunger cap seat of the hydraulic valve tappet.

(7) Install the rocker arms, pivots and bridge at their original location.

(8) Tighten the bridge capscrews alternately, one at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(9) Install the engine cylinder head cover.

ENGINE CYLINDER HEAD

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Disconnect negative cable from battery.

REMOVAL AND INSTALLATION (Continued)

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(2) Drain the coolant and disconnect the hoses at the engine thermostat housing. DO NOT waste reusable coolant. If the solution is clean and is being drained only to service the engine or cooling system, drain the coolant into a clean container for reuse.

(3) Remove the air cleaner assembly.

(4) Remove the engine cylinder head cover.

(5) Remove the capscrews, bridge and pivot assemblies and rocker arms.

(6) Remove the push rods. **Retain the push rods, bridges, pivots and rocker arms in the same order as removed.**

(7) Loosen the serpentine drive belt at the power steering pump, if equipped or at the idler pulley (refer to Group 7, Cooling System for the proper procedure).

(8) If equipped with air conditioning, perform the following:

(a) Remove the bolts from the A/C compressor mounting bracket and set the compressor aside.

(b) Remove the air conditioner compressor bracket bolts from the engine cylinder head.

(c) Loosen the through bolt at the bottom of the bracket.

(9) If equipped, disconnect the power steering pump bracket. Set the pump and bracket aside. DO NOT disconnect the hoses.

(10) Perform the Fuel System Pressure Release procedure (refer to Group 14, Fuel System).

(11) Remove the fuel lines and vacuum advance hose.

(12) Remove the intake and engine exhaust manifolds from the engine cylinder head (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).

(13) Disconnect the ignition wires and remove the spark plugs.

(14) Disconnect the temperature sending unit wire connector.

(15) Remove the ignition coil and bracket assembly.

(16) Remove the engine cylinder head bolts. Bolt No.14 cannot be removed until the head is moved forward (Fig. 32). Pull bolt No.14 out as far as it will go and then suspend the bolt in this position (tape around the bolt).

(17) Remove the engine cylinder head and gasket (Fig. 32).

(18) If this was the first time the bolts were removed, put a paint dab on the top of the bolt. If the bolts have a paint dab on the top of the bolt or it isn't known if they were used before, discard the bolts.

(19) Stuff clean lint free shop towels into the cylinder bores.

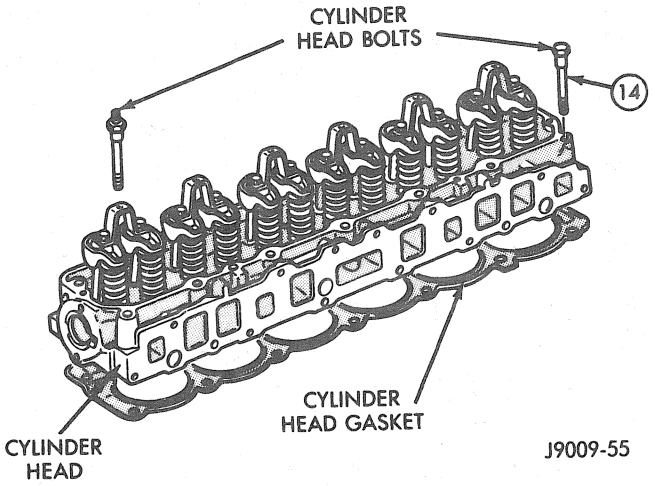


Fig. 32 Engine Cylinder Head Assembly

INSTALLATION

The engine cylinder head gasket is a composition gasket. The gasket is to be installed DRY. **DO NOT use a gasket sealing compound on the gasket.**

If the engine cylinder head is to be replaced and the original valves used, measure the valve stem diameter. Only standard size valves can be used with a service replacement engine cylinder head unless the replacement head valve stem guide bores are reamed to accommodate oversize valve stems. Remove all carbon buildup and reface the valves.

(1) Remove the shop towels from the cylinder bores. Coat the bores with clean engine oil.

(2) Position the engine cylinder head gasket (with the numbers facing up) onto the cylinder block.

CAUTION: Engine cylinder head bolts should be reused only once. Replace the head bolts if they were used before or if they have a paint dab on the top of the bolt.

(3) With bolt No.14 held in place (tape around bolt), install the engine cylinder head. Remove the tape from bolt No.14.

(4) Coat the threads of stud bolt No.11 with Loctite 592 sealant, or equivalent.

(5) Tighten the engine cylinder head bolts in sequence according to the following procedure (Fig. 33).

CAUTION: During the final tightening sequence, bolt No.11 will be tightened to a lower torque than the rest of the bolts. DO NOT overtighten bolt No.11.

REMOVAL AND INSTALLATION (Continued)

(a) Tighten all bolts in sequence (1 through 14) to 30 N·m (22 ft. lbs.) torque.

(b) Tighten all bolts in sequence (1 through 14) to 61 N·m (45 ft. lbs.) torque.

(c) Check all bolts to verify they are set to 61 N·m (45 ft. lbs.) torque.

(d) Tighten bolts (in sequence):

- Bolts 1 through 10 to 149 N·m (110 ft. lbs.) torque.
- Bolt 11 to 13 N·m (100 ft. lbs.) torque.
- Bolts 12 through 14 to 149 N·m (110 ft. lbs.) torque.

(e) Check all bolts in sequence to verify the correct torque.

(f) If not already done, clean and mark each bolt with a dab of paint after tightening. Should you encounter bolts which were painted in an earlier service operation, replace them.

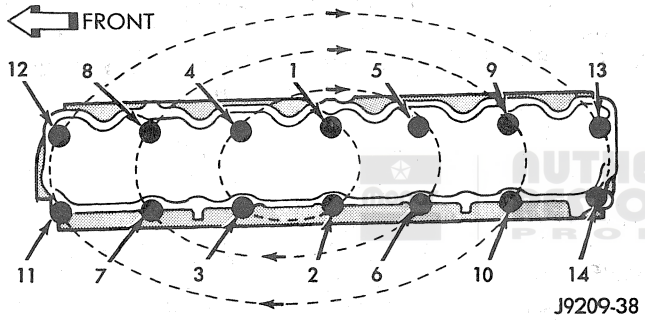


Fig. 33 Engine Cylinder Head Bolt Tightening Sequence

(6) Install the ignition coil and bracket assembly.

(7) Connect the temperature sending unit wire connector.

(8) Install the spark plugs and tighten to 37 N·m (27 ft. lbs.) torque. Connect the ignition wires.

(9) Install the intake and engine exhaust manifolds (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).

(10) Install the fuel lines and the vacuum advance hose.

(11) If equipped, attach the power steering pump and bracket.

(12) Install the push rods, rocker arms, pivots and bridges in the order they were removed (refer to Rocker Arms and Push Rods in this section).

(13) Install the engine cylinder head cover.

(14) Attach the air conditioner compressor mounting bracket to the engine cylinder head and block. Tighten the bolts to 40 N·m (30 ft. lbs.) torque.

(15) Attach the air conditioning compressor to the bracket. Tighten the bolts to 27 N·m (20 ft. lbs.) torque.

CAUTION: The serpentine drive belt must be routed correctly. Incorrect routing can cause the water pump to turn in the opposite direction causing the engine to overheat.

(16) Install the serpentine drive belt and correctly tension the belt (refer to Group 7, Cooling System for the proper procedure).

(17) Install the air cleaner and ducting.

(18) Install the engine cylinder head cover.

(19) Connect the hoses to the engine thermostat housing and fill the cooling system to the specified level (refer to Group 7, Cooling Systems for the proper procedure).

(20) The automatic transmission throttle linkage and cable must be adjusted after completing the engine cylinder head installation (refer to Group 21, Transmissions for the proper procedures).

(21) Install the temperature sending unit and connect the wire connector.

(22) Connect the fuel line.

(23) Connect negative cable to battery.

(24) Connect the upper radiator hose and heater hose at the engine thermostat housing.

(25) Fill the cooling system. Check for leaks.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN DIRECT LINE WITH THE FAN. DO NOT PUT HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(26) Operate the engine with the radiator cap off. Inspect for leaks and continue operating the engine until the engine thermostat opens. Add coolant, if required.

VALVES AND VALVE SPRINGS

This procedure is done with the engine cylinder head removed from the block.

REMOVAL

(1) Remove the engine cylinder head from the cylinder block.

(2) Use Valve Spring Compressor Tool MD-998772A and compress each valve spring.

(3) Remove the valve locks, retainers, springs and valve stem oil seals. Discard the oil seals.

(4) Use an Arkansas smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.

(5) Remove the valves, and place them in a rack in the same order as removed.

INSTALLATION

(1) Thoroughly clean the valve stems and the valve guide bores.

(2) Lightly lubricate the stem.

REMOVAL AND INSTALLATION (Continued)

(3) Install the valve in the original valve guide bore.

(4) Install the replacement valve stem oil seals on the valve stems. If the 0.381 mm (0.015 inch) oversize valve stems are used, oversize oil seals are required.

(5) Position the valve spring and retainer on the engine cylinder head and compress the valve spring with Valve Spring Compressor Tool MD-998772A.

(6) Install the valve locks and release the tool.

(7) Tap the valve spring from side to side with a hammer to ensure that the spring is properly seated at the engine cylinder head. Also tap the top of the retainer to seat the valve locks.

(8) Install the engine cylinder head.

HYDRAULIC TAPPETS

Retain all the components in the same order as removed.

REMOVAL

(1) Remove the engine cylinder head cover.

(2) Remove the bridge and pivot assemblies and rocker arms by removing the capscrews at each bridge. Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridges.

(3) Remove the push rods.

(4) Remove the tappets through the push rod openings in the cylinder block with a Hydraulic Valve Tappet Removal/Installation Tool (Fig. 34).

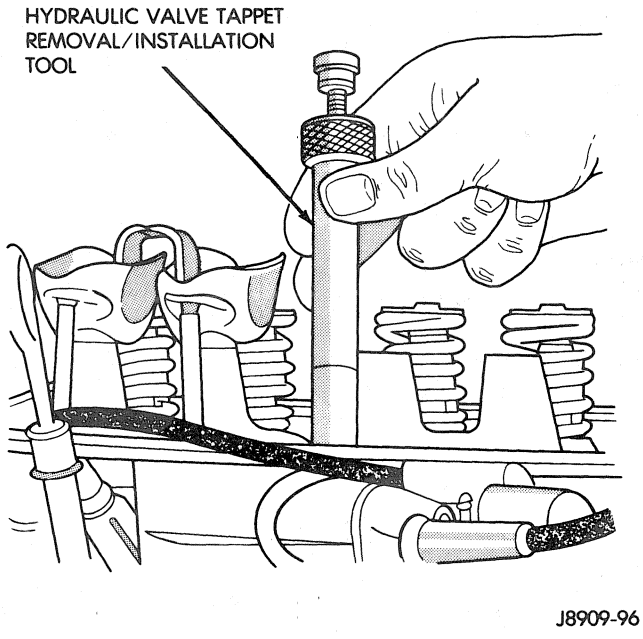


Fig. 34 Hydraulic Valve Tappet Removal—Installation Tool

INSTALLATION

It is not necessary to charge the tappets with engine oil. They will charge themselves within a very short period of engine operation.

(1) Dip each tappet in Mopar Engine Oil Supplement, or equivalent.

(2) Use Hydraulic Valve Tappet Removal/Installation Tool to install each tappet in the same bore from where it was originally removed.

(3) Install the push rods in their original locations.

(4) Install the rocker arms and bridge and pivot assemblies at their original locations. Loosely install the capscrews at each bridge.

(5) Tighten the capscrews alternately, one turn at a time, to avoid damaging the bridges. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(6) Pour the remaining Mopar Engine Oil Supplement, or equivalent over the entire valve actuating assembly. The Mopar Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1 609 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(7) Install the engine cylinder head cover.

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt and fan shroud.

(3) Remove the vibration damper retaining bolt and washer.

(4) Use Vibration Damper Removal Tool 7697 to remove the damper from the crankshaft (Fig. 35).

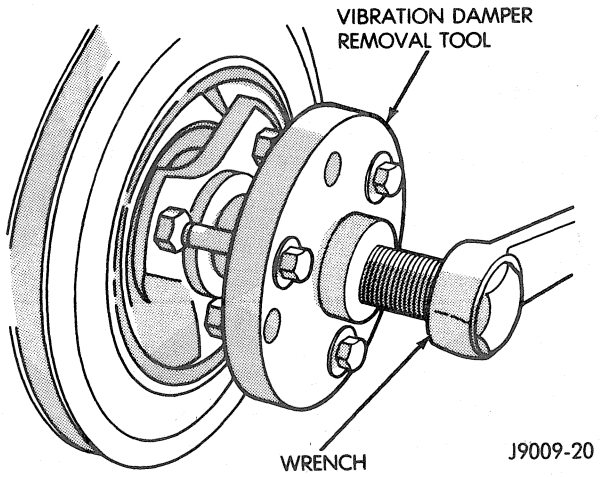


Fig. 35 Vibration Damper Removal Tool 7697

INSTALLATION

(1) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in position, align the keyway on the

REMOVAL AND INSTALLATION (Continued)

vibration damper hub with the crankshaft key and tap the damper onto the crankshaft.

(2) Install the vibration damper retaining bolt and washer.

(3) Tighten the damper retaining bolt to 108 N·m (80 ft. lbs.) torque.

(4) Install the serpentine drive belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(5) Connect negative cable to battery.

TIMING CASE COVER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the vibration damper.

(3) Remove the fan and hub assembly and remove the fan shroud.

(4) Remove the accessory drive brackets that are attached to the timing case cover.

(5) Remove the A/C compressor (if equipped) and generator bracket assembly from the engine cylinder head and move to one side.

(6) Remove the oil pan-to-timing case cover bolts and timing case cover-to-cylinder block bolts.

(7) Remove the timing case cover and gasket from the engine. Make sure the tension spring and thrust pin do not fall out of the preload bolt.

(8) Pry the crankshaft oil seal from the front of the timing case cover (Fig. 36).

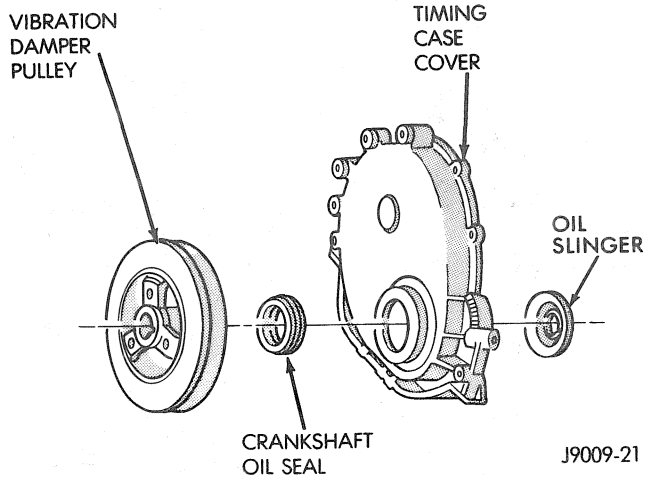


Fig. 36 Timing Case Cover Components

INSTALLATION

Clean the timing case cover, oil pan and cylinder block gasket surfaces.

(1) Install a new crankshaft oil seal in the timing case cover. The open end of the seal should be toward the inside of the cover. Support the cover at the seal area while installing the seal. Force it into position with Seal Installation Tool 6139.

(2) Position the gasket on the cylinder block.

(3) Position the timing case cover on the oil pan gasket and the cylinder block. Make sure the tension spring and thrust pin are in place in the camshaft preload bolt.

(4) Insert Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 37).

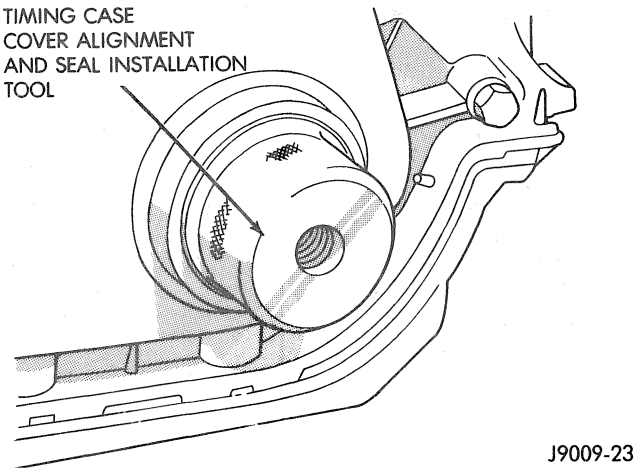


Fig. 37 Timing Case Cover Alignment and Seal Installation Tool 6139

(5) Install the timing case cover-to-cylinder block and the oil pan-to-timing case cover bolts.

(6) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 14 N·m (120 in. lbs.) torque. Tighten the oil pan-to-cover 5/16 inch bolts to 18 N·m (156 in. lbs.) torque.

(7) Remove the cover alignment tool.

(8) Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(9) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(10) Install the A/C compressor (if equipped) and generator bracket assembly.

(11) Install the engine fan and hub assembly and shroud.

(12) Install the serpentine drive belt and tighten to obtain the specified tension.

(13) Connect negative cable to battery.

TIMING CHAIN AND SPROCKETS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the fan and shroud.

(3) Remove the serpentine drive belt.

REMOVAL AND INSTALLATION (Continued)

(4) Remove the crankshaft vibration damper.
(5) Remove the timing case cover.
(6) Rotate crankshaft until the "0" timing mark is closest to and on the center line with camshaft sprocket timing mark (Fig. 38).

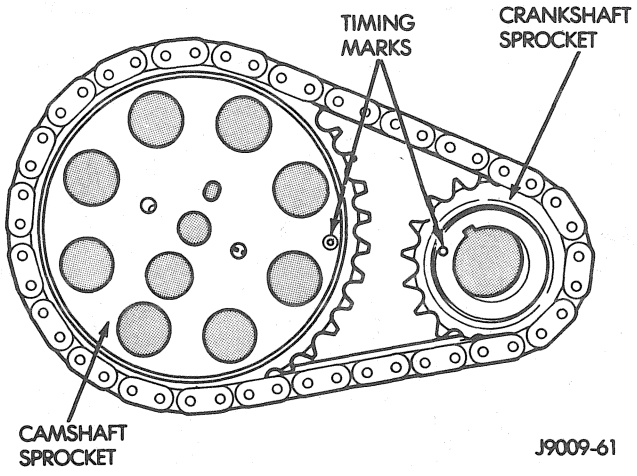


Fig. 38 Crankshaft—Camshaft Alignment—Typical

(7) Remove the oil slinger from the crankshaft.
(8) Remove the tension spring and thrust pin from the preload bolt (Fig. 39). Remove the camshaft sprocket retaining preload bolt and washer.

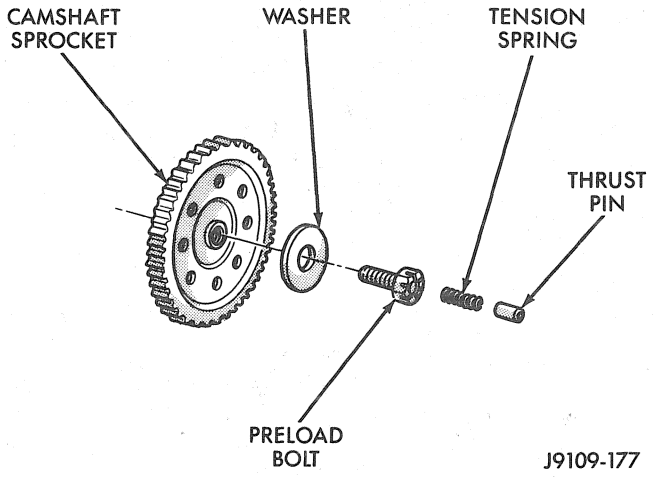


Fig. 39 Camshaft Sprocket Preload Bolt

(9) Remove the crankshaft sprocket, camshaft sprocket and timing chain as an assembly.
(10) Installation of the timing chain with the timing marks on the crankshaft and camshaft sprockets properly aligned ensures correct valve timing. A worn or stretched timing chain will adversely affect valve timing. If the timing chain deflects more than 12.7 mm (1/2 inch) replace it. The correct timing chain has 48 pins. A chain with more than 48 pins will cause excessive slack.

INSTALLATION

Assemble the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned (Fig. 40).
(1) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in the keyway on the crankshaft, install the assembly on the crankshaft and camshaft.
(2) Install the camshaft sprocket retaining preload bolt and washer (Fig. 39). Tighten the preload bolt to 108 N·m (80 ft. lbs.) torque.
(3) To verify correct installation of the timing chain, turn the crankshaft to position the camshaft sprocket timing mark as shown in (Fig. 40). Count the number of chain pins between the timing marks of both sprockets. There must be 15 pins.

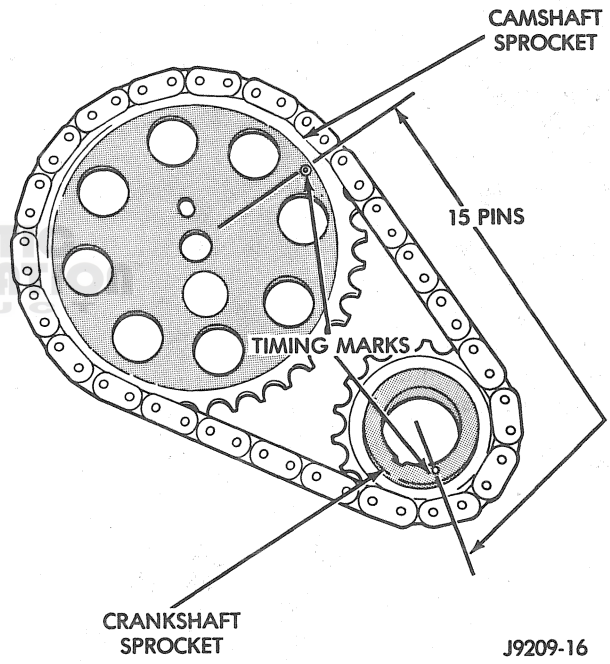


Fig. 40 Verify Sprocket—Chain Installation—Typical

(4) Install the crankshaft oil slinger.
(5) Replace the oil seal in the timing case cover.
(6) Lubricate the tension spring, thrust pin and pin bore in the preload bolt with Mopar Engine Oil Supplement, or equivalent. Install the spring and thrust pin in the preload bolt head (Fig. 39).
(7) Install the timing case cover and gasket.
(8) With the key installed in the crankshaft keyway, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.
(9) Install the serpentine drive belt and tighten to the specified tension (refer to Group 7, Cooling System for the proper procedure).
(10) Install the fan and hub (or Tempatrol fan) assembly. Install the shroud.
(11) Connect negative cable to battery.

REMOVAL AND INSTALLATION (Continued)

CAMSHAFT

REMOVAL

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. RELEASE THE PRESSURE BEFORE REMOVING THE DRAIN COCK, CAP AND DRAIN PLUGS.

(1) Disconnect negative cable from battery.
(2) Drain the cooling system. DO NOT waste reusable coolant. If the solution is clean, drain it into a clean container for reuse.
(3) Remove the radiator or radiator and condenser, if equipped with A/C (refer to Group 7, Cooling System for the proper procedure).
(4) Remove the air conditioner condenser and receiver/drier assembly as a charged unit, if equipped (refer to Group 24, Heating and Air Conditioning).
(5) Remove the distributor cap and mark the position of the rotor.
(6) Remove the distributor and ignition wires.
(7) Remove the engine cylinder head cover.
(8) Remove the rocker arms, bridges and pivots.
(9) Remove the push rods.
(10) Remove the engine cylinder head and gasket.
(11) Remove the hydraulic valve tappets from the engine cylinder head.
(12) Remove the vibration damper.
(13) Remove the timing case cover.
(14) Remove the timing chain and sprockets.
(15) Remove the front bumper and/or grille, as required.
(16) Remove the camshaft (Fig. 41).

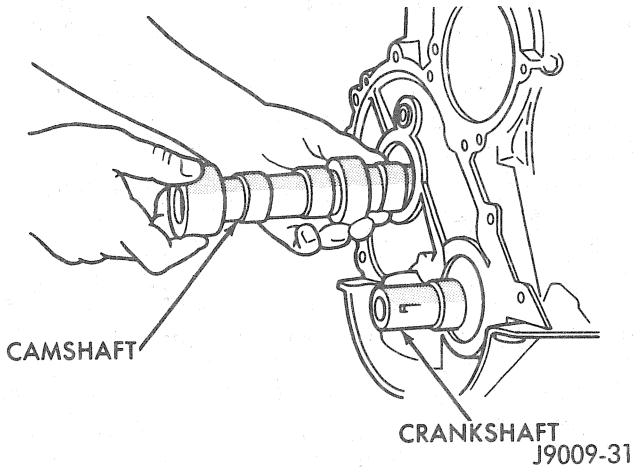


Fig. 41 Camshaft

INSTALLATION

(1) Inspect the cam lobes for wear.
(2) Inspect the bearing journals for uneven wear pattern or finish.
(3) Inspect the bearings for wear.
(4) Inspect the distributor drive gear for wear.
(5) If the camshaft appears to have been rubbing against the timing case cover, examine the oil pressure relief holes in the rear cam journal. The oil pressure relief holes must be free of debris.
(6) Lubricate the camshaft with Mopar Engine Oil Supplement, or equivalent.
(7) Carefully install the camshaft to prevent damage to the camshaft bearings (Fig. 41).
(8) Install the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned.
(9) Install the camshaft sprocket retaining preload bolt. Tighten the bolt to 108 N·m (80 ft. lbs.) torque.
(10) Lubricate the tension spring, the thrust pin and the pin bore in the preload bolt with Mopar Engine Oil Supplement, or equivalent. Install the spring and thrust pin in the preload bolt head.
(11) Install the timing case cover with a replacement oil seal (Fig. 42). Refer to Timing Case Cover Installation.
(12) Install the vibration damper (Fig. 42).

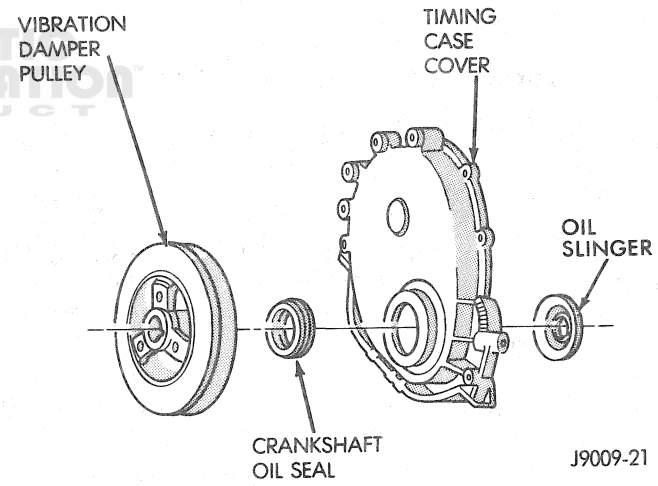


Fig. 42 Timing Case Cover Components

(13) Install the hydraulic valve tappets.
(14) Install the engine cylinder head.
(15) Install the push rods.
(16) Install the rocker arms and pivot and bridge assemblies. Tighten each of the capscrews for each bridge alternately, one turn at a time, to avoid damaging the bridge.
(17) Install the engine cylinder head cover.
(18) Position the oil pump gear. Refer to Distributor in the Component Removal/Installation section of Group 8D, Ignition Systems.
(19) Install the distributor and ignition wires. Refer to Distributor in the Component Removal/Installation section of Group 8D, Ignition Systems.

REMOVAL AND INSTALLATION (Continued)

(20) Install the serpentine drive belt and tighten to the specified tension (refer to Group 7, Cooling System for the proper procedure).

NOTE: During installation, lubricate the hydraulic valve tappets and all valve components with Mopar Engine Oil Supplement, or equivalent. The Mopar Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1 609 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(21) Install the A/C condenser and receiver/drier assembly, if equipped (refer to Group 24, Heating and Air Conditioning).

CAUTION: Both service valves must be opened before the air conditioning system is operated.

(22) Install the radiator, connect the hoses and fill the cooling system to the specified level (refer to Group 7, Cooling System for the proper procedure).

(23) Check the ignition timing and adjust as necessary.

(24) Install the grille and bumper, if removed.

(25) Connect negative cable to battery.

CAMSHAFT PIN REPLACEMENT

REMOVAL

WARNING: DO NOT LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

(1) Disconnect negative cable from battery.

(2) Drain the radiator. DO NOT waste reusable coolant. Drain the coolant into a clean container.

(3) Remove the fan and shroud.

(4) Disconnect the radiator overflow tube, radiator hoses, automatic transmission fluid cooler pipes (if equipped).

(5) Remove the radiator.

(6) If equipped with air conditioning:

CAUTION: DO NOT loosen or disconnect any air conditioner system fittings. Move the condenser and receiver/drier aside as a complete assembly.

(a) Remove the A/C compressor serpentine drive belt idler pulley.

(b) Disconnect and remove the generator.

(c) Remove the A/C condenser attaching bolts and move the condenser and receiver/drier assembly up and out of the way.

(7) Remove the serpentine drive belt.

(8) Remove the crankshaft vibration damper.

(9) Remove the timing case cover. Clean the gasket material from the cover.

(10) Remove the thrust pin and tension spring from the preload bolt head.

(11) Rotate crankshaft until the crankshaft sprocket timing mark is closest to and on the center line with the camshaft sprocket timing mark (Fig. 43).

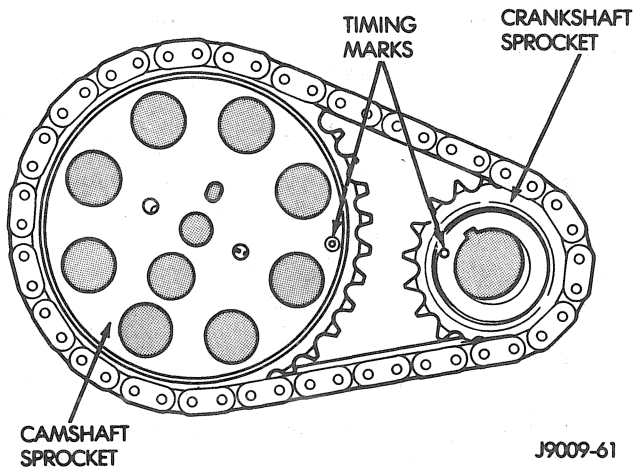


Fig. 43 Timing Chain Alignment—Typical

(12) Remove the camshaft sprocket preload retaining bolt and washer.

(13) Remove the crankshaft oil slinger.

(14) Remove the sprockets and chain as an assembly.

CAUTION: The following procedural step must be accomplished to prevent the camshaft from damaging the rear camshaft plug during pin installation.

(15) Inspect the damaged camshaft pin.

(16) If the pin is a spring-type pin, remove the broken pin by inserting a self-tapping screw into the pin and carefully pulling the pin from the camshaft.

(17) If the pin is a dowel-type pin, center-punch it. Ensure the exact center is located when center-punching the pin.

CAUTION: Cover the opened oil pan area to prevent metal chips from entering the pan.

(18) Drill into the pin center with a 4 mm (5/32 inch) drill bit.

(19) Insert a self-tapping screw into the drilled pin and carefully pull the pin from the camshaft.

CAMSHAFT BEARINGS

The camshaft rotates within four steel-shelled, babbitt-lined bearings that are pressed into the cylinder block and then line reamed. The camshaft bearing bores and bearing diameters are not the same size. They are stepped down in 0.254 mm

REMOVAL AND INSTALLATION (Continued)

(0.010 inch) increments from the front bearing (largest) to the rear bearing (smallest). This permits easier removal and installation of the camshaft. The camshaft bearings are pressure lubricated.

NOTE: It is not advisable to attempt to replace camshaft bearings unless special removal and installation tools are available.

Camshaft end play is maintained by the load placed on the camshaft by the sprocket preload bolt tension spring and thrust pin.

INSTALLATION

(1) Clean the camshaft pin hole.

(2) Compress the center of the replacement spring pin with vise grips.

(3) Carefully drive the pin into the camshaft pin hole until it is seated.

(4) Install the camshaft sprocket, crankshaft sprocket and timing chain with the timing marks aligned (Fig. 43).

(5) To verify correct installation of the timing chain, turn the crankshaft to position the camshaft sprocket timing mark as shown in (Fig. 44). Count the number of chain pins between the timing marks of both sprockets. There must be 15 pins.

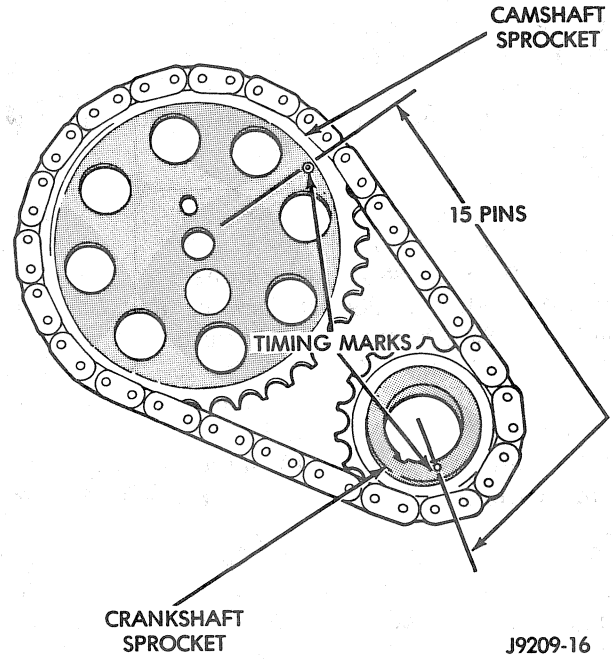


Fig. 44 Verify Crankshaft—Camshaft Installation—Typical

(6) Install the crankshaft oil slinger.

(7) Tighten the camshaft sprocket preload bolt to 108 N·m (80 ft. lbs.) torque.

(8) Check the valve timing.

(9) Lubricate the tension spring, the thrust pin and the pin bore in the preload bolt with Mopar Engine Oil Supplement, or equivalent. Install the spring and thrust pin in the preload bolt head.

(10) Coat both sides of the replacement timing case cover gasket with gasket sealer. Apply a 3 mm (1/8 inch) bead of Mopar Silicone Rubber Adhesive Sealant, or equivalent to the joint formed at the oil pan and cylinder block.

(11) Position the timing case cover on the oil pan gasket and the cylinder block.

(12) Place Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 45).

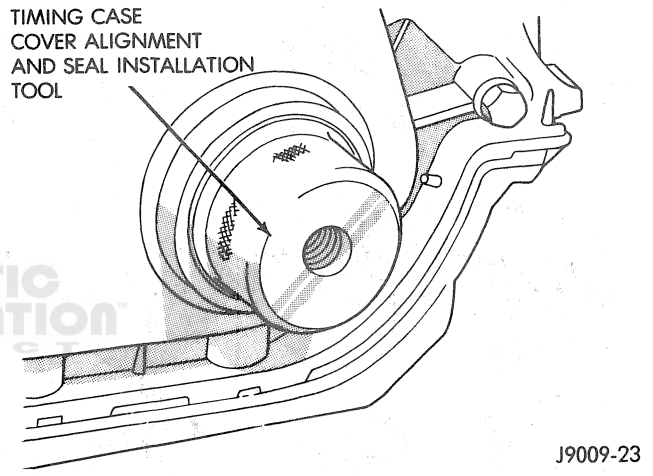


Fig. 45 Timing Case Cover Alignment and Seal Installation Tool 6139

(13) Install the timing case cover-to-cylinder block bolts. Install the oil pan-to-timing case cover bolts.

(14) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 14 N·m (120 in. lbs.) torque. Tighten the oil pan-to-cover 5/16 inch bolts to 18 N·m (156 in. lbs.) torque.

(15) Remove the cover alignment tool and install a replacement oil seal into the cover.

(16) Install the vibration damper on the crankshaft.

(17) Lubricate and tighten the damper bolt to 108 N·m (80 ft. lbs.) torque.

(18) If equipped with air conditioning:

(a) Install the A/C compressor serpentine drive belt idler pulley.

(b) Install the generator.

(c) Install the A/C condenser and receiver/drier assembly.

(19) Install the serpentine drive belt on the pulleys and tighten (refer to Group 7, Cooling System for the specifications and procedures).

REMOVAL AND INSTALLATION (Continued)

(20) Install the radiator. Connect the radiator hoses and automatic transmission fluid cooler pipes, if equipped. Fill the cooling system.

(21) Install the fan and shroud.

(22) Connect negative cable to battery.

CRANKSHAFT MAIN BEARINGS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the spark plugs.

(3) Raise the vehicle.

(4) Remove the oil pan and oil pump.

(5) Remove only one main bearing cap and lower insert at a time (Fig. 46).

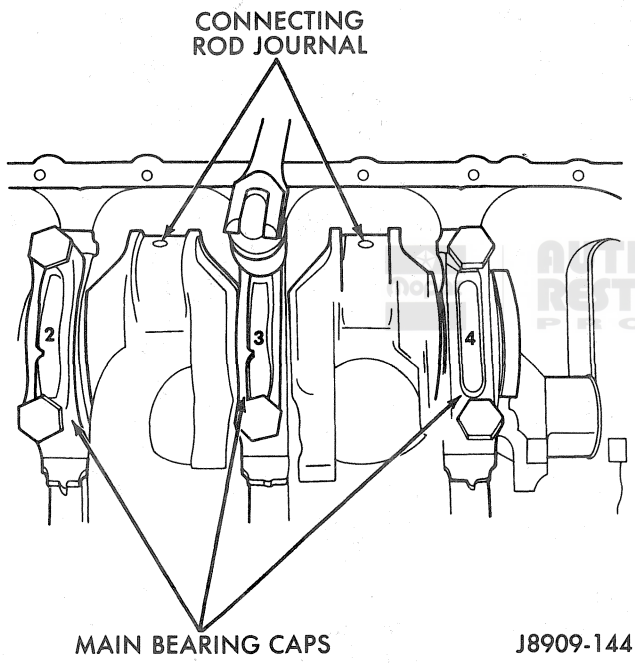


Fig. 46 Removing Main Bearing Caps and Lower Inserts

(6) Remove the lower insert from the bearing cap.

(7) Remove the upper insert by LOOSENING (DO NOT REMOVE) all of the other bearing caps. Now insert a small cotter pin tool in the crankshaft journal oil hole. Bend the cotter pin as illustrated to fabricate the tool (Fig. 47). With the cotter pin tool in place, rotate the crankshaft so that the upper bearing insert will rotate in the direction of its locking tab. Because there is no hole in the No.3 main journal, use a tongue depressor or similar soft-faced tool to remove the bearing insert (Fig. 47). After moving the insert approximately 25 mm (1 inch), it can be removed by applying pressure under the tab.

(8) Using the same procedure described above, remove the remaining bearing inserts one at a time for inspection.

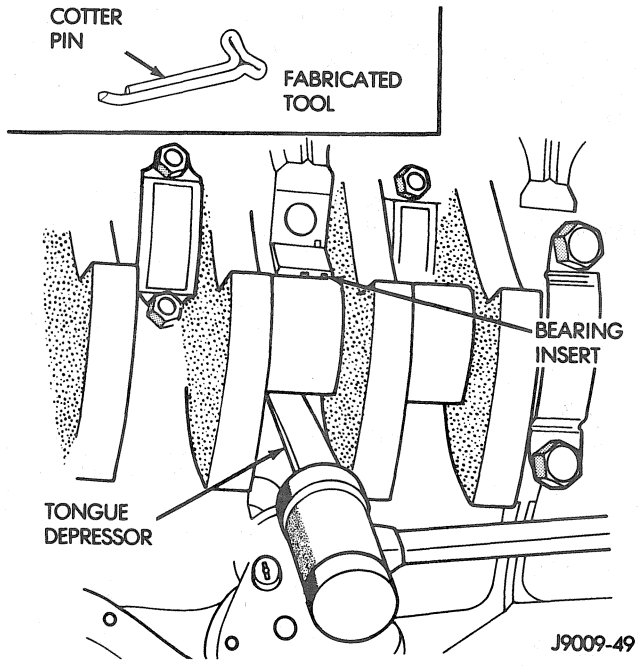


Fig. 47 Removing Upper Inserts

INSTALLATION

(1) Lubricate the bearing surface of each insert with engine oil.

(2) Loosen all the main bearing caps. Install the main bearing upper inserts.

(3) Install the lower bearing inserts into the main bearing caps.

(4) Install the main bearing cap(s) and lower insert(s).

(5) Tighten the bolts of caps 1, 2, 4, 5, 6, and 7 to 54 N·m (40 ft. lbs.) torque. Now tighten these bolts to 95 N·m (70 ft. lbs.) torque. Finally, tighten these bolts to 108 N·m (80 ft. lbs.) torque.

(6) Push the crankshaft forward and backward. Load the crankshaft front or rear and tighten cap bolt No.3 to 54 N·m (40 ft. lbs.) torque. Then tighten to 95 N·m (70 ft. lbs.) torque and finally tighten to 108 N·m (80 ft. lbs.) torque.

(7) Rotate the crankshaft after tightening each main bearing cap to ensure the crankshaft rotates freely.

(8) Check crankshaft end play. Crankshaft end play is controlled by the thrust bearing which is flange and installed at the No.2 main bearing position.

(a) Attach a magnetic base dial indicator to the cylinder block at either the front or rear of the engine.

(b) Position the dial indicator rod so that it is parallel to the center line of the crankshaft.

(c) Pry the crankshaft forward, position the dial indicator to zero.

REMOVAL AND INSTALLATION (Continued)

(d) Pry the crankshaft forward and backward. Note the dial indicator readings. End play is the difference between the high and low measurements (Fig. 48). Correct end play is 0.038-0.165 mm (0.0015-0.0065 inch). The desired specifications are 0.051-0.064 mm (0.002-0.0025 inch).

(e) If end play is not within specification, inspect crankshaft thrust faces for wear. If no wear is apparent, replace the thrust bearing and measure end play. If end play is still not within specification, replace the crankshaft.

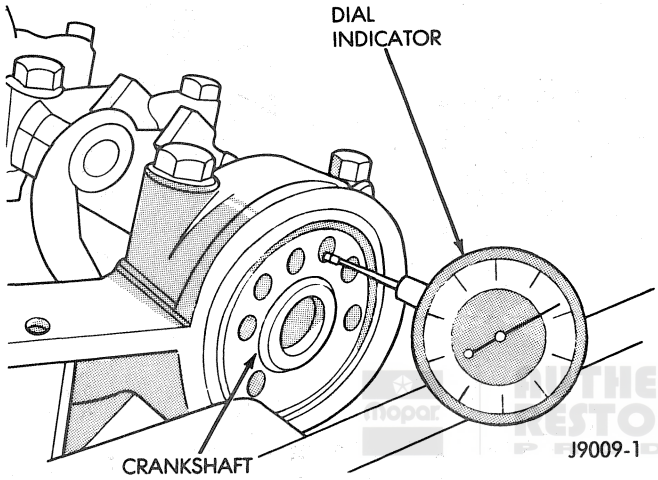


Fig. 48 Crankshaft End Play Measurement

(9) If the crankshaft was removed, install the crankshaft into the cylinder block (refer to Cylinder Block - Assemble).

(10) Install the oil pan.

(11) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(12) Lower the vehicle.

(13) Install the spark plugs. Tighten the plugs to 37 N·m (27 ft. lbs.) torque.

(14) Fill the oil pan with engine oil to the full mark on the dipstick level.

(15) Connect negative cable to battery.

OIL PAN

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle.

(3) Remove the oil pan drain plug and drain the engine oil.

(4) Disconnect the exhaust pipe at the exhaust manifold.

(5) Disconnect the exhaust hanger at the catalytic converter and lower the pipe.

(6) Remove the starter motor.

(7) Remove the engine flywheel and transmission torque converter housing access cover.

(8) If equipped with an oil level sensor, disconnect the sensor.

(9) Position a jack stand directly under the engine vibration damper.

(10) Place a piece of wood (2 x 2) between the jack stand and the engine vibration damper.

(11) Remove the engine mount through bolts.

(12) Using the jack stand, raise the engine until adequate clearance is obtained to remove the oil pan.

(13) Remove the oil pan bolts. Carefully slide the oil pan and gasket to the rear. If equipped with an oil level sensor, take care not to damage the sensor.

INSTALLATION

(1) Clean the block and pan gasket surfaces.

(2) Fabricate 4 alignment dowels from 1 1/2 x 1/4 inch bolts. Cut the head off the bolts and cut a slot into the top of the dowel. This will allow easier installation and removal with a screwdriver (Fig. 49).

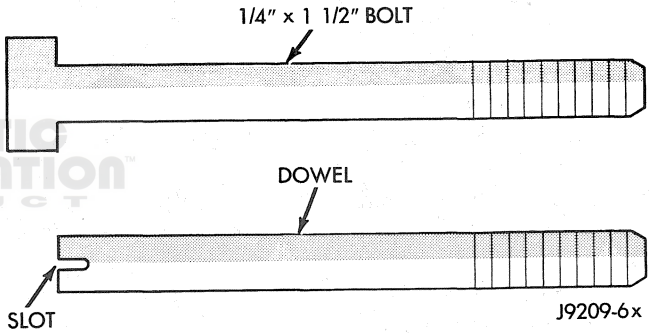


Fig. 49 Fabrication of Alignment Dowels

(3) Install two dowels in the timing case cover. Install the other two dowels in the cylinder block (Fig. 50).

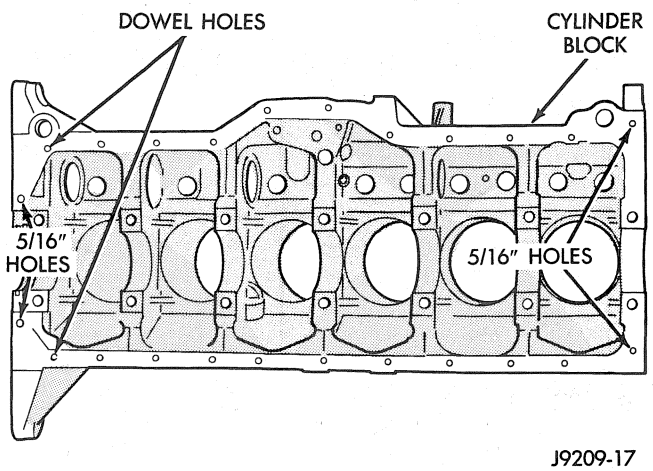


Fig. 50 Position of Dowels in Cylinder Block

(4) Slide the one-piece gasket over the dowels and onto the block and timing case cover.

REMOVAL AND INSTALLATION (Continued)

(5) Position the oil pan over the dowels and onto the gasket. If equipped with an oil level sensor, take care not to damage the sensor.

(6) Install the 1/4 inch oil pan bolts. Tighten these bolts to 14 N·m (120 in. lbs.) torque. Install the 5/16 inch oil pan bolts (Fig. 51). Tighten these bolts to 18 N·m (156 in. lbs.) torque.

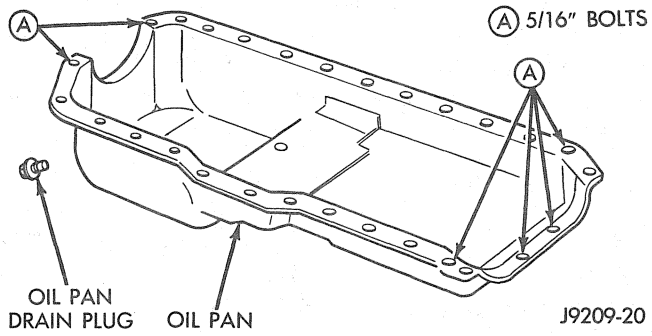


Fig. 51 Position of 5/16 inch Oil Pan Bolts

(7) Remove the dowels. Install the remaining 1/4 inch oil pan bolts. Tighten these bolts to 14 N·m (120 in. lbs.) torque.

(8) Lower the engine until it is properly located on the engine mounts.

(9) Install the through bolts and tighten the nuts.

(10) Lower the jack stand and remove the piece of wood.

(11) Install the engine flywheel and transmission torque converter housing access cover.

(12) Install the engine starter motor.

(13) Connect the exhaust pipe to the hanger and to the engine exhaust manifold.

(14) Install the oil pan drain plug (Fig. 51). Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(15) Lower the vehicle.

(16) Connect negative cable to battery.

(17) Fill the oil pan with engine oil to the specified level.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(18) Start the engine and inspect for leaks.

PISTONS AND CONNECTING RODS

REMOVAL

(1) Remove the engine cylinder head cover.

(2) Remove the rocker arms, bridges and pivots.

(3) Remove the push rods.

(4) Remove the engine cylinder head.

(5) Position the pistons one at a time near the bottom of the stroke. Use a ridge reamer to remove the ridge from the top end of the cylinder walls. Use a protective cloth to collect the cuttings.

(6) Raise the vehicle.

(7) Drain the engine oil.

(8) Remove the oil pan and gasket.

(9) Remove the connecting rod bearing caps and inserts. Mark the caps and rods with the cylinder bore location. The connecting rods and caps are stamped with a two letter combination (Fig. 52).

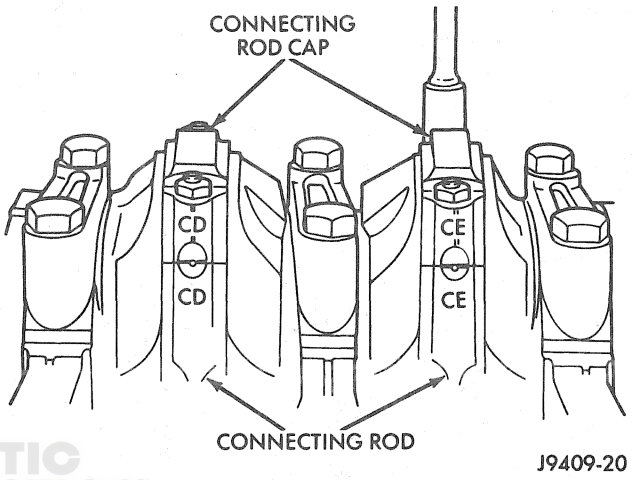


Fig. 52 Stamped Connecting Rods and Caps

(10) Lower the vehicle until it is about 2 feet from the floor.

CAUTION: Ensure that the connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose, slipped over the rod bolts will provide protection during removal.

(11) Have an assistant push the piston and connecting rod assemblies up and through the top of the cylinder bores (Fig. 53).

INSTALLATION

(1) Clean the cylinder bores thoroughly. Apply a light film of clean engine oil to the bores with a clean lint-free cloth.

(2) Install the piston rings on the pistons if removed.

(3) Lubricate the piston and rings with clean engine oil.

CAUTION: Ensure that connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose slipped over the connecting rod bolts will provide protection during installation.

(4) Use a piston ring compressor to install the connecting rod and piston assemblies through the top of the cylinder bores (Fig. 54).

REMOVAL AND INSTALLATION (Continued)

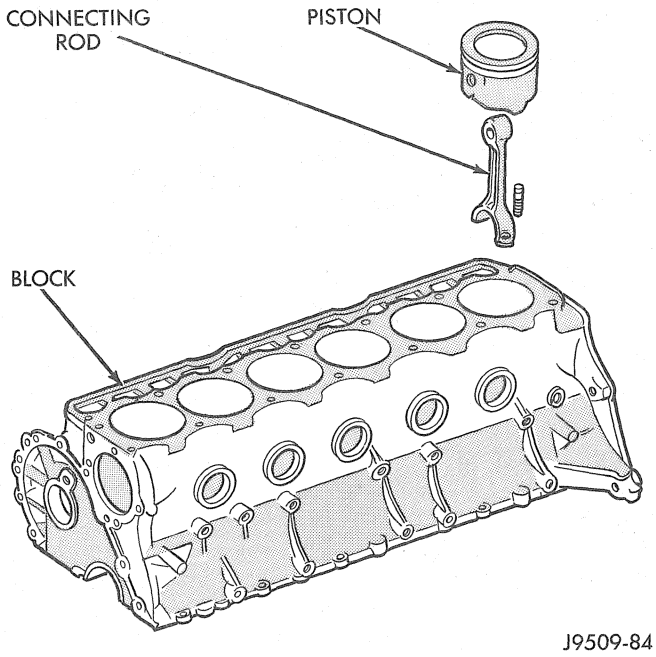


Fig. 53 Removal of Connecting Rod and Piston Assembly

(5) Ensure the arrow on the piston top points to the front of the engine (Fig. 54).

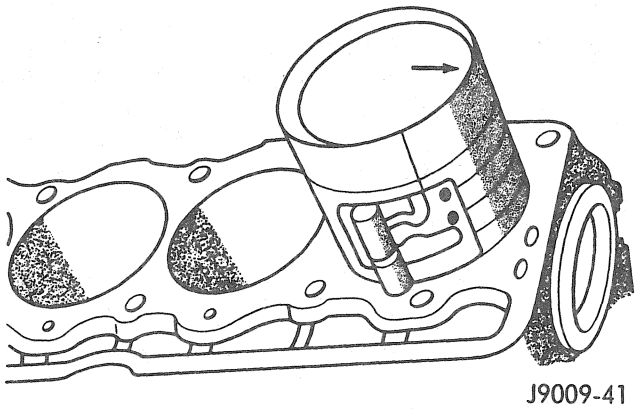


Fig. 54 Rod and Piston Assembly Installation

(6) Raise the vehicle.

(7) Each bearing insert is fitted to its respective journal to obtain the specified clearance between the bearing and the journal. In production, the select fit is obtained by using various-sized, color-coded bearing inserts as listed in the Connecting Rod Bearing Fitting Chart. The color code appears on the edge of the bearing insert. The size is not stamped on inserts used for production of engines.

(8) The rod journal is identified during the engine production by a color-coded paint mark on the adjacent cheek or counterweight toward the flange (rear) end of the crankshaft. The color codes used to indicate journal sizes are listed in the Connecting Rod Bearing Fitting Chart.

(9) When required, upper and lower bearing inserts of different sizes may be used as a pair (refer to Connecting Rod Bearing Fitting Chart). A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce clearance 0.013 mm (0.0005 inch).

CAUTION: DO NOT intermix bearing caps. Each connecting rod and bearing cap are stamped with the cylinder number. The stamp is located on a machined surface adjacent to the oil squirt hole that faces the camshaft side of the cylinder block.

(10) Install the connecting rod bearing caps and inserts in the same positions as removed.

CAUTION: Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

(11) Install the oil pan and gaskets as outlined in the installation procedure.

(12) Lower the vehicle.

(13) Install the engine cylinder head, push rods, rocker arms, bridges, pivots and engine cylinder head cover.

(14) Fill the crankcase with engine oil.

REAR MAIN OIL SEALS

The crankshaft rear main bearing oil seal consists of two half pieces of viton with a single lip that effectively seals the rear of the crankshaft. Replace the upper and lower seal halves as a unit to ensure leak-free operation.

REMOVAL

(1) Remove the engine flywheel or converter drive plate.

(2) Remove the oil pan.

(3) Remove the rear main bearing cap (No.7).

(4) Push the upper seal out of the groove. Ensure that the crankshaft and seal groove are not damaged.

(5) Remove the lower half of the seal from the bearing cap.

INSTALLATION

(1) Wipe the seal surface area of the crankshaft until it is clean.

(2) Apply a thin coat of engine oil.

(3) Coat the lip of the seal with engine oil.

(4) Carefully position the upper seal into the groove in the cylinder block. The lip of the seal faces toward the front of the engine.

(5) Place the lower half of the seal into bearing cap No.7 (Fig. 55).

REMOVAL AND INSTALLATION (Continued)

(6) Coat the outer curved surface of the lower seal with soap and the lip of the seal with engine oil (Fig. 55).

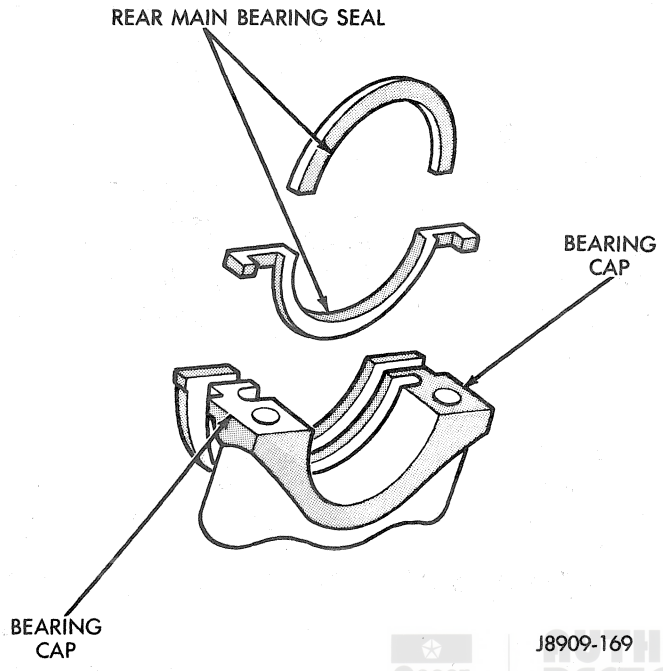


Fig. 55 Rear Main Bearing Oil Seal

(7) Position the lower seal into the bearing cap recess and seat it firmly. Be sure the seal is flush with the cylinder block pan rail.

(8) Apply Loctite 518, or equivalent on the rear bearing cap (Fig. 56). The bead should be 3 mm (0.125 in) thick. DO NOT apply Loctite 518, or equivalent to the lip of the seal.

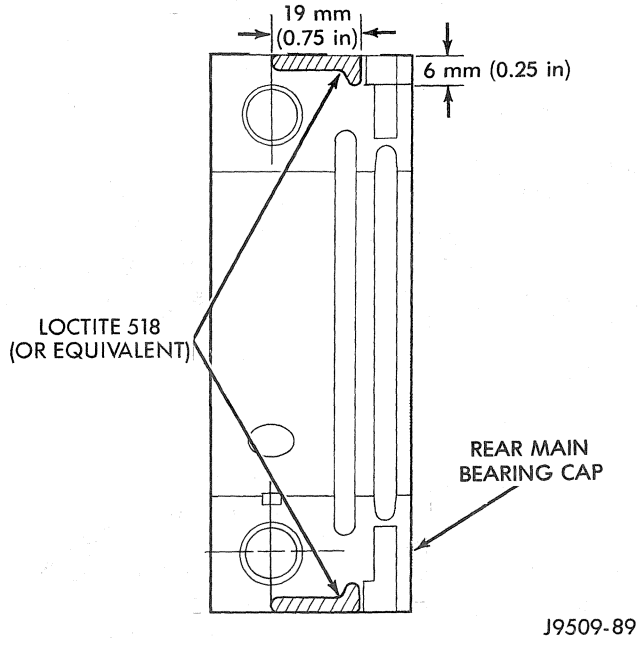


Fig. 56 Location of Loctite 518 (or equivalent)

(9) Install the rear main bearing cap. DO NOT strike the cap more than twice for proper engagement.

(10) Tighten all main bearing bolts to 108 N·m (80 ft. lbs.) torque.

(11) Install the oil pan gasket and oil pan.

(12) Install the engine flywheel or converter drive plate.

OIL PUMP

A gear-type oil pump is mounted at the underside of the cylinder block opposite the No.4 main bearing.

The pump incorporates a nonadjustable pressure relief valve to limit maximum pressure to 517 kPa (75 psi). In the relief position, the valve permits oil to bypass through a passage in the pump body to the inlet side of the pump.

Oil pump removal or replacement will not affect the distributor timing because the distributor drive gear remains in mesh with the camshaft gear.

REMOVAL

(1) Drain the engine oil.

(2) Remove the oil pan.

(3) Remove the pump-to-cylinder block attaching bolts. Remove the pump assembly with gasket (Fig. 57).

CAUTION: If the oil pump is not to be serviced, DO NOT disturb position of oil inlet tube and strainer assembly in pump body. If the tube is moved within the pump body, a replacement tube and strainer assembly must be installed to assure an airtight seal.

INSTALLATION

(1) Install the oil pump on the cylinder block using a replacement gasket. Tighten the bolts to 23 N·m (17 ft. lbs.) torque.

(2) Install the oil pan.

(3) Fill the oil pan with oil to the specified level.

TIMING CASE COVER OIL SEAL

This procedure is done with the timing case cover installed.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt.

(3) Remove the vibration damper.

(4) Remove the radiator shroud.

(5) Carefully remove the oil seal. Make sure seal bore is clean.

REMOVAL AND INSTALLATION (Continued)

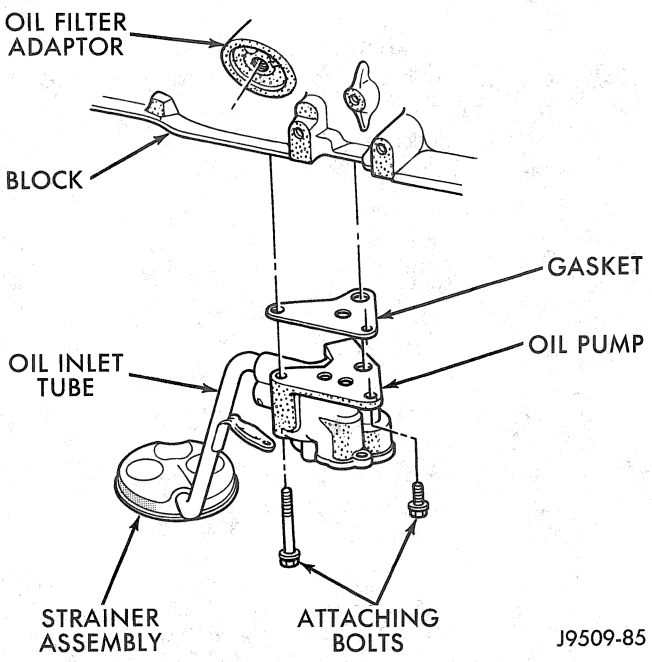


Fig. 57 Oil Pump Assembly

INSTALLATION

(1) Position the replacement oil seal on Timing Case Cover Alignment and Seal Installation Tool 6139 with seal open end facing inward. Apply a light film of Perfect Seal, or equivalent, on the outside diameter of the seal. Lightly coat the crankshaft with engine oil.

(2) Position the tool and seal over the end of the crankshaft and insert a draw screw tool into Seal Installation Tool 6139 (Fig. 58). Tighten the nut against the tool until it contacts the cover.

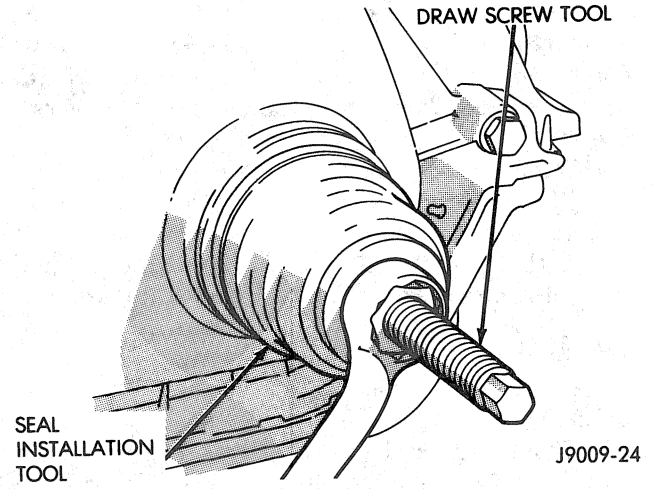


Fig. 58 Timing Case Cover Oil Seal Installation

(3) Remove the tools. Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(4) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(5) Install the serpentine belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(6) Install the radiator shroud.

(7) Connect negative cable to battery.

DISASSEMBLY AND ASSEMBLY

VALVE SERVICE

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

Clean all grime and gasket material from the engine cylinder head machined gasket surface.

Inspect for cracks in the combustion chambers and valve ports.

Inspect for cracks on the exhaust seat.

Inspect for cracks in the gasket surface at each coolant passage.

Inspect valves for burned, cracked or warped heads.

Inspect for scuffed or bent valve stems.

Replace valves displaying any damage.

VALVE REFACING

(1) Use a valve refacing machine to reface the intake and exhaust valves to the specified angle.

(2) After refacing, a margin of at least 0.787 mm (0.031 inch) must remain (Fig. 59). If the margin is less than 0.787 mm (0.031 inch), the valve must be replaced.

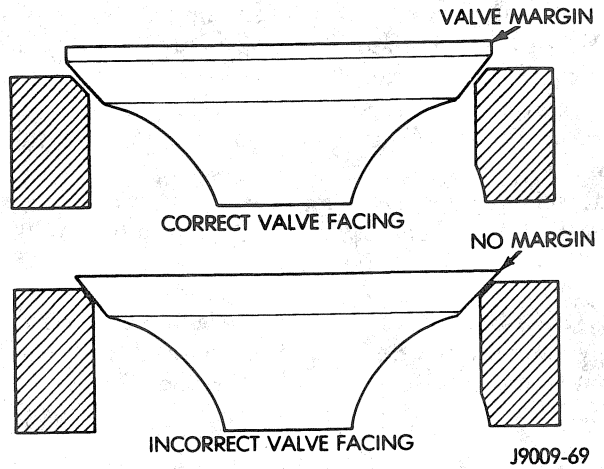


Fig. 59 Valve Facing Margin

DISASSEMBLY AND ASSEMBLY (Continued)

VALVE SEAT REFACING

(1) Install a pilot of the correct size in the valve guide bore. Reface the valve seat to the specified angle with a good dressing stone. Remove only enough metal to provide a smooth finish.

(2) Use tapered stones to obtain the specified seat width when required.

(3) Control valve seat runout to a maximum of 0.0635 mm (0.0025 in.) (Fig. 60).

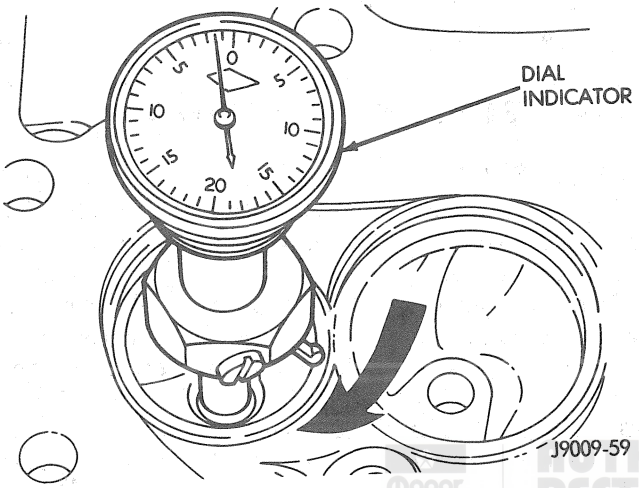


Fig. 60 Measurement of Valve Seat Runout

VALVE STEM OIL SEAL REPLACEMENT

Valve stem oil seals are installed on each valve stem to prevent rocker arm lubricating oil from entering the combustion chamber through the valve guide bores. One seal is marked INT (intake valve) and the other is marked EXH (exhaust valve).

Replace the oil seals whenever valve service is performed or if the seals have deteriorated.

VALVE GUIDES

The valve guides are an integral part of the engine cylinder head and are not replaceable.

When the valve stem guide clearance is excessive, the valve guide bores must be reamed oversize. Service valves with oversize stems are available in 0.076 mm (0.003 inch) and 0.381 mm (0.015 inch) increments.

Corresponding oversize valve stem seals are also available and must be used with valves having 0.381 mm (0.015 inch) oversize stems.

NOTE: If the valve guides are reamed oversize, the valve seats must be ground to ensure that the valve seat is concentric to the valve guide.

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

Valve stem-to-guide clearance may be measured by either of the following two methods.

PREFERRED METHOD

(1) Remove the valve from the head.

(2) Clean the valve stem guide bore with solvent and a bristle brush.

(3) Insert a telescoping gauge into the valve stem guide bore approximately 9.525 mm (.375 inch) from the valve spring side of the head (Fig. 61).

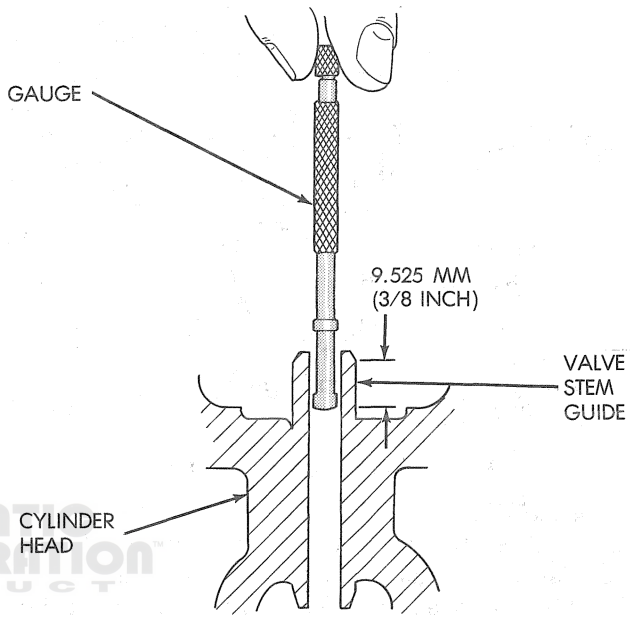


Fig. 61 Measurement of Valve Guide Bore Diameter

(4) Remove and measure telescoping gauge with a micrometer.

(5) Repeat the measurement with contacts lengthwise to engine cylinder head.

(6) Compare the crosswise to lengthwise measurements to determine out-of-roundness. If the measurements differ by more than 0.0635 mm (0.0025 in.), ream the guide bore to accommodate an oversize valve stem.

(7) Compare the measured valve guide bore diameter with specifications (7.95-7.97 mm or 0.313-0.314 inch). If the measurement differs from specification by more than 0.076 mm (0.003 inch), ream the guide bore to accommodate an oversize valve stem.

ALTERNATIVE METHOD

(1) Use a dial indicator to measure the lateral movement of the valve stem (stem-to-guide clearance). This must be done with the valve installed in its guide and just off the valve seat (Fig. 62).

(2) Correct clearance is 0.025-0.0762 mm (0.001-0.003 inch). If indicated movement exceeds the specification ream the valve guide to accommodate an oversize valve stem.

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: Valve seats must be ground after reaming the valve guides to ensure that the valve seat is concentric to the valve guide.

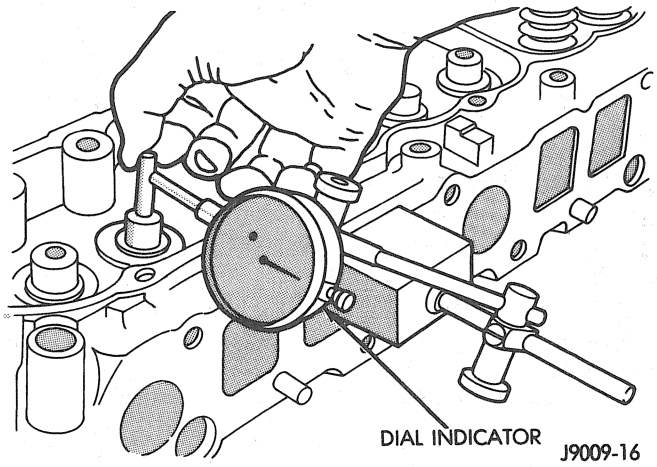


Fig. 62 Measurement of Lateral Movement of Valve Stem

VALVE SPRING TENSION TEST

Use a universal Valve Spring Tester and a torque wrench to test each valve spring for the specified tension value (Fig. 63).

Replace valve springs that are not within specifications.

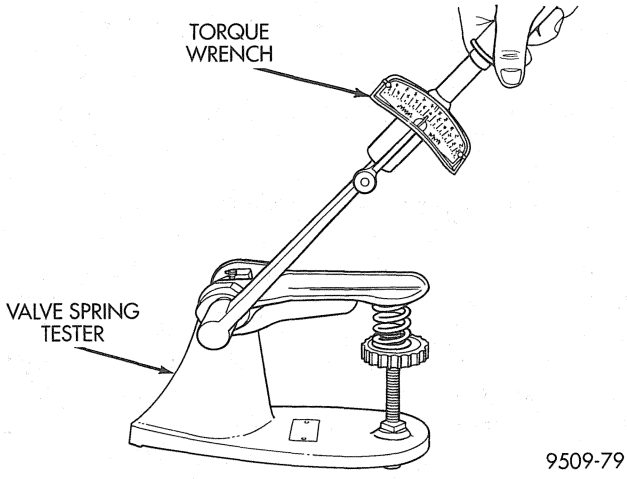


Fig. 63 Valve Spring Tester

CYLINDER BLOCK

DISASSEMBLY

Refer to the applicable sections for detailed instructions.

(1) Drain the engine oil. Remove and discard the oil filter.

(2) Remove the water pump from the cylinder block.

(3) Remove the vibration damper.

(4) Remove the timing case cover and lay the cover upside down.

(5) Position a drift punch into the slot in the back of the cover and tap the old seal out.

(6) Remove the oil slinger from crankshaft.

(7) Remove the camshaft retaining bolt and remove the sprockets and chain as an assembly.

(8) Remove the camshaft.

(9) Remove the oil pan and gasket.

(10) Remove the front and rear oil galley plugs.

(11) Remove the oil pump.

(12) Remove the connecting rods and the pistons. Remove the connecting rod and piston assemblies through the top of the cylinder bores.

(13) Remove the crankshaft.

ASSEMBLY

Refer to the applicable sections for detailed instructions.

(1) Install the crankshaft.

(2) Install the connecting rods and the pistons through the top of the cylinder bores.

(3) Install the oil pump.

(4) Install the oil pan and gasket.

(5) Install the camshaft.

(6) Install the sprockets and chain as an assembly.

(7) Install the oil slinger from the crankshaft.

(8) Install the timing case cover seal.

(9) Install the timing case cover.

(10) Install the vibration damper.

(11) Install the water pump. Tighten the mounting bolts to 31 N·m (270 in. lbs.) torque.

(12) Lubricate the oil filter seal with clean engine oil. Tighten oil filter to 18 N·m (13 ft. lbs.) torque.

(13) Install the engine into the vehicle.

(14) Fill the engine with clean lubrication oil (refer to Group 0, Lubrication and Maintenance).

(15) Fill the cooling system.

CLEANING AND INSPECTION

ENGINE CYLINDER HEAD

CLEANING

Thoroughly clean the engine cylinder head and cylinder block mating surfaces. Clean the intake and engine exhaust manifold and engine cylinder head mating surfaces. Remove all gasket material and carbon.

Check to ensure that no coolant or foreign material has fallen into the tappet bore area.

Remove the carbon deposits from the combustion chambers and top of the pistons.

CLEANING AND INSPECTION (Continued)

INSPECTION

Use a straightedge and feeler gauge to check the flatness of the engine cylinder head and block mating surfaces.

ENGINE CYLINDER HEAD COVER

CLEANING

Remove any original sealer from the cover sealing surface of the engine cylinder head and clean the surface using a fabric cleaner.

Remove all residue from the sealing surface using a clean, dry cloth.

INSPECTION

Inspect the engine cylinder head cover for cracks. Replace the cover, if cracked.

The original dark grey gasket material should NOT be removed. If sections of the gasket material are missing or are compressed, replace the engine cylinder head cover. However, sections with minor damage such as small cracks, cuts or chips may be repaired with a hand held applicator. The new material must be smoothed over to maintain gasket height. Allow the gasket material to cure prior to engine cylinder head cover installation.

ROCKER ARMS AND PUSH RODS

CLEANING

Clean all the components with cleaning solvent.

Use compressed air to blow out the oil passages in the rocker arms and push rods.

INSPECTION

Inspect the pivot surface area of each rocker arm. Replace any that are scuffed, pitted, cracked or excessively worn.

Inspect the valve stem tip contact surface of each rocker arm and replace any rocker arm that is deeply pitted.

Inspect each push rod end for excessive wear and replace as required. If any push rod is excessively worn because of lack of oil, replace it and inspect the corresponding hydraulic tappet for excessive wear.

Inspect the push rods for straightness by rolling them on a flat surface or by shining a light between the push rod and the flat surface.

A wear pattern along the length of the push rod is not normal. Inspect the engine cylinder head for obstruction if this condition exists.

HYDRAULIC TAPPETS

CLEANING

Clean each tappet assembly in cleaning solvent to remove all varnish, gum and sludge deposits.

INSPECTION

Inspect for indications of scuffing on the side and base of each tappet body.

Inspect each tappet base for concave wear with a straightedge positioned across the base. If the base is concave, the corresponding lobe on the camshaft is also worn. Replace the camshaft and defective tappets.

LEAK-DOWN TEST

After cleaning and inspection, test each tappet for specified leak-down rate tolerance to ensure zero-lash operation (Fig. 64).

Swing the weighted arm of the hydraulic valve tappet tester away from the ram of the Leak-Down Tester.

(1) Place a 7.925-7.950 mm (0.312-0.313 inch) diameter ball bearing on the plunger cap of the tappet.

(2) Lift the ram and position the tappet (with the ball bearing) inside the tester cup.

(3) Lower the ram, then adjust the nose of the ram until it contacts the ball bearing. DO NOT tighten the hex nut on the ram.

(4) Fill the tester cup with hydraulic valve tappet test oil until the tappet is completely submerged.

(5) Swing the weighted arm onto the push rod and pump the tappet plunger up and down to remove air. When the air bubbles cease, swing the weighted arm away and allow the plunger to rise to the normal position.

(6) Adjust the nose of the ram to align the pointer with the SET mark on the scale of the tester and tighten the hex nut.

(7) Slowly swing the weighted arm onto the push rod.

(8) Rotate the cup by turning the handle at the base of the tester clockwise one revolution every 2 seconds.

(9) Observe the leak-down time interval from the instant the pointer aligns with the START mark on the scale until the pointer aligns with the 0.125 mark. A normally functioning tappet will require 20-110 seconds to leak-down. Discard tappets with leak-down time interval not within this specification.

CYLINDER BLOCK

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole, the filter bypass hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

CLEANING AND INSPECTION (Continued)

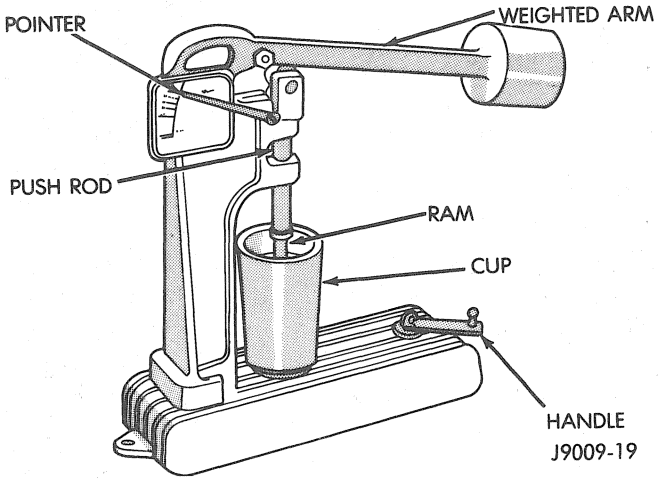


Fig. 64 Leak-Down Tester

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 41 N·m (30 ft. lbs.) torque.

INSPECTION—CYLINDER BORE

(1) It is mandatory to use a dial bore gauge to measure each cylinder bore diameter (Fig. 65). To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.

(3) Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.

(4) Determine taper by subtracting the smaller diameter from the larger diameter.

(5) Rotate measuring device 90° and repeat steps above.

(6) Determine out-of-roundness by comparing the difference between each measurement.

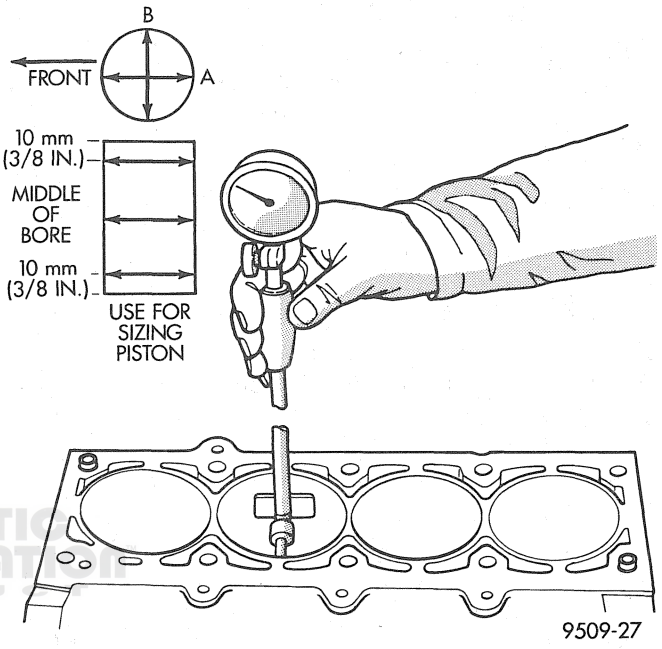


Fig. 65 Cylinder Bore Measurement

(7) If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder must be bored and then honed to accept an oversize piston. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

HONING—CYLINDER BORE

The honing operation should be closely coordinated with the fitting of pistons and rings. This will ensure specified clearances are maintained.

Refer to Standard Service Procedures in the beginning of this Group for the proper honing of cylinder bores.

SPECIFICATIONS

4.0L ENGINE SPECIFICATIONS

Camshaft
Hydraulic Tappet Clearance . . . . . .Zero Lash
Bearing Clearance. . . . . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Bearing Journal Diameter
No. 1 . . . . . .51.54 to 51.56 mm (2.029 to 2.030 in.)
No. 2 . . . . . .51.28 to 51.31 mm (2.019 to 2.020 in.)
No. 3 . . . . . .51.03 to 51.05 mm (2.009 to 2.010 in.)
No. 4 . . . . . .50.78 to 50.80 mm (1.999 to 2.000 in.)
Base Circle Runout . . . . . .0.03 mm - max. (0.001 in. - max.)
Valve Lift . . . . . .10.29 mm (0.405 in.)
Intake Valve Timing
Opens . . . . . .12.4° BTDC
Closes . . . . . .60.9° ABDC
Exhaust Valve Timing
Opens . . . . . .49.8 BBDC
Closes. . . . . .29.2° ATDC
Valve Overlap. . . . . .42.6°
Intake Duration . . . . . .253.3°
Exhaust Duration. . . . . .259.°
Crankshaft
End Play . . .0.038 to 0.165 mm (0.0015 to 0.0065 in.)
Main Bearing Journal Diameter No.
1-6 . . . .63.489 to 63.502 mm (2.4996 to 2.5001 in.)
Main Bearing Journal Diameter No.
7. . . . . .63.449 to 63.487 mm (2.4980 to 2.4995 in.)
Main Bearing Journal Width
No. 1 . . . . . .27.58 to 27.89 mm (1.086 to 1.098 in.)
Main Bearing Journal Width
No. 3 . . . . . .32.28 to 32.33 mm (1.271 to 1.273 in.)
Main Bearing Journal Width No.
2-4-5-6-7 . . .30.02 to 30.18 mm (1.182 to 1.188 in.)
Main Bearing Clearance . . . . . .0.03 to 0.06 mm (0.001 to 0.0025 in.)
Main Bearing Clearance (Preferred) . . . . . .0.051 mm (0.002 in.)
Connecting Rod Journal Diameter . . . .53.17 to 53.23 mm (2.0934 to 2.0955 in.)
Connecting Rod Journal Width . . .27.18 to 27.33 mm (1.070 to 1.076 in.)
Out-of-Round (Max. All Journals) . . . . . .0.013 mm (0.0005 in.)
Taper (Max. – All Journals) . . . . . .0.013 mm (0.0005 in.)
Cylinder Block
Deck Height. . . . . .240.03 to 240.18 mm (9.450 to 9.456 in.)
Deck Clearance (Below Block) . . . . . .0.546 mm (0.0215 in.)
Cylinder Bore Diameter— Standard . .98.45 to 98.48 mm (3.8759 to 3.8775 in.)
Cylinder Bore Diameter— Taper (Max.) . . .0.025 mm (0.001 in.)
Cylinder Bore Diameter— Out-of-Round . .0.025 mm (0.001 in.)
Tappet Bore Diameter . . . . . .23.000 to 23.025 mm (0.9055 to 0.9065 in.)
Flatness. . . .0.03 mm per 25 mm (0.001 in. per 1 in.)
Flatness. . .0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max. . . . . .0.20 mm max. for total length (0.008 in. max. for total length)
Main Bearing Bore Diameter. . . . . .68.3514 to 68.3768 mm (2.691 to 2.692 in.)
Connecting Rods
Total Weight (Less Bearing) . . . . . .657 to 665 grams (23.17 to 23.45 oz.)
Length (Center-to-Center) . . . . .155.52 to 155.62 mm (6.123 to 6.127 in.)
Piston Pin Bore Diameter . . . . . .23.59 to 23.62 mm (0.9288 to 0.9298 in.)
Bore (Less Bearings) . . . . . .56.08 to 56.09 mm (2.2080 to 2.2085 in.)
Bearing Clearance.0.025 to 0.076 mm (0.001 to 0.003 in.)
Bearing Clearance (Preferred). . . .0.044 to 0.050 mm (0.0015 to 0.0020 in.)
Side Clearance . .0.25 to 0.48 mm (0.010 to 0.019 in.)
Twist (Max.) . .0.001 mm per mm (0.001 in. per inch)
Bend Max.) . .0.001 mm per mm (0.001 in. per inch.)
Cylinder Compression Pressure
Ratio. 8.7:1
Pressure Range. . . .827 to 1,034 kPa (120 to 150 psi)
Max. Variation Between Cylinders . .206 kPa (30 psi)
Cylinder Head
Combustion Chamber. . . . . .52.22 to 58.22 cc (3.37 to 3.55 cu. in.)
Valve Guide I.D. (Integral). . . . . .7.9 mm (0.312 in.)
Valve Stem-to-Guide Clearance. . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Intake Valve Seat Angle . . . . . .44.5°
Exhaust Valve Seat Angle . . . . . .44.5°
Valve Seat Width . . . . . .1.02 to 1.52 mm (0.040 to 0.060 in.)
Valve Seat Runout . . . . . .0.064 mm (0.0025 in.)
Flatness. . . .0.03 mm per 25 mm (0.001 in. per 1 in.)
Flatness. . .0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max. . . . . .0.20 mm - max. for total length (0.008 in. max. for total length)
Rocker Arms, Push Rods & Tappets
Rocker Arm Ratio 1.6:1
Push Rod Length . . . . . .244.856 to 245.364 mm (9.640 to 9.660 in.)
Push Rod Diameter. . . . . .7.92 to 8.00 mm (0.312 to 0.315 in.)

SPECIFICATIONS (Continued)

Hydraulic Tappet Diameter . . . .22.962 to 22.974 mm (0.904 to 0.9045 in.)
Tappet-to-Bore Clearance . .0.025 to 0.063 mm (0.001 to 0.0025 in.)
Valves
Length (Tip-to-Gauge Dimension Line)
Intake . . .122.479 to 122.860 mm (4.822 to 4.837 in.)
Length (Tip-to-Gauge Dimension Line)
Exhaust. .122.860 to 123.241 mm (4.837 to 4.852 in.)
Valve Stem Diameter . . .7.899 to 7.925 mm (0.311 to 0.312 in.)
Stem-to-Guide Clearance . .0.025 to 0.076 mm (0.001 to 0.003 in.)
Valve Head Diameter—Intake. .48.387 to 48.641 mm (1.905 to 1.915 in.)
Valve Head Diameter—Exhaust . . . .37.973 to 38.227 mm (1.495 to 1.505 in.)
Valve Face Angle—Intake . . . . . .45°
Valve Face Angle—Exhaust. . . . . .45°
Tip Refinishing (Max. Allowable) .0.25 mm (0.010 in.)
Valve Springs
Free Length (Approx.) . . . . . .47.65 mm (1.876 in.)
Spring Tension—Valve Closed . . . . . .271 to 307 N @ 41.656 mm (61 to 69 lbf. @ 1.64 in.)
Spring Tension—Valve Open. . . . .818.5 to 871.9 N @ 30.89 mm (184 to 196 lbf @ 1.216 in.)
Inside Diameter . . . . . .21.0 mm to 21.51 mm (0.827 to 0.847 in.)
Pistons
Weight (Less Pin) . . . . . .563 to 567 grams (19.86 to 20.00 oz.)
Piston Pin Bore (Centerline to Piston Top) . .40.61 to 40.72 mm (1.599 to 1.603 in.)
Piston-to-Bore Clearance. . . . . .0.033 to 0.053 mm (0.0013 to 0.0021 in.)
Piston-to-Bore Clearance (Preferred) . .0.033 to 0.038 mm (0.0013 to 0.0015 in.)
Ring Gap Clearance— Top Compression Ring . . . . .0.229 to 0.610mm (0.0090 to 0.0240 in.)
Ring Gap Clearance— 2nd Compression Ring. . . . .0.483 to 0.965 mm (0.0190 to 0.0380 in.)
Ring Gap Clearance—Oil Control Steel Rails . . . . . .0.254 to 1.500 mm (0.010 to 0.060 in.)
Ring Side Clearance—Compression Rings . . . .0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Ring Side Clearance—Oil Control Rings. . . . . .0.06 to 0.21 mm (0.0024 to 0.0083 in.)
Piston Ring Groove Height—Compression Rings . . . .1.530 to 1.555 mm (0.0602 to 0.0612 in.)
Piston Ring Groove Height—Oil Control Ring. . . . .4.035 to 4.060 mm (0.1589 to 0.1598 in.)
Piston Ring Groove Diameter—Compression Rings. . . . . .88.3 to 88.55 mm (3.476 to 3.486 in.)
Piston Ring Groove Diameter—Oil Control Ring. . . . . .90.35 to 90.60 mm (3.557 to 3.566 in.)
Piston Pin Bore Diameter . . . . .23.647 to 23.655 mm (0.9310 to 0.9313 in.)
Piston Pin Diameter . . . . . .23.637 to 23.640 mm (0.9306 to 0.9307 in.)
Piston-to-Pin Clearance . . . . .0.0076 to 0.0178 mm—Loose (0.0003 to 0.0007 in. Loose)
Piston-to-Pin Clearance (Preferred) . . . . . .0.013 mm (0.0005 in.)
Piston-to-Pin Connecting Rod (Press Fit). . . . .8.9 kN (2000 lbf.)
Oil Pump
Gear-to-Body Clearance (Radial). .0.051 to 0.102 mm (0.002 to 0.004 in.)
Gear-to-Body Clearance (Radial) (Preferred) . . .0.051 mm (0.002 in.)
Gear End Clearance—Plastigage. .0.051 to 0.152 mm (0.002 to 0.006 in.)
Gear End Clearance—Plastigage (Preferred). . .0.051 mm (0.002 in.)
Gear End Clearance—Feeler Gauge .0.1016 to 0.2032 mm (0.004 to 0.008 in.)
Gear End Clearance—Feeler Gauge (Preferred) . . . . . .0.1778 mm (0.007 in.)
Oil Pressure
At Idle Speed (600 rpm). . . . . .89.6 kPa (13 psi)
At 1600 rpm & Higher .255 to 517 kPa (37 to 75 psi)
Oil Pressure Relief . . . . . .517 kPa (75 psi)

TORQUE SPECIFICATIONS

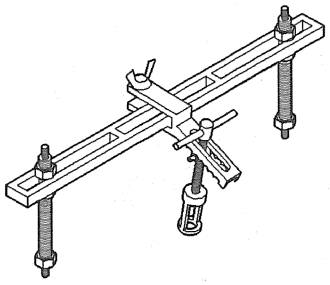
DESCRIPTION	TORQUE
A/C Compressor Bracket-to-Engine Bolts	.34 N·m (25 ft. lbs.)
A/C Compressor Mounting Bolts	.27 N·m (20 ft. lbs.)
A/C Low Pressure Service Valve Nut	.38 N·m (28 ft. lbs.)
Block Heater Nut	.1.8 N·m (16 in. lbs.)
Camshaft Sprocket Bolt	.108 N·m (80 ft. lbs.)
Connecting Rod Nuts	.45 N·m (33 ft. lbs.)
Cylinder Block Drain Plugs	.41 N·m (30 ft. lbs.)
Cylinder Head Bolts #1–10 & #12–14	.149 N·m (110 ft. lbs.)
Bolt #11.	.135 N·m (100 ft. lbs.)
Cylinder Head Cover Bolts	.13 N·m (115 in. lbs.)
Engine Mounts—Front Support Bracket Bolts	.61 N·m (45 ft. lbs.)
Support Cushion Bolts/Nuts	.41 N·m (30 ft. lbs.)
Support Cushion Bracket Bolts.	.54 N·m (40 ft. lbs.)
Support Cushion Bracket Stud Nuts	.41 N·m (30 ft. lbs.)

SPECIFICATIONS (Continued)

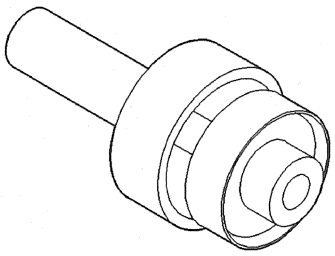
DESCRIPTION	TORQUE
Support Cushion Thru-Bolt	65 N·m (48 ft. lbs.)
Engine Mounts—Rear Crossmember-to-Sill Bolts (Automatic)	41 N·m (30 ft. lbs.)
Insulator Stud Assembly Nut	41 N·m (30 ft. lbs.)
Support Cushion/Crossmember Nuts	22 N·m (192 in. lbs.)
Support Cushion/Bracket Nuts (Manual)	75 N·m (55 ft. lbs.)
Transmission Support Bracket Bolt (Manual)	46 N·m (34 ft. lbs.)
Transmission Support Bracket/ Cushion Bolt (4WD Auto)	75N·m (55 ft. lbs.)
Transmission Support Adaptor Bracket Bolts (2WD Auto)	75N·m (55 ft. lbs.)
Exhaust Manifold/Pipe Nuts	27 N·m (20 ft. lbs.)
Flywheel/Converter Housing Bolts	38 N·m (28 ft. lbs.)
Flywheel/Crankshaft Bolts	143 N·m (105 ft. lbs.)
Front Cover-to-Block Bolts 1/4–20	7N·m (60 in. lbs.)
Bolts 5/16–18	22N·m (192 in. lbs.)
Fuel Pump Bolts	22 N·m (16 ft. lbs.)
Generator Adjusting Bolt	24 N·m (18 ft. lbs.)
Pivot Bolt/Nut	38 N·m (28 ft. lbs.)
Main Bearing Bolts	108 N·m (80 ft. lbs.)
Oil Filter Filter	18 N·m (13 ft. lbs.)
Oil Filter Adaptor Bolts	102 N·m (75 ft. lbs.)
Oil Galley Plug	41 N·m (30 ft. lbs.)
Oil Pan 1/4–20 Bolts	14 N·m (129 in. lbs.)
5/16–18 Bolts	18 N·m (156 in. lbs.)
Drain Plug	34 N·m (25 ft. lbs.)
Oil Pump Short Attaching Bolts	14 N·m (10 ft. lbs.)
Long Attaching Bolts	23 N·m (17 ft. lbs.)
Cover Bolts	8 N·m (70 in. lbs.)
Power Steering Pump Pressure Hose Nut	52 N·m (38 ft. lbs.)
Rocker Arm Assembly-to-Cylinder Head Capscrews	28 N·m (21ft. lbs.)
Spark Plugs Plugs	37 N·m (27 ft. lbs.)
Starting Motor Mounting Bolts	45 N·m (33 ft. lbs.)
Thermostat Housing Bolts	18 N·m (13 ft. lbs.)
Vibration Damper Bolts	108 N·m (80 ft. lbs.)
Water Pump/Block Bolts	31 N·m (270 in. lbs.)

SPECIAL TOOLS

4.0L ENGINE

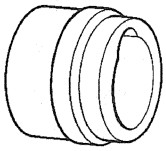


Valve Spring Compressor Tool MD-998772A

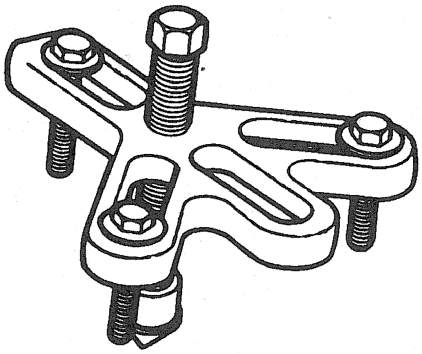


Rear Main Seal Installer Tool 6271A

Mopar AUTHENTIC RESTORATION PRODUCT



Timing Case Cover Alignment and Seal installation Tool 6139



Vibration Damper Removal Tool 7697

EXHAUST SYSTEM AND INTAKE MANIFOLD

CONTENTS

	page		page
GENERAL INFORMATION		EXHAUST MANIFOLD—2.5L ENGINE	7
CATALYTIC CONVERTER	1	EXHAUST MANIFOLD—4.0L ENGINE	8
EXHAUST HEAT SHIELDS	2	EXHAUST PIPE	3
EXHAUST SYSTEM	1	INTAKE MANIFOLD—2.5L ENGINE	5
DIAGNOSIS AND TESTING		INTAKE MANIFOLD—4.0L ENGINE	6
EXHAUST SYSTEM DIAGNOSIS	2	MUFFLER AND EXHAUST TAILPIPE	4
REMOVAL AND INSTALLATION		**SPECIFICATIONS**	
CATALYTIC CONVERTER	3	TORQUE SPECIFICATIONS	8

GENERAL INFORMATION

EXHAUST SYSTEM

The basic exhaust system consists of an engine exhaust manifold, exhaust pipe with oxygen sensor, catalytic converter with oxygen sensor, exhaust heat shield(s), muffler and exhaust tailpipe (Fig. 1).

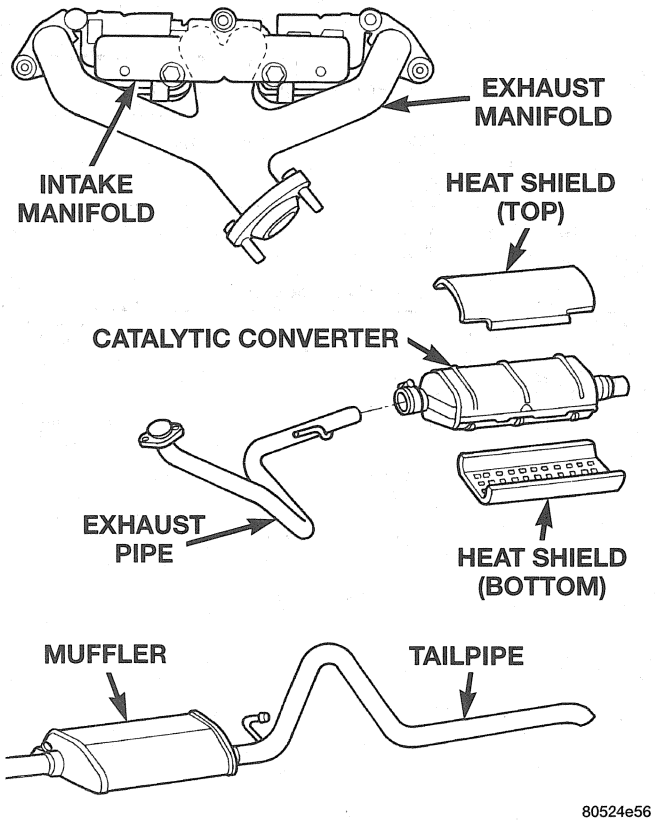


Fig. 1 Typical Exhaust System

The exhaust system uses a single muffler with a catalytic converter consisting of dual ceramic monoliths.

The 4.0L engines use a seal between the engine exhaust manifold and exhaust pipe to assure a tight seal and strain free connections.

The exhaust system must be properly aligned to prevent stress, leakage and body contact. If the system contacts any body panel, it may amplify objectionable noises originating from the engine or body.

When inspecting an exhaust system, critically inspect for cracked or loose joints, stripped screw or bolt threads, corrosion damage and worn, cracked or broken hangers. Replace all components that are badly corroded or damaged. DO NOT attempt to repair.

When replacement is required, use original equipment parts (or their equivalent). This will assure proper alignment and provide acceptable exhaust noise levels.

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan exhaust heat shields. Light overspray near the edges is permitted. Application of coating will result in excessive floor pan temperatures and objectionable fumes.

CATALYTIC CONVERTER

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

GENERAL INFORMATION (Continued)

Unleaded gasoline must be used to avoid contaminating the catalyst core.

EXHAUST HEAT SHIELDS

Exhaust heat shields are needed to protect both the vehicle and the environment from the high temperatures developed by the catalytic converter. The catalytic converter releases additional heat into the exhaust system. Under severe operating conditions, the temperature increases in the area of the converter. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency.

DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

DO NOT allow the engine to operate at fast idle for extended periods (over 5 minutes). This condition may result in excessive temperatures in the exhaust system and on the floor pan.

DIAGNOSIS AND TESTING

EXHAUST SYSTEM DIAGNOSIS

Mopar AUTHENTIC RESTORATION GT

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE EXHAUST NOISE	1. Leaks at pipe joints.	1. Tighten clamps at leaking joints.
	2. Burned or blown-out muffler.	2. Replace muffler assembly. Check exhaust system.
	3. Burned or rusted-out exhaust pipe.	3. Replace exhaust pipe.
	4. Exhaust pipe leaking at manifold flange.	4. Tighten connection attaching nuts.
	5. Exhaust manifold cracked or broken.	5. Replace exhaust manifold.
	6. Leak between exhaust manifold and cylinder head.	6. Tighten exhaust manifold to cylinder head stud nuts or bolts.
	7. Restriction in muffler or tail pipe.	7. Remove restriction, if possible. Replace muffler or tail pipe, as necessary.
LEAKING EXHAUST GASES	1. Leaks at pipe joints.	1. Tighten clamps at leaking joints.
	2. Damaged or improperly installed gaskets.	2. Replace gaskets, as necessary.
ENGINE HARD TO WARM UP OR WILL NOT RETURN TO NORMAL IDLE	1. Blocked crossover passage in intake manifold.	1. Remove restriction or replace intake manifold.
	2. Thermostat broken.	2. Replace thermostat.

J9311-13

Exhaust System Diagnosis

REMOVAL AND INSTALLATION (Continued)

REMOVAL AND INSTALLATION

EXHAUST PIPE

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

(1) Raise and support the vehicle.

(2) Saturate the bolts and nuts with heat valve lubricant (Fig. 2). Allow 5 minutes for penetration.

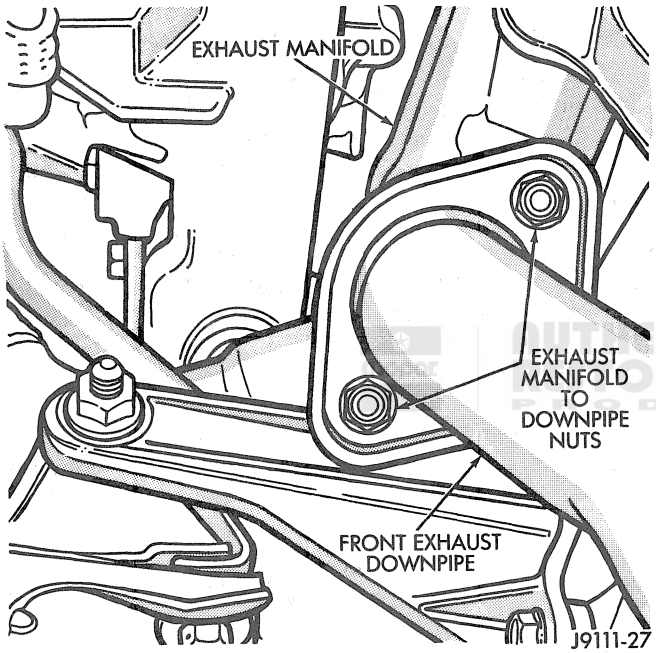


Fig. 2 Exhaust Pipe-to-Engine Exhaust Manifold Nuts

(3) Remove the oxygen sensor from the exhaust pipe (Fig. 3).

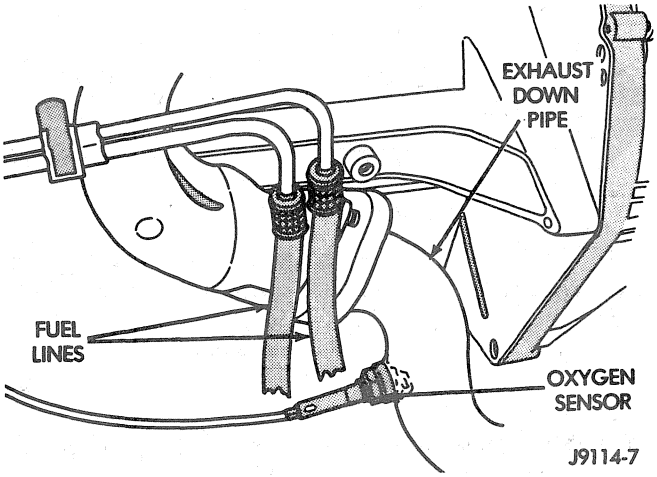


Fig. 3 Oxygen Sensor

(4) Disconnect the exhaust pipe from the engine exhaust manifold. Discard the seal (4.0L engine, only).

(5) Support the transmission and remove the rear crossmember.

(6) Remove the clamp nuts and clamp (Fig. 4). To remove the exhaust pipe from the catalytic converter, apply heat until the metal becomes cherry red. Disconnect the exhaust pipe from the catalytic converter (Fig. 4). Remove the exhaust pipe.

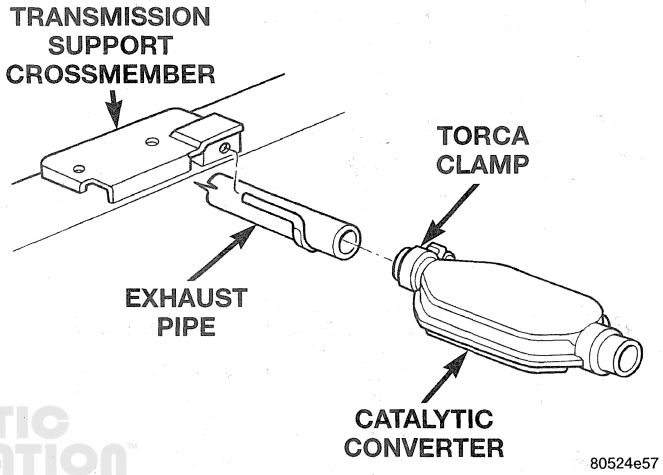


Fig. 4 Exhaust Pipe-to-Catalytic Converter Connection

INSTALLATION

(1) Assemble exhaust pipe to manifold and catalytic converter loosely to permit proper alignment of all parts.

(2) Use a new clamp and tighten the nut to 71 N·m (52 ft. lbs.) torque.

(3) Connect the exhaust pipe to the engine exhaust manifold. Install a new seal between the exhaust manifold and the exhaust pipe (4.0L engine, only). Tighten the nuts to 31 N·m (23 ft. lbs.) torque (Fig. 2).

(4) Install the rear crossmember. Tighten the crossmember-to-sill bolts to 41 N·m (30 ft. lbs.) torque. Remove the support from the transmission.

(5) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque.

(6) Lower the vehicle.

(7) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

CATALYTIC CONVERTER

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the clamp from the catalytic converter and muffler connection (Fig. 5).

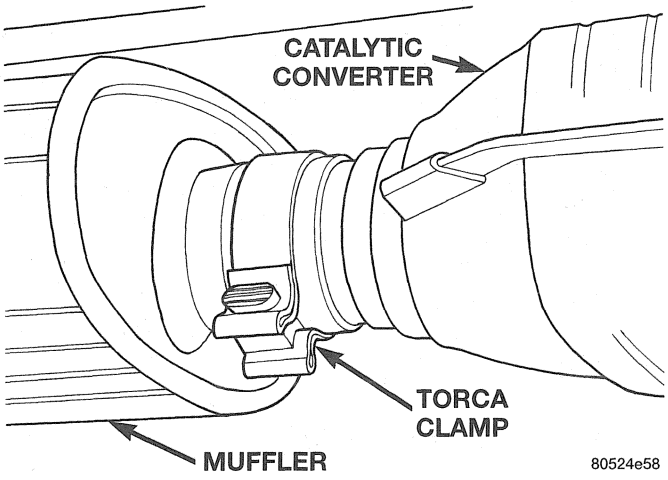


Fig. 5 Catalytic Converter-to-Muffler Connection

(3) Remove the oxygen sensor from the catalytic converter.

(4) Heat the catalytic converter and muffler connection with an oxyacetylene torch until the metal becomes cherry red.

(5) While the metal is still cherry red, twist the muffler assembly back and forth to separate it from the catalytic converter.

(6) Disconnect the exhaust pipe from the catalytic converter (Fig. 6). If needed, heat up the pipes to separate.

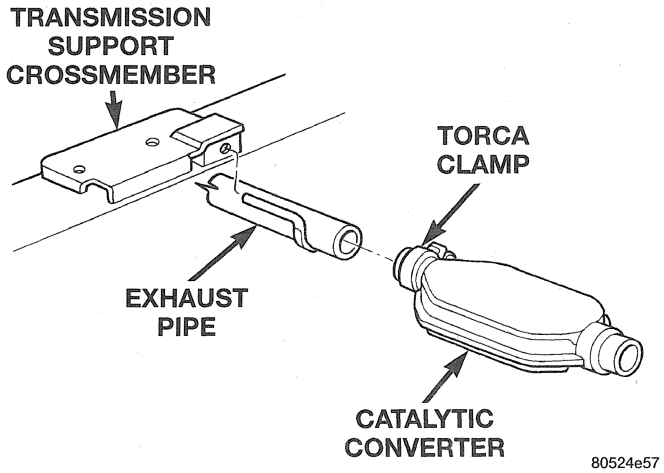


Fig. 6 Exhaust Pipe to Catalytic Converter Connection

INSTALLATION

(1) Connect the catalytic converter to the exhaust pipe (Fig. 6). Use a new clamp and tighten the nut to 71 N·m (52 ft. lbs.) torque.

(2) Install the muffler onto the catalytic converter until the alignment tab is inserted into the alignment slot.

(3) Install a new clamp at the muffler and catalytic converter connection (Fig. 5). Tighten the clamp nut to 71 N·m (52 ft. lbs.) torque.

(4) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque.

(5) Lower the vehicle.

(6) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

MUFFLER AND EXHAUST TAILPIPE

All original equipment exhaust systems are manufactured with the exhaust tailpipe welded to the muffler. Service replacement mufflers and exhaust tailpipes are either clamped together or welded together.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the front muffler clamp from the catalytic converter and muffler connection (Fig. 7).

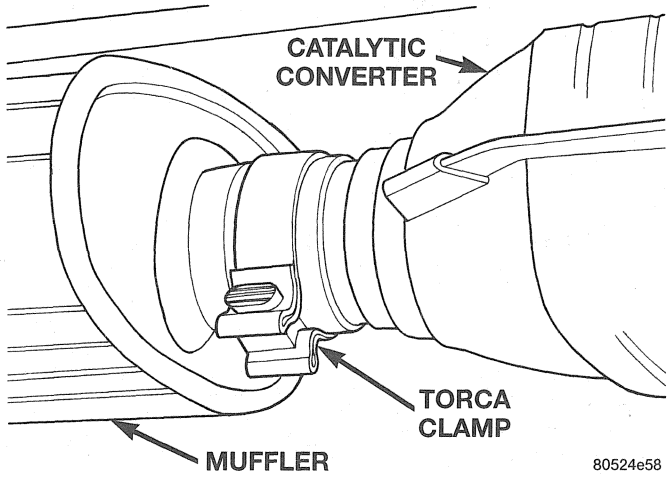


Fig. 7 Catalytic Converter to Muffler Connection

(3) Remove the rear exhaust tailpipe hanger clamp (Fig. 8) and remove the exhaust tailpipe from the front exhaust tailpipe hanger (Fig. 9).

(4) Heat the catalytic converter-to-muffler connection with an oxyacetylene torch until the metal becomes cherry red.

(5) While the metal is still cherry red, remove the exhaust tailpipe/muffler assembly from the catalytic converter.

REMOVAL AND INSTALLATION (Continued)

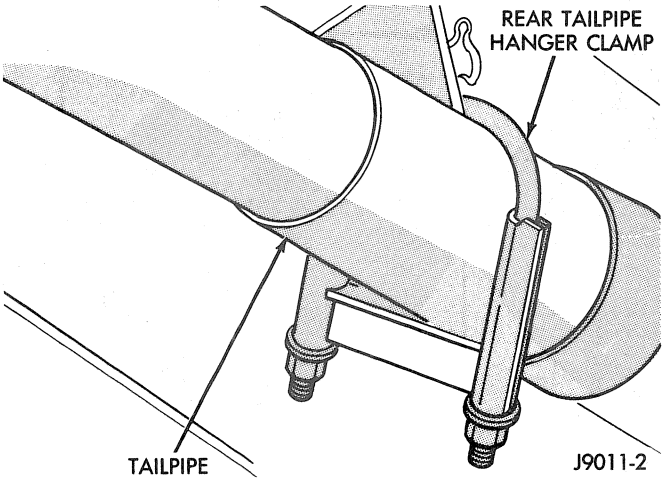


Fig. 8 Rear Exhaust Tailpipe Hanger Clamp

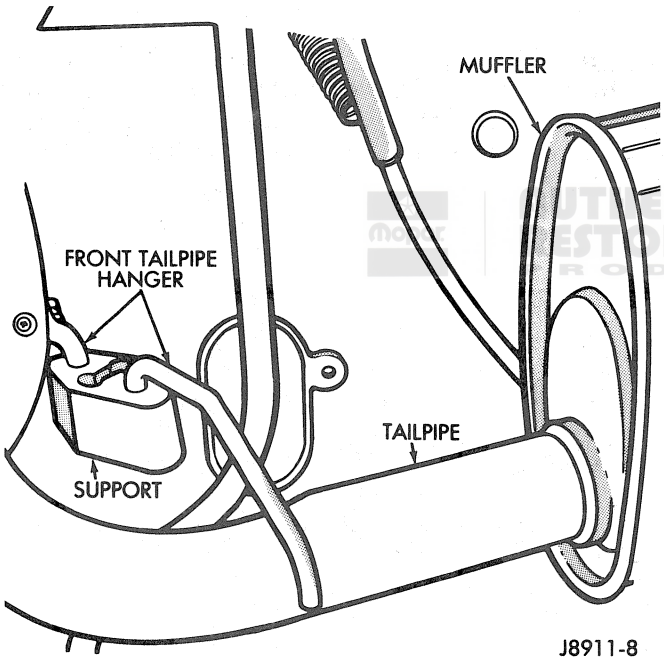


Fig. 9 Front Exhaust Tailpipe Hanger

(6) Remove the exhaust tailpipe from the muffler:

- To remove an original equipment exhaust tailpipe/muffler combination, cut the exhaust tailpipe close to the muffler. Collapse the part remaining in the muffler and remove.
- To remove a service exhaust tailpipe/muffler combination, apply heat until the metal becomes cherry red. Remove the exhaust tailpipe/muffler clamp and twist the exhaust tailpipe out of the muffler.

INSTALLATION

(1) Install the muffler onto the catalytic converter. Install the clamp and tighten the nut finger tight.

(2) Install the exhaust tailpipe into the rear of the muffler.

(3) Install the exhaust tailpipe/muffler assembly on the rear exhaust tailpipe hanger. Make sure that the exhaust tailpipe has sufficient clearance from the floor pan.

(4) Install the remaining clamps and the front exhaust tailpipe hanger.

(5) Tighten the nuts on the muffler-to-catalytic converter clamp to 71 N·m (52 ft. lbs.) torque (Fig. 7). Tighten the nuts on the rear exhaust tailpipe clamp to 14 N·m (10 ft. lbs.) torque (Fig. 8).

(6) Lower the vehicle.

(7) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

INTAKE MANIFOLD—2.5L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove the air inlet hose from the throttle body and air cleaner.

(3) Loosen the accessory drive belt tension and remove the belt from the power steering pump.

(4) Remove the power steering pump and brackets from the water pump and intake manifold. Support power steering pump and bracket with mechanics wire attached to the radiator upper crossmember.

(5) Remove the fuel tank filler cap to relieve the fuel tank pressure.

(6) Install the fuel tank filler cap.

(7) Disconnect fuel supply and return tube from the fuel rail (refer to Group 14, Fuel System - Quick Connect Fittings).

(8) Disconnect the accelerator cable from the throttle body and the holddown bracket.

CAUTION: When disconnecting the cruise control connector at the throttle body, DO NOT pry the connector off with pliers or screwdriver. Use finger pressure only. Prying the connector off could break it.

(9) Disconnect the electrical connectors. Pull the harnesses away from the manifold.

- The throttle position sensor.
- The idle speed control motor.
- The coolant temperature sensor at the thermostat.
- The manifold air temperature sensor at the intake manifold.
- The fuel injectors.
- The oxygen sensor.

(10) Disconnect the crankcase ventilation (CCV) vacuum hose and manifold absolute pressure (MAP) sensor vacuum hose connector at the intake manifold.

REMOVAL AND INSTALLATION (Continued)

(11) Disconnect vacuum hose from vacuum port on the intake manifold.

(12) Disconnect CCV hose at the cylinder head cover (Fig. 10).

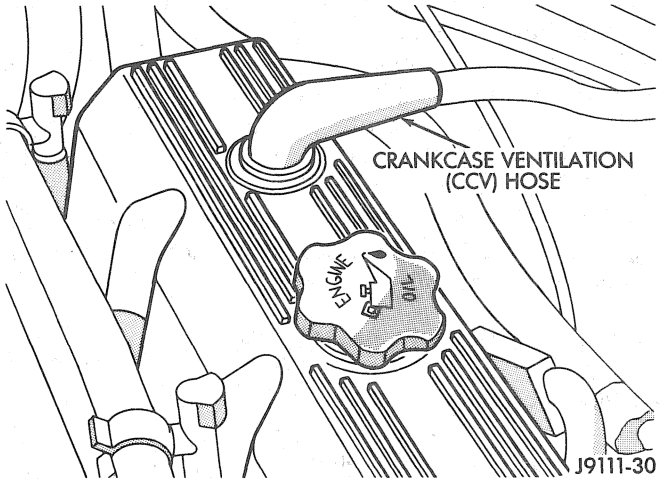


Fig. 10 Crankcase Ventilation (CCV) Hose (2.5L Engine)

(13) Remove the molded vacuum harness.

(14) Disconnect the vacuum brake booster hose at the intake manifold.

(15) Remove bolts 2 through 5 securing the intake manifold to the cylinder head (Fig. 10). Slightly loosen bolt No.1 and nuts 6 and 7.

(16) Remove the intake manifold and gaskets. Drain the coolant from the manifold.

INSTALLATION

(1) Clean the intake manifold and cylinder head mating surfaces. **DO NOT allow foreign material to enter either the intake manifold or the ports in the cylinder head.**

(2) Install the new intake manifold gasket over the locating dowels.

(3) Position the manifold in place and finger tighten the mounting bolts.

(4) Tighten the fasteners in sequence and to the specified torque (Fig. 10).

- Fastener No.1—Tighten to 41 N·m (30 ft. lbs.) torque.
- Fasteners Nos.2 through 7—Tighten to 31 N·m (23 ft. lbs.) torque.

(5) Connect the fuel return and supply tube to the connector next to the fuel rail. Push them into the fitting until a click is heard. Verify that the connections are complete.

- First, ensure only the retainer tabs protrude from the connectors.
- Second, pull out on the fuel tubes to ensure they are locked in place.

(6) Connect the molded vacuum hoses to the vacuum port on the intake manifold and the cylinder head cover.

(7) Connect the electrical connectors.

- The throttle position sensor.
- The automatic idle speed control motor.
- The coolant temperature sensor at the thermostat housing.
- The fuel injectors.
- The air manifold temperature sensor.
- The oxygen sensor.

(8) Connect the CCV vacuum hose and MAP sensor vacuum hose connectors to the throttle body.

(9) Install the power steering pump and bracket assembly to the water pump and intake manifold.

(10) Connect the accelerator cable and cruise control cable to the holddown bracket and the throttle arm.

CAUTION: Ensure that the accessory drive belt is routed correctly. Failure to do so can cause the water pump to turn in the opposite direction resulting in engine overheating. Refer to Group 7, Cooling System for the proper procedure.

(11) Tension the accessory drive belt. Refer to Group 7, Cooling System for the proper procedure.

(12) Connect the air inlet hose to the throttle body and the air cleaner.

(13) Connect the battery negative cable.

(14) Start the engine and check for leaks.

INTAKE MANIFOLD—4.0L ENGINE

The intake and engine exhaust manifolds on the 4.0L engine must be removed and installed together. The two manifolds use a common gasket at the cylinder head.

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove air cleaner inlet hose from throttle plate assembly.

(3) Remove the air cleaner assembly.

(4) Remove the throttle cable, cruise control cable (if equipped) and the transmission line pressure cable.

(5) Disconnect all electrical connectors on the intake manifold.

(6) Disconnect and remove the fuel supply and return lines from the fuel rail assembly (refer to Group 14, Fuel System).

(7) Loosen the accessory drive belt (refer to Group 7, Cooling System). Loosen the tensioner.

(8) Remove the power steering pump and bracket from the intake manifold and set aside.

(9) Remove the fuel rail and injectors (refer to Group 14, Fuel System).

REMOVAL AND INSTALLATION (Continued)

(10) Raise the vehicle.
(11) Disconnect the exhaust pipe from the engine exhaust manifold. Discard the seal.
(12) Lower the vehicle.
(13) Remove the intake manifold and engine exhaust manifold.

INSTALLATION

(1) Clean the mating surfaces of the cylinder head and the manifold if the original manifold is to be installed.
(2) If the manifold is being replaced, ensure all the fitting, etc. are transferred to the replacement manifold.
(3) Install a new exhaust/intake manifold gasket over the alignment dowels on the cylinder head.
(4) Position the engine exhaust manifold to the cylinder head. Install fastener No.3 and finger tighten at this time (Fig. 11).
(5) Install intake manifold on the cylinder head dowels.
(6) Install washers and fasteners Nos.1, 2, 4, 5, 8, 9, 10 and 11 (Fig. 11).
(7) Install washers and fasteners Nos.6 and 7 (Fig. 11).
(8) Tighten the fasteners in sequence and to the specified torque (Fig. 11).
- Fasteners Nos.1 through 5—Tighten to 33 N·m (24 ft. lbs.) torque.
- Fasteners Nos.6 and 7—Tighten to 31 N·m (23 ft. lbs.) torque.
- Fasteners Nos.8 through 11—Tighten to 33 N·m (24 ft. lbs.) torque.

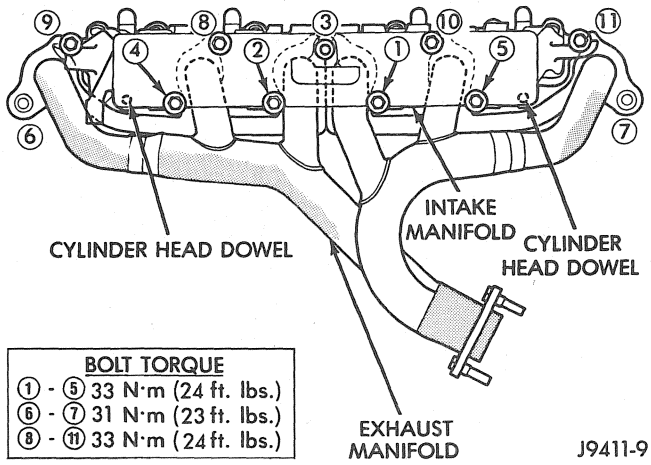


Fig. 11 Intake/Engine Exhaust Manifold Installation (4.0L Engine)

(9) Install the fuel rail and injectors.
(10) Install the power steering pump and bracket to the intake manifold. Tighten the belt to specification. Refer to Group 7, Cooling System for the proper procedures.
(11) Install the fuel supply and return lines to the fuel rail assembly. **Before connecting the fuel lines to the fuel rail replace the O-rings in the quick-connect fuel line couplings.** Refer to Group 14, Fuel System for the proper procedure.
(12) Connect all electrical connections on the intake manifold.
(13) Connect the vacuum connector on the intake manifold and install it in the bracket.
(14) Install throttle cable, cruise control cable (if equipped).
(15) Install the transmission line pressure cable (if equipped). Refer to Group 21, Transmission for the adjustment procedures.
(16) Install air cleaner assembly.
(17) Connect air inlet hose to the throttle plate assembly.
(18) Raise the vehicle on a side mounted hoist.
(19) Using a new seal, connect the exhaust pipe to the engine exhaust manifold. Tighten the bolts to 31 N·m (23 ft. lbs.) torque.
(20) Lower the vehicle.
(21) Connect the battery negative cable.
(22) Start the engine and check for leaks.

EXHAUST MANIFOLD—2.5L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.
(2) Remove all components attached to the intake manifold.
(3) Raise the vehicle.
(4) Disconnect the exhaust pipe from the engine exhaust manifold.
(5) Lower the vehicle.
(6) Remove fasteners 2 through 5 and remove the intake manifold (Fig. 12).
(7) Remove fasteners 1, 6 and 7 and remove the engine exhaust manifold (Fig. 12).

INSTALLATION

(1) Clean the intake and engine exhaust manifolds and cylinder head mating surfaces. **DO NOT allow foreign material to enter either the intake manifold or the ports in the cylinder head.**
(2) Install a new intake manifold gasket over the alignment dowels on the cylinder head.
(3) Install the engine exhaust manifold assembly. **Exhaust manifold must be centrally located over the end studs and spacer (Fig. 12).**
(4) Tighten bolt No.1 to 41 N·m (30 ft. lbs.) torque (Fig. 12).
(5) Install the intake manifold on the cylinder head dowels (Fig. 12).
(6) Install bolts 2 through 5 (Fig. 12). Tighten these bolts to 31 N·m (23 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

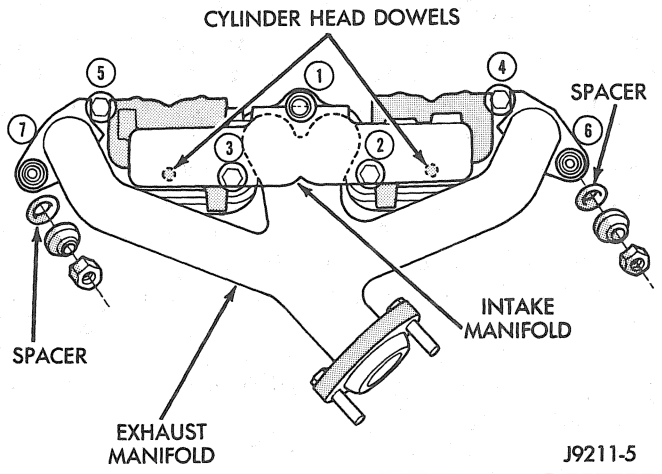


Fig. 12 Intake/Engine Exhaust Manifold Installation (2.5L Engine)

(7) Install new engine exhaust manifold spacers over the engine exhaust manifold mounting studs in the cylinder head (Fig. 12).

(8) Tighten nuts 6 and 7 to 31 N·m (23 ft. lbs.) torque (Fig. 12).

(9) Install all components to the intake manifold.

(10) Raise the vehicle.

(11) Connect the exhaust pipe to the engine exhaust manifold. Tighten the bolts to 31 N·m (23 ft. lbs.) torque.

(12) Lower the vehicle.

(13) Connect the battery negative cable.

(14) Start the engine and check for leaks.

EXHAUST MANIFOLD—4.0L ENGINE

The intake and engine exhaust manifolds on the 4.0L engine must be removed and installed together. The manifolds use a common gasket at the cylinder head.

Refer to Intake Manifold—4.0L Engine in this section for the proper removal and installation procedures.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	Torque
Catalytic Converter/Exhaust Pipe Torca Clamp Nut	71 N·m (52 ft. lbs.)
Crossmember to Sill Bolts	41 N·m (30 ft. lbs.)
Exhaust Pipe to Manifold Nuts	31 N·m (23 ft. lbs.)
Exhaust Manifold 2.5L Engine Bolt #1	41 N·m (30 ft. lbs.)
Exhaust Manifold 2.5L Engine Bolts #2–5	31 N·m (23 ft. lbs.)
Exhaust Manifold 4.0L Engine Nuts/Bolts #1–5 & #8–11	33 N·m (24 ft. lbs.)
Exhaust Manifold 2.5L Engine Nuts #6&7	31 N·m (23 ft. lbs.)
Exhaust Manifold 4.0L Engine Nuts #6&7	31 N·m (23 ft. lbs.)
Intake Manifold 2.5L Engine Bolt #1	41 N·m (30 ft. lbs.)
Intake Manifold 2.5L Engine Bolt #2–5	31 N·m (23 ft. lbs.)
Mufler to Catalytic Converter Torca Clamp Nut	71 N·m (52 ft. lbs.)
Oxygen Sensors Nut	48 N·m (35 ft. lbs.)
Rear Tail Pipe Clamp Nuts	14 N·m (10 ft. lbs.)

FRAME AND BUMPERS

CONTENTS

	page		page
BUMPERS	1	FRAME	6

BUMPERS

INDEX

	page		page
REMOVAL AND INSTALLATION		REAR TOW HOOK	3
FRONT BUMPER	1	DISASSEMBLY AND ASSEMBLY	
FRONT TOW HOOKS	1	FRONT BUMPER	4
REAR BUMPER	3	REAR BUMPER	5

REMOVAL AND INSTALLATION

FRONT BUMPER

REMOVAL

The bumper guards, end caps and tow hooks can be removed from XJ front bumpers with the bumper attached to the vehicle. Do not remove the bumper from the vehicle if only these components require service.

(1) Disconnect the fog lamp wire harness connectors, if equipped.

(2) Disconnect the vacuum reservoir tube harness connectors (Fig. 1) and (Fig. 2).

(3) Remove the locknuts and Torx-head bolts that attach the tow hook straps (Fig. 3) to the underbody sillmember.

NOTE: The retaining screws and the steering gear skid plate must be removed before the left strap can be removed from the sillmember.

(4) Detach the tow hook straps from the sillmember.

(5) Support the bumper.

(6) Remove the bolts that attach the bumper support brackets to the right and left sillmembers (Fig. 4).

(7) Remove the support and the bumper from the vehicle.

INSTALLATION

(1) Position and support the bumper at the front of the vehicle.

(2) Attach the bumper support brackets to the right and left sillmembers and reinforcement brackets. Tighten screws and bolts to 56 N·m (41 ft. lbs.) torque.

(3) Install the Torx-head bolts and locknuts that attach the tow hook straps to the underbody sillmember. Tighten locknuts with 30 N·m (22 ft. lbs.) torque.

NOTE: Install the steering gear skid plate and screws after the left tow hook strap has been installed.

(4) Connect the fog lamp wire harness connectors.

(5) Connect the vacuum reservoir tube harness connectors.

(6) Remove the bumper support.

FRONT TOW HOOKS

If a tow hook must be replaced or removed only for service access, remove the nuts and bolts that attach it to the bumper support bracket. When installing a tow hook, tighten nuts with 100 N·m (74 ft. lbs.) torque.

REMOVAL

(1) Disconnect the fog lamp wire harness connectors, if equipped.

(2) Disconnect the vacuum reservoir tube harness connectors.

REMOVAL AND INSTALLATION (Continued)

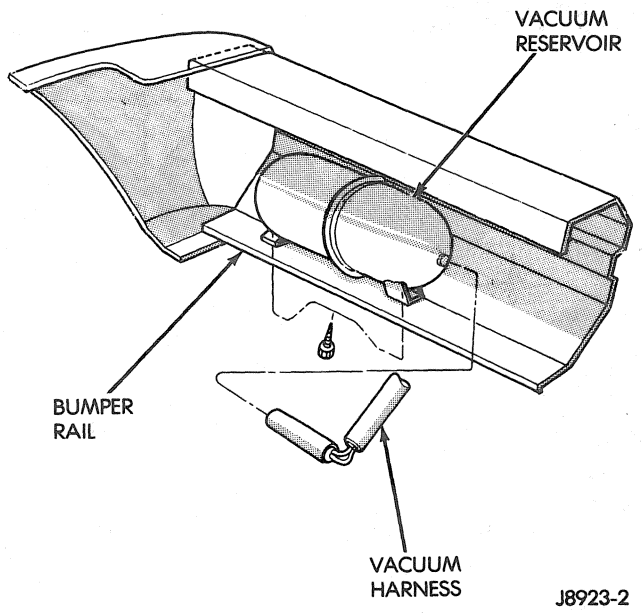


Fig. 1 Vacuum Reservoir—Left Side

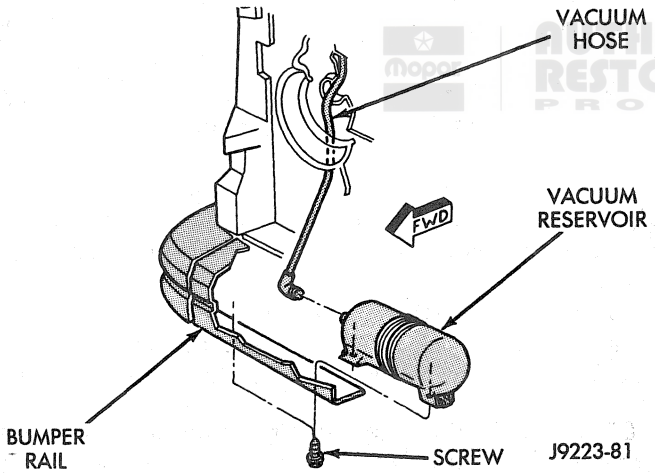


Fig. 2 Vacuum Reservoir—Right Side With Speed Control Only

(3) Support the bumper.

(4) Remove the bolts that attach the bumper support brackets to the right and left sillmembers.

(5) Remove the locknuts and Torx-head bolts that attach the tow hook straps to the underbody sillmember.

NOTE: The retaining screws and the steering gear skid plate must be removed before the left strap can be removed from the sillmember.

(6) Detach the tow hook straps from the sillmember.

(7) Remove the support and the bumper from the vehicle.

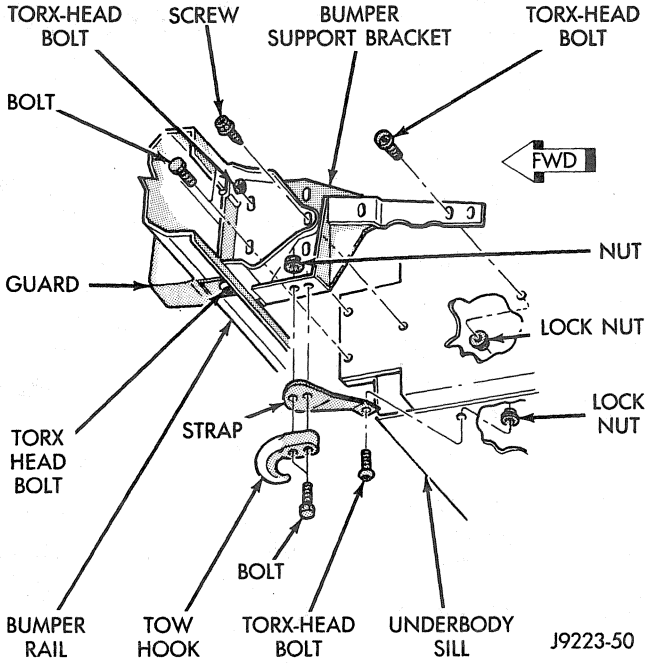


Fig. 3 Tow Hook & Strap

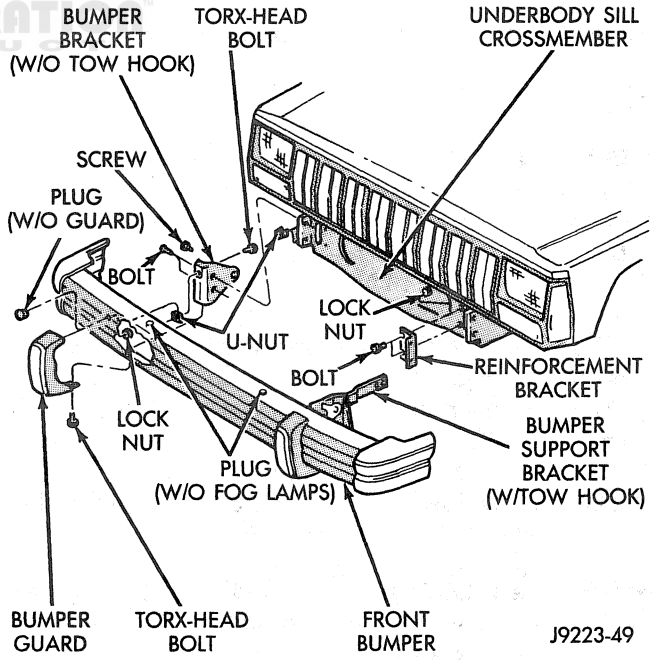


Fig. 4 Front Bumper Removal/Installation

(8) Remove the nuts and bolts that attach the tow hooks to the bumper support brackets.

(9) Remove the tow hook from the bumper support bracket.

(10) Remove the support bracket from the bumper rail.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Install the bumper guard and bumper support bracket on the bumper rail. Refer to the front bumper disassembly/assembly paragraph in this group for tightening sequence. Tighten locknuts to 20 N·m (15 ft. lbs.) torque. Tighten bolts to 56 N·m (41 ft. lbs.) torque.

(2) If not equipped with bumper guards, install the bumper support bracket on the bumper rail. Tighten bolts to 56 N·m (41 ft. lbs.) torque.

(3) Position the tow hook at the support bracket. Install the bolts and nuts that attach tow hook to the bumper support bracket. Tighten nuts to 100 N·m (74 ft. lbs.) torque.

(4) Position and support the bumper at the front of the vehicle.

(5) Attach the bumper support brackets to the right and left sillmembers and reinforcement brackets. Tighten screws and bolts to 56 N·m (41 ft. lbs.) torque.

(6) Install the Torx-head bolts and locknuts that attach the tow hook straps to the underbody sillmember. Tighten locknuts to 30 N·m (22 ft. lbs.) torque.

NOTE: Install the steering gear skid plate and screws after the left tow hook strap has been installed.

(7) Connect the fog lamp wire harness connectors. Connect the vacuum reservoir tube harness connectors.

(8) Remove the bumper support.

REAR BUMPER

REMOVAL

(1) For vehicles equipped with a trailer hitch, remove the hitch before removing the bumper. If necessary, refer to the removal procedure within Group 13, Frame and Bumpers.

(2) Raise and support the rear of the vehicle.

(3) Support the bumper.

(4) Remove the bolts that attach the bumper support brackets to the sill crossmember (Fig. 5).

(5) Remove the support and the rear bumper from the vehicle.

INSTALLATION

(1) Position and support the bumper with the bracket holes aligned with the sill crossmember holes. Install the bracket-to-crossmember bolts. Tighten the bolts to 42 N·m (31 ft. lbs.) torque.

(2) Remove the supports and lower the vehicle.

(3) If removed, install the trailer hitch. If necessary, refer to the installation procedure within Group 13, Frame and Bumpers.

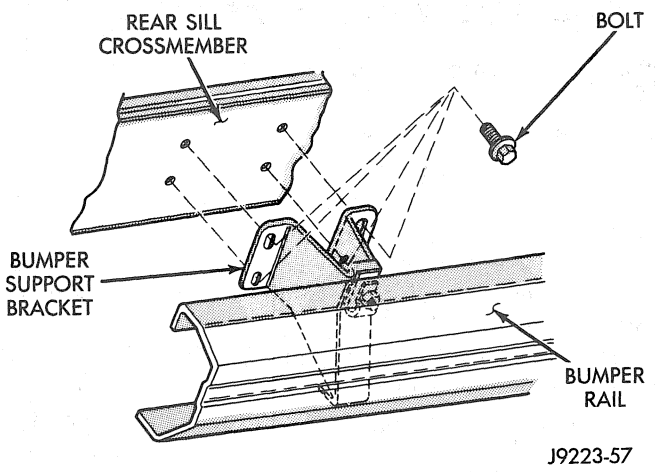


Fig. 5 Rear Bumper Removal/Installation

REAR TOW HOOK

REMOVAL

(1) Remove the bolts that attach tow hook bracket to the frame rail and reinforcement bracket (Fig. 6).

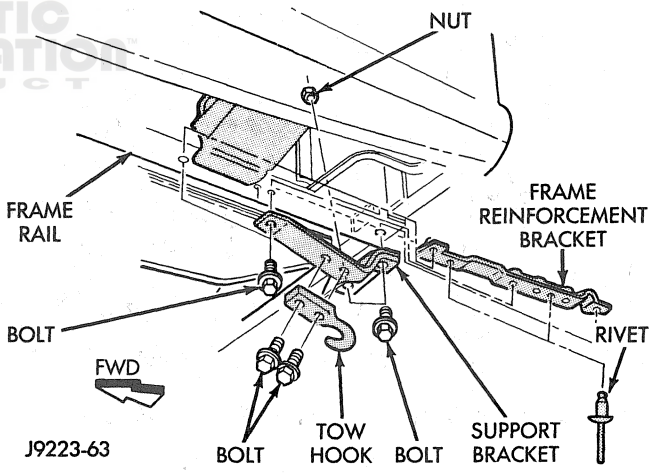


Fig. 6 Rear Tow Hook

NOTE: The reinforcement bracket is held on the frame rail with two blind rivets.

(2) Remove the bracket and tow hook from frame rail.

INSTALLATION

(1) Position bracket and tow hook on the frame rail.

(2) Install bolts that attach tow hook bracket to frame rail and reinforcement bracket. Tighten bolts to 75 N·m (55 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY

FRONT BUMPER

DISASSEMBLY

(1) Remove the bumper.

(2) Remove the nuts and bolts that attach the tow hooks to the bumper support brackets.

(3) Remove the support brackets (Fig. 7), bumper guards (Fig. 8) and caps (Fig. 9) from the bumper rail.

(4) Remove the license plate bracket if equipped, from the bumper rail.

(5) Remove the fog lamps (Fig. 10) from the bumper rail.

(6) If necessary, remove the vacuum reservoir(s) from the bumper rail.

(7) If necessary, remove the sill crossmember reinforcement brackets from the sillmembers.

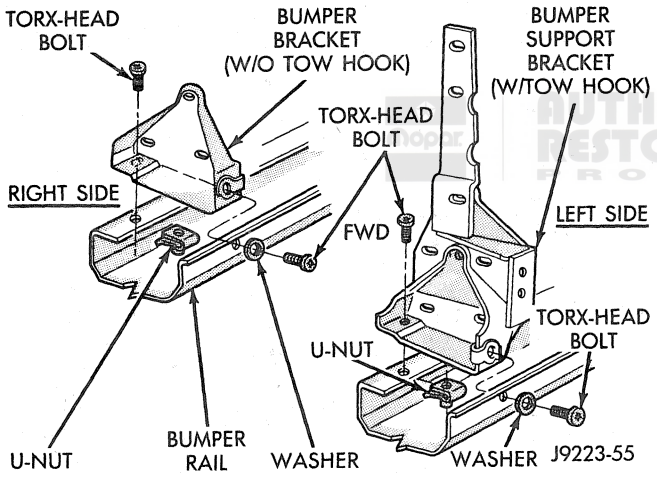


Fig. 7 Bumper Support Bracket Removal/Installation

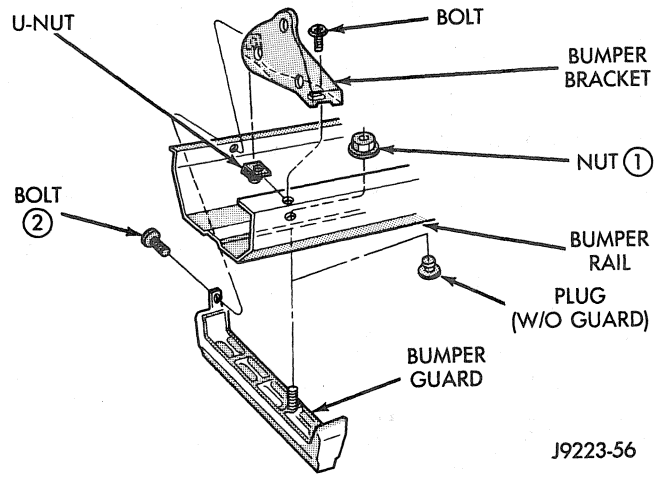


Fig. 8 Bumper Guard Removal/Installation

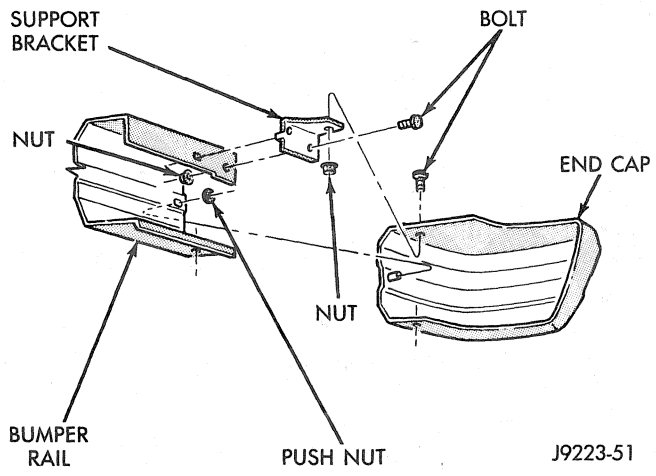


Fig. 9 Bumper End Cap Removal/Installation

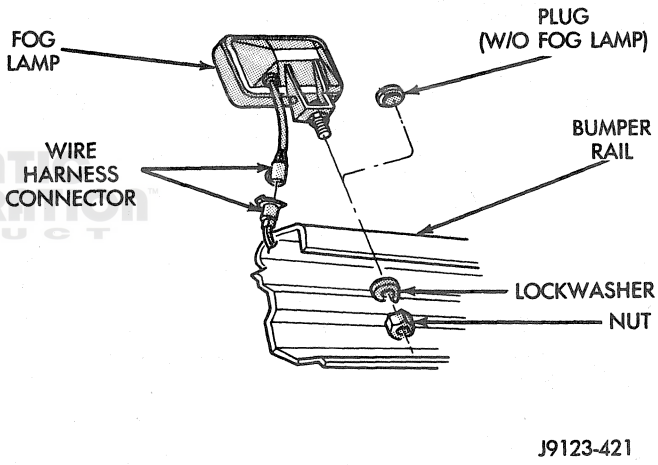


Fig. 10 Fog Lamp

ASSEMBLY

(1) If removed, install the sill crossmember reinforcement brackets on the sillmembers. Tighten bolts to 56 N·m (41 ft. lbs.) torque.

(2) If equipped, install the bumper support brackets and bumper guards on the bumper rail. Tighten hardware in the sequence indicated in (Fig. 8). Tighten the locknuts with 20 N·m (15 ft. lbs.) torque. Tighten bolts to 56 N·m (41 ft. lbs.) torque.

(3) If not equipped with bumper guards, install the bumper support brackets on the bumper rail. Tighten bolts to 56 N·m (41 ft. lbs.) torque.

(4) Install tow hooks. Tighten nuts with 100 N·m (74 ft. lbs.) torque.

(5) Install the bumper end caps on the bumper rail. Tighten nuts with 8 N·m (72 in. lbs.) torque.

(6) Install the license plate bracket on the bumper rail. Tighten the nuts securely.

(7) Install the fog lamps on the bumper rail. Tighten the nuts to 20 N·m (15 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

(8) If removed, install the vacuum reservoir(s) on the bumper rail. Tighten the retaining screws and bolts to 8 N·m (72 in. lbs.) torque.

REAR BUMPER

DISASSEMBLY

(1) Remove the bumper support brackets and splash shield the bumper, if necessary (Fig. 11).

(2) Remove the bumper end caps (Fig. 12) and bumper guards from the bumper (Fig. 13), if necessary.

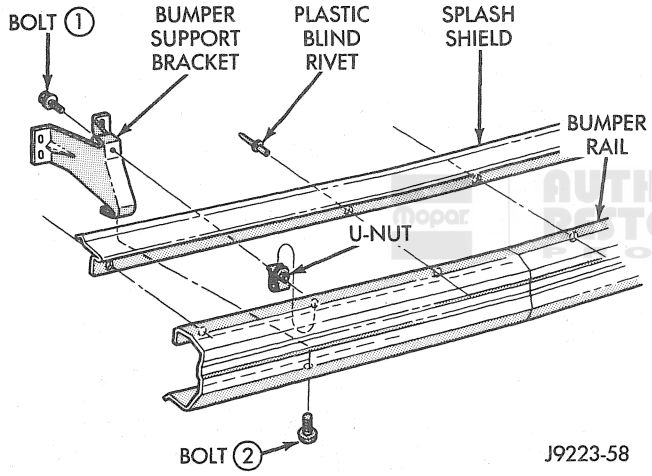


Fig. 11 Bumper Bracket & Splash Shield Removal/ Installation

ASSEMBLY

(1) As applicable, install the splash shield and bumper support brackets, the bumper end caps and the bumper guards.

(2) Tighten the bumper support bolts to 56 N·m (41 ft. lbs.).

(3) Tighten the nuts in the sequence depicted in (Fig. 12). Tighten the bumper end cap plate bolt nuts to 22 N·m (16 ft. lbs.) torque. Tighten the lower bolt nuts to 8 N·m (6 ft. lbs.) torque.

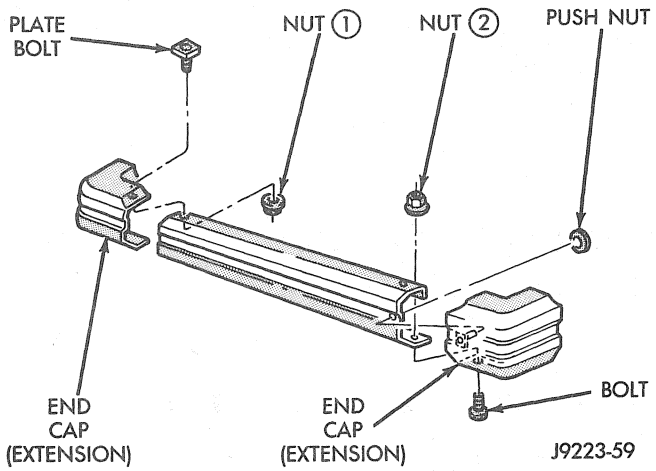


Fig. 12 Bumper End Cap Removal/Installation

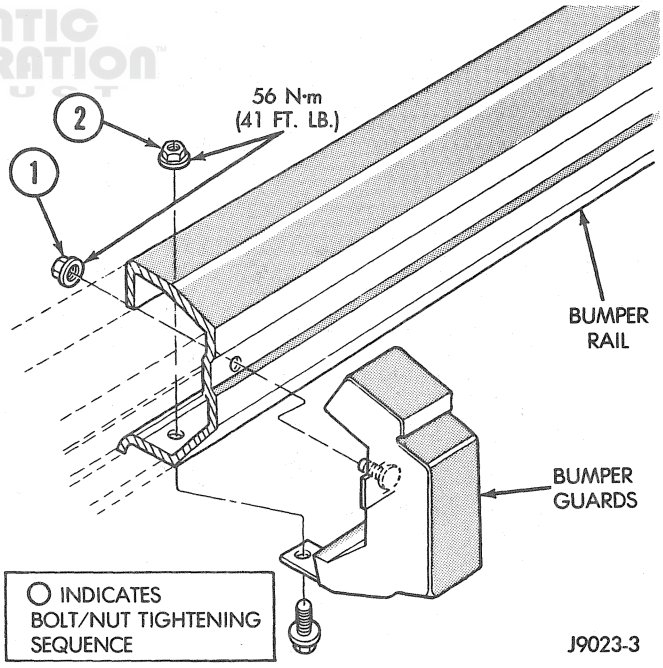


Fig. 13 Bumper Guard Removal/Installation

(4) If applicable, tighten the bumper guard bolts/ nuts to 56 N·m (41 ft. lbs.).

FRAME

INDEX

page

REMOVAL AND INSTALLATION
FRONT SKID PLATE 6
FUEL TANK SKID PLATE 6
TRAILER HITCH 7
TRANSFER CASE SKID PLATE 6
SPECIFICATIONS
FRAME DIMENSIONS 7
FRAME TORQUE SPECIFICATIONS 10

REMOVAL AND INSTALLATION

FRONT SKID PLATE

REMOVAL

(1) Remove the screws that attach skid plate to side sills.

(2) Remove the nuts that attach the skid plate to the crossmember (Fig. 1).

(3) Remove the skid plate from the vehicle.

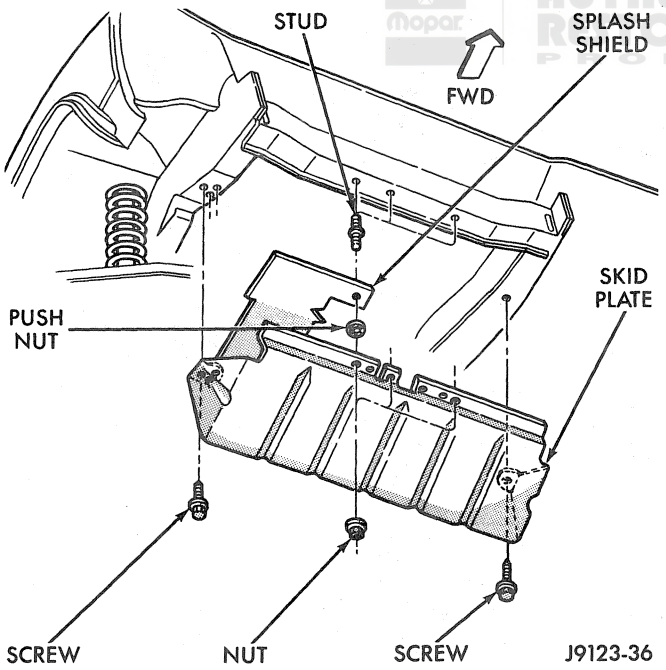


Fig. 1 Front Skid Plate Removal/Installation

INSTALLATION

(1) Position the skid plate at front crossmember and side sills.

(2) Install the nuts to attach the skid plate to crossmember.

(3) Install the screws to attach skid plate to side sills.

TRANSFER CASE SKID PLATE

REMOVAL

(1) Support the skid plate.

(2) Remove the bolts that attach the skid plate to the transmission support crossmember and frame sill (Fig. 2).

(3) Remove the support and skid plate from the vehicle.

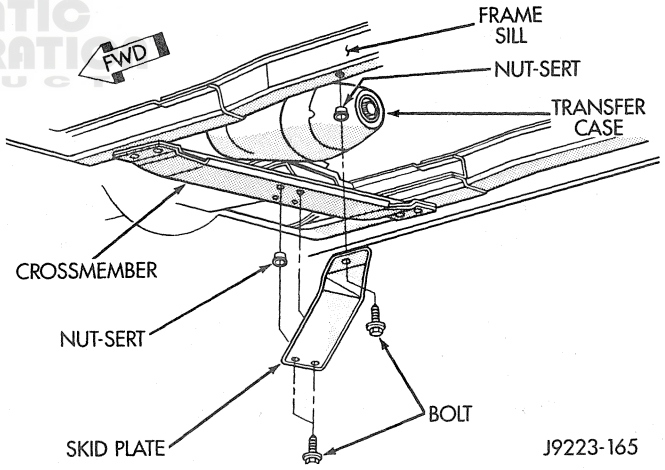


Fig. 2 Transfer Case Skid Plate

INSTALLATION

(1) Position and support the skid plate at the frame sill and transmission support crossmember.

(2) Attach the skid plate to the frame sill and crossmember with bolts. Tighten bolts to 22 N·m (16 ft. lbs.) torque.

FUEL TANK SKID PLATE

REMOVAL

(1) Position a support under skid plate.

(2) Remove the bolts that attach skid plate to underbody side rails (Fig. 3) and (Fig. 4).

(3) Remove the support and the skid plate from the vehicle.

REMOVAL AND INSTALLATION (Continued)

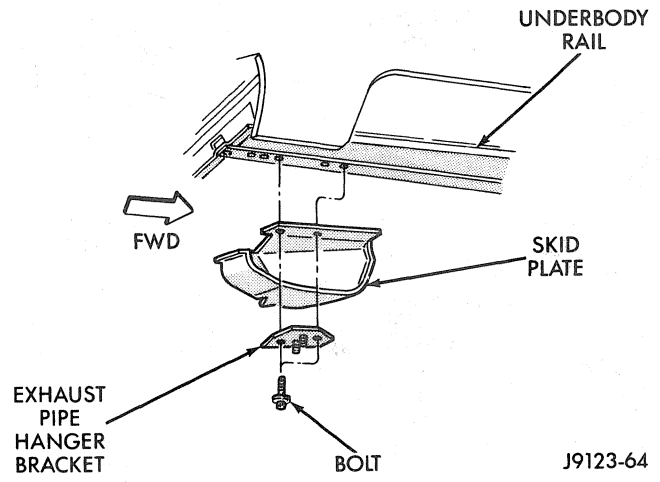


Fig. 3 Fuel Tank Skid Plate W/O Trailer Hitch Or Tow Hook

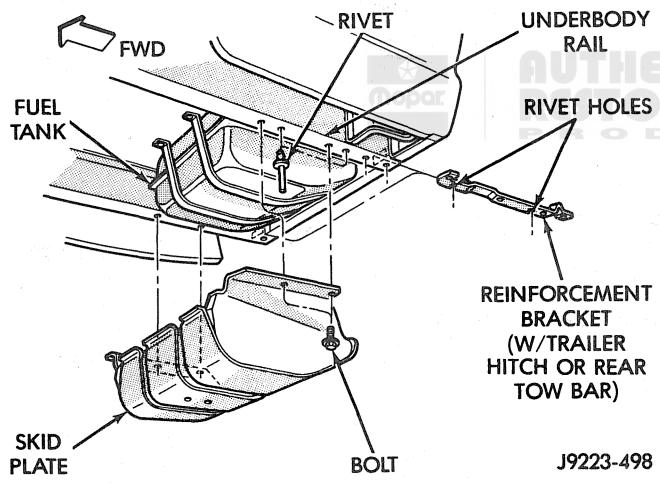


Fig. 4 Fuel Tank Skid Plate With Trailer Hitch Or Tow Hook

INSTALLATION

(1) Position and support skid plate under fuel tank.

(2) Install bolts to attach the skid plate to underbody rails. Tighten the bolts to 50 N·m (37 ft. lbs.) torque.

(3) Remove the support from under skid plate.

TRAILER HITCH

REMOVAL

A class III, weight-distributing/equalizer type hitch is comprised of:

- Towing tube with a ball mount receptacle.
- Various reinforcement/support brackets that are attached to the vehicle frame sills and rear crossmember with bolts.

(1) If necessary, remove the trailer tow wire harness connector from the hitch.

(2) Support the hitch.

(3) Remove the bolts that attach the towing tube to the frame sills and reinforcement bracket. If equipped, remove the fuel tank skid plate.

NOTE: The reinforcement brackets are held on the frame sills with two blind rivets.

(4) Remove the bolts from the plate bracket and rear crossmember and lower the support and hitch (Fig. 5).

INSTALLATION

(1) Install frame reinforcement brackets, if removed. Slide the brackets through the vehicle rear sill openings and hold in position on the frame sills with blind rivets.

(2) Place hitch on a lifting device. Raise, position hitch at the proper location for installation on vehicle and support it.

(3) If equipped, position fuel tank skid plate on vehicle frame sills.

(4) Loosely install the bolts to attach the towing tube (and the skid plate) to frame sills and reinforcement brackets.

(5) Position the plate bracket and install the attaching bolts through the vehicle rear crossmember.

(6) Tighten all bolts/nuts to the specified torque:

- Towing tube-to-reinforcement bracket bolt, 74 N·m (55 ft. lbs.).
- Plate bracket-to-rear crossmember nut, 52 N·m (40 ft. lbs.).

(7) Remove the lift/support and, if removed, attach the trailer wire harness connector to the hitch.

SPECIFICATIONS

FRAME DIMENSIONS

Frame dimensions are listed in millimeter scale. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location (Fig. 6).

SPECIFICATIONS (Continued)

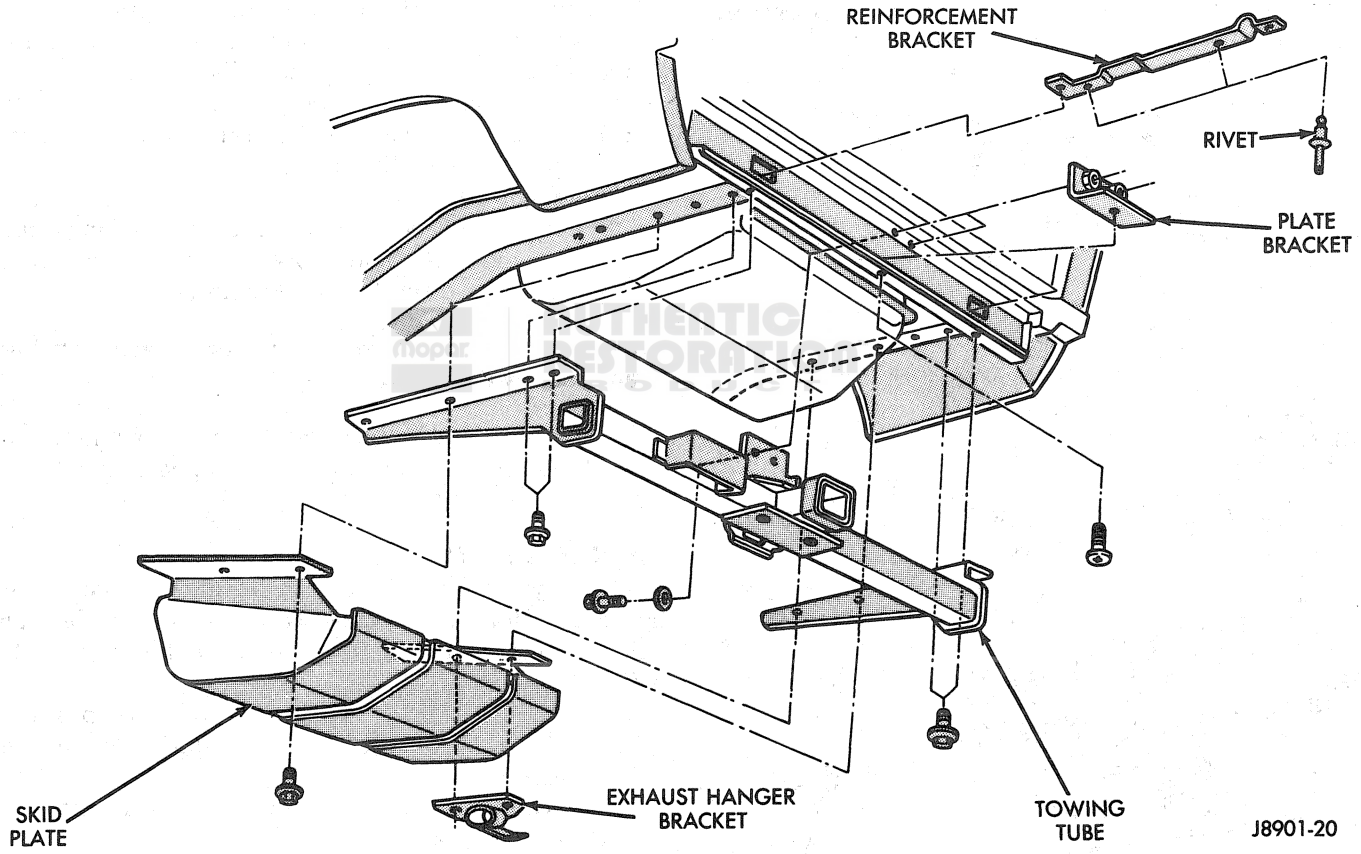


Fig. 5 Reinforcement Bracket and Hitch

SPECIFICATIONS (Continued)

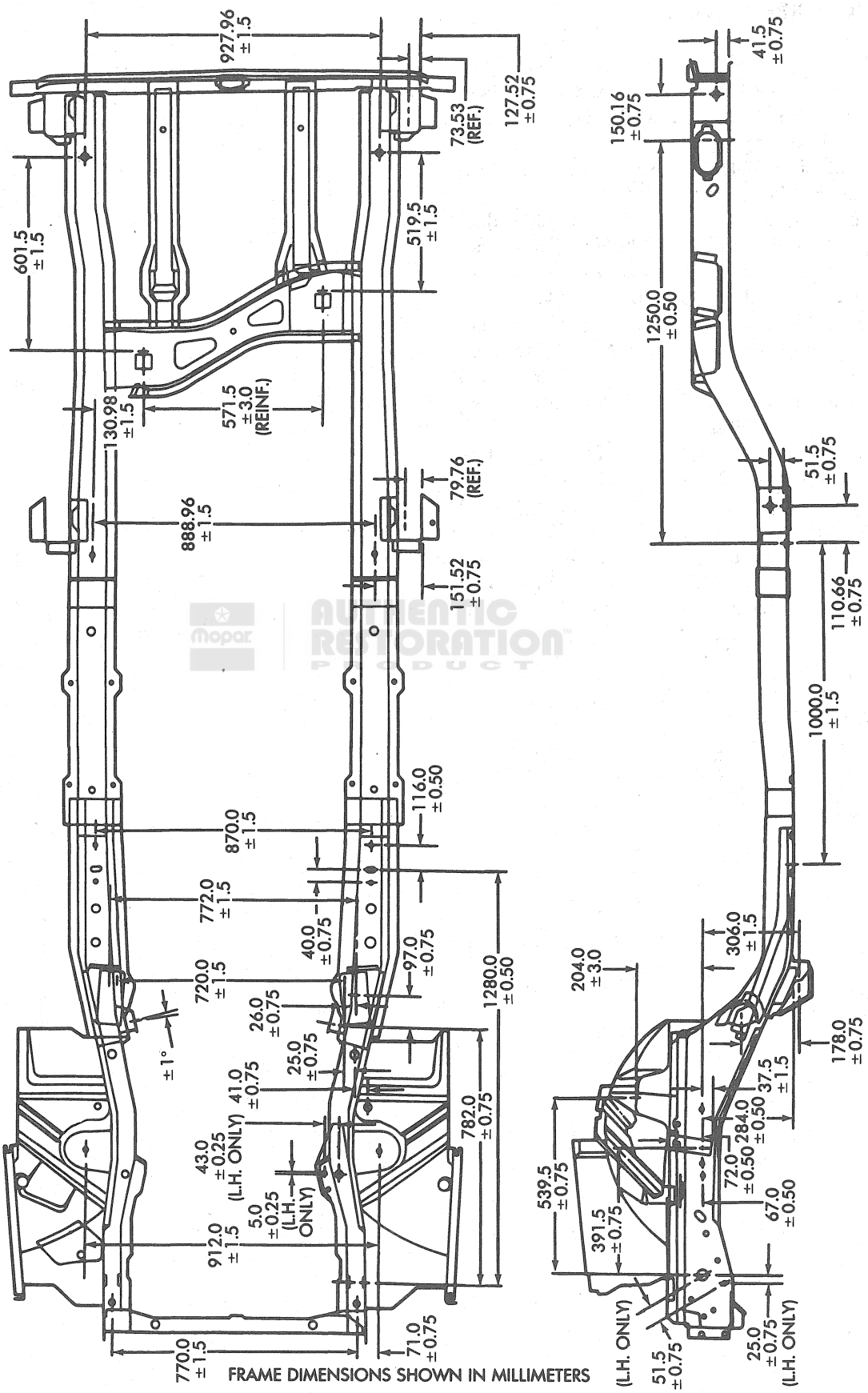


Fig. 6 Frame Alignment Reference Dimensions

SPECIFICATIONS (Continued)

FRAME TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Front Skid Plate Screw	42 N·m (31 ft. lbs.)
Front Skid Plate Nut	17 N·m (150 in. lbs.)
Transfer Case Skid Plate Bolt	22 N·m (16 ft. lbs.)
Fuel Tank Skid Plate Bolt	50 N·m (37 ft. lbs.)
Front Bumper Reinforcement Bracket Bolt	56 N·m (41 ft. lbs.)
Front Bumper Guard Locknut	20 N·m (15 ft. lbs.)
Front Bumper Guard Bolt	56 N·m (41 ft. lbs.)
Frnt Bumper Support Brkt Bolt	56 N·m (41 ft. lbs.)
Front Tow Hook Nut	100 N·m (74 ft. lbs.)
Front Bumper End Cap Nut	8 N·m (72 in. lbs.)
Fog Lamp Nut	20 N·m (15 ft. lbs.)
Front Tow Hook Strap Nut	30 N·m (22 ft. lbs.)
Rear Bumper End Cap Plate Bolt	22 N·m (16 ft. lbs.)
Rear Bumper Guard Bolt/Nut	56 N·m (41 ft. lbs.)
Rear Bumper Bracket Bolt	42 N·m (31 ft. lbs.)
Rear Tow Hook Bolt	74 N·m (55 ft. lbs.)
Trailer Tow Reinforcement Brkt Bolt	74 N·m (55 ft. lbs.)
Trailer Tow Plate Bracket Nut	52 N·m (40 ft. lbs.)

Mopar AUTHENTIC RESTORATION PRODUCT

FUEL SYSTEM

CONTENTS

page

FUEL DELIVERY SYSTEM 3
FUEL INJECTION SYSTEM 19
GENERAL INFORMATION 1

GENERAL INFORMATION

INDEX

page

GENERAL INFORMATION
FUEL REQUIREMENTS 1
GASOLINE/OXYGENATE BLENDS 1
INTRODUCTION 1

GENERAL INFORMATION

INTRODUCTION

Throughout this group, references may be made to a particular vehicle by letter or number designation. A chart showing the breakdown of these designations is included in the Introduction Section at the front of this service manual.

The Evaporation Control System, is also considered part of the fuel system. The system reduces the emission of fuel vapor into the atmosphere.

The description and function of the Evaporation Control System is found in Group 25 of this manual.

FUEL REQUIREMENTS

Light spark knock at low engine speeds is not harmful to your engine. However, continued heavy spark knock at high speeds can cause damage and should be reported to your dealer immediately. Engine damage resulting from operating with a heavy spark knock may not be covered by the new vehicle warranty.

In addition to using unleaded gasoline with the proper octane rating, gasolines that contain detergents, corrosion and stability additives are recommended. Using gasolines that have these additives will help improve fuel economy, reduce emissions, and maintain vehicle performance. Generally, premium unleaded gasolines contain more additive than regular unleaded.

Poor quality gasoline can cause problems such as hard starting, stalling, and stumble. If you experience these problems, try another brand of gasoline before considering service for the vehicle.

GASOLINE/OXYGENATE BLENDS

Some fuel suppliers blend gasoline with materials that contain oxygen such as alcohol, MTBE (Methyl Tertiary Butyl Ether) and ETBE (Ethyl Tertiary Butyl Ether). Oxygenates are required in some areas of the country during winter months to reduce carbon monoxide emissions. The type and amount of oxygenate used in the blend is important.

The following are generally used in gasoline blends:

Ethanol - (Ethyl or Grain Alcohol) properly blended, is used as a mixture of 10 percent ethanol and 90 percent gasoline. Gasoline blended with ethanol may be used in your vehicle.

Methanol - (Methyl or Wood Alcohol) is used in a variety of concentrations when blended with unleaded gasoline. You may find fuels containing 3 percent or more methanol along with other alcohols called cosolvents.

Do not use gasolines containing Methanol.

Use of methanol/gasoline blends may result in starting and driveability problems and damage critical fuel system components.

Problems that are the result of using methanol/gasoline blends are not the responsibility of Chrysler Motors and may not be covered by the new vehicle warranty.

MTBE/ETBE - Gasoline and MTBE (Methyl Tertiary Butyl Ether) blends are a mixture of unleaded gasoline blended and up to 15 percent MTBE. Gaso-

GENERAL INFORMATION (Continued)

line and ETBE (Ethyl Tertiary Butly Ether) are blends of gasoline and up to 17 percent ETBE. Gasoline blended with MTBE or ETBE may be used in your vehicle.

Many gasolines are now being blended that contribute to cleaner air, especially in those areas of the country where pollution levels are high. These new blends provide a cleaner burning fuel and some are referred to as reformulated gasoline.

Reformulated Gasoline

Many areas of the country are requiring the use of cleaner-burning fuel referred to as **Reformulated Gasoline**. Reformulated gasolines are specially blended to reduce vehicle emissions and improve air quality.

Chrysler Corporation strongly supports the use of reformulated gasolines whenever available. Although your vehicle was designed to provide optimum performance and lowest emissions operating on high quality unleaded gasoline, it will perform equally well and produce even lower emissions when operating on reformulated gasoline.

Materials Added to Fuel

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain active solvents of similar ingredients that can be harmful to fuel system gasket and diaphragm materials.

FUEL DELIVERY SYSTEM

INDEX

page

DESCRIPTION AND OPERATION
FUEL DELIVERY SYSTEM 3
FUEL FILTER 4
FUEL GAUGE SENDING UNIT 4
FUEL INJECTORS 5
FUEL PRESSURE REGULATOR 4
FUEL PUMP MODULE 3
FUEL PUMP 3
FUEL RAIL 5
FUEL TANK FILLER TUBE CAP 5
FUEL TANK 5
QUICK-CONNECT FITTINGS 5
DIAGNOSIS AND TESTING
FUEL GAUGE SENDING UNIT 7
FUEL INJECTOR TEST 7
FUEL PUMP PRESSURE TEST—2.5L ENGINE . . 6
FUEL PUMP PRESSURE TEST–4.0L ENGINE . . . 6
SERVICE PROCEDURES
FUEL SYSTEM PRESSURE RELEASE PROCEDURE—2.5L ENGINE 9

page

FUEL SYSTEM PRESSURE RELEASE PROCEDURE–4.0L ENGINE 9
FUEL TUBES/LINES/HOSES AND CLAMPS 9
QUICK-CONNECT FITTINGS 10
REMOVAL AND INSTALLATION
ACCELERATOR PEDAL 17
FUEL FILTER 13
FUEL INJECTOR RAIL 15
FUEL INJECTORS 16
FUEL LEVEL SENSOR 15
FUEL PRESSURE REGULATOR 14
FUEL PUMP INLET STRAINER 15
FUEL PUMP MODULE 14
FUEL PUMP RELAY 14
FUEL TANK 16
THROTTLE CABLE 18
SPECIFICATIONS
FUEL SYSTEM PRESSURE 18
FUEL TANK CAPACITY 18
TORQUE SPECIFICATIONS 18
VECI LABEL SPECIFICATIONS 18

DESCRIPTION AND OPERATION

FUEL DELIVERY SYSTEM

The fuel delivery system consists of: the electric fuel pump, fuel filter, fuel pressure regulator, fuel pump module, fuel tubes/lines/hoses, fuel rail, fuel injectors, fuel tank, accelerator pedal and throttle cable.

A fuel return system is used on all models (all engines). Fuel is returned through the fuel pump module and back into the fuel tank through the fuel pressure regulator. A separate fuel return line from the engine to the tank is no longer used with any 2.5L or 4.0L engine.

The fuel tank assembly consists of: the fuel tank, filler tube, fuel gauge sending unit/electric fuel pump module, a pressure relief/rollover valve and a pressure-vacuum filler cap.

Also to be considered part of the fuel system is the evaporation control system. This is designed to reduce the emission of fuel vapors into the atmosphere. The description and function of the Evaporative Control System is found in Group 25, Emission Control Systems.

FUEL PUMP MODULE

The fuel pump module on all models is installed in the top/front of the fuel tank (Fig. 1). The fuel pump module contains the following components (Fig. 2):

- Fuel pressure regulator
- Electric fuel pump
- A separate in-tank fuel filter (strainer)
- Fuel pump gauge sending unit
- Fuel supply line connection
- A rubber stopper to align module to fuel tank

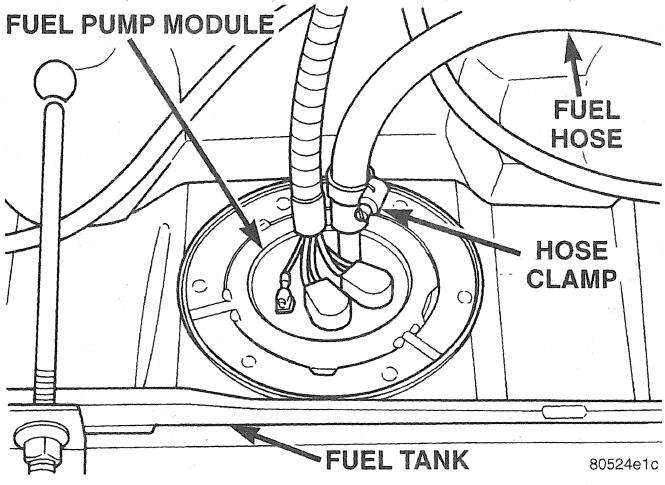


Fig. 1 Fuel Pump Module Location

FUEL PUMP

The fuel pump used in this system has a permanent magnet electric motor. The pump is part of the

DESCRIPTION AND OPERATION (Continued)

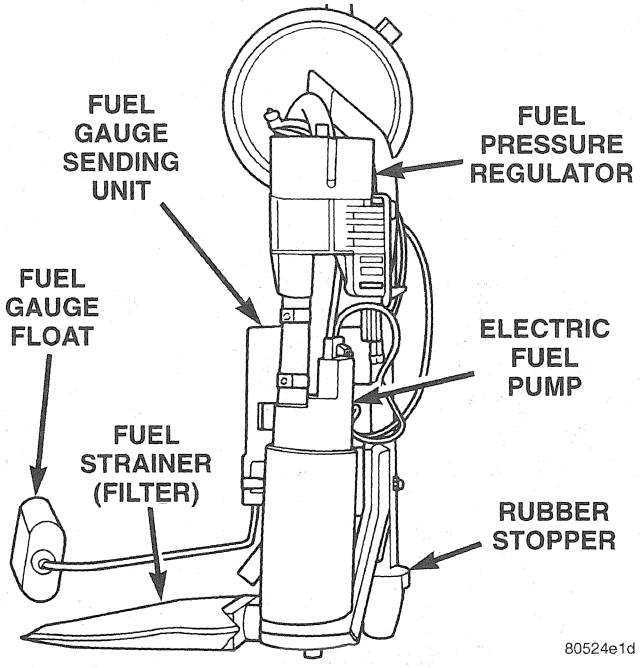


Fig. 2 Fuel Pump Module Components—Typical

fuel pump module (Fig. 2). The fuel pump module is suspended in fuel in the fuel tank. Fuel is drawn in through a filter and pushed through the electric motor to the outlet. The pump contains a check valve. This valve is located near the pump outlet. It restricts fuel movement in either direction to maintain fuel supply line pressure when the pump is not operational. Voltage to operate the pump is supplied through the fuel pump relay.

FUEL GAUGE SENDING UNIT

The fuel gauge sending unit is attached to the side of the fuel pump module. The sending unit consists of a float, an arm, and two variable resistors (tracks). These two tracks are used to send two different electrical signals. One is used for fuel gauge operation and the other is for OBD II emission requirements.

Track 1— fuel gauge operation: As the fuel level increases, the float and arm move up. This decreases the sending unit resistance, causing the fuel gauge on the instrument panel to read full. As the fuel level decreases, the float and arm move down. This increases the sending unit resistance, causing the fuel gauge on the instrument panel to read empty.

Track 2—OBD II emission requirements: A variable voltage signal is sent to the PCM to indicate fuel level. The purpose of this feature is to prevent a false setting of misfire and fuel system monitor trouble codes if the fuel level in the tank is less than 15 percent of its rated capacity.

FUEL FILTER

The fuel filter protects the fuel injectors from dirt, water and other foreign matter. The filter is located under the vehicle along the frame rail (Fig. 3). Replace fuel filter at intervals specified in the Lubrication and Maintenance Schedule chart found in Group 0, Lubrication and Maintenance.

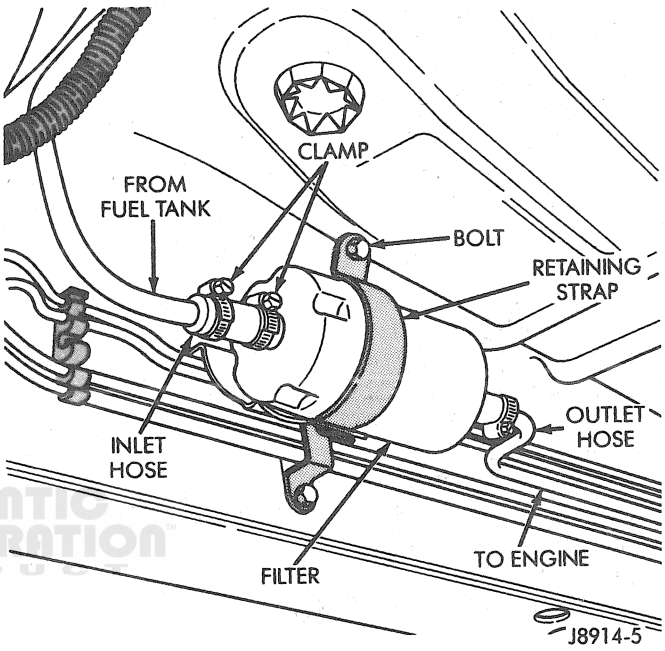


Fig. 3 Fuel Filter Location

FUEL PRESSURE REGULATOR

A fuel pressure regulator is used on all engines. It is located on the fuel pump module (Fig. 2). A separate frame mounted fuel filter is also used.

Fuel Pressure Regulator Operation: The pressure regulator is a mechanical device that is not controlled by engine vacuum or the powertrain control module (PCM).

The regulator is calibrated to maintain fuel system operating pressure of 338 kPa ± 14 kPa (49.0 psi ± 2 psi) at the fuel injectors. It contains a diaphragm, calibrated springs and a fuel return valve.

Fuel is supplied to the regulator by the electric fuel pump through an opening tube at the bottom.

The fuel pump module contains a check valve to maintain some fuel pressure when the engine is not operating. This will help to start the engine.

If fuel pressure at the pressure regulator exceeds 49.0 psi ± 2 psi, an internal diaphragm closes and excess fuel pressure is routed back into the tank through the pressure regulator. A separate fuel return line is not used with any engine.

DESCRIPTION AND OPERATION (Continued)

FUEL TANK

All models pass a full 360 degree rollover test without fuel leakage. To accomplish this, fuel and vapor flow controls are required for all fuel tank connections.

All models have a rollover valve mounted in the top of the fuel tank.

An evaporation control system is used to reduce emissions of fuel vapors into atmosphere by evaporation and to reduce unburned hydrocarbons emitted by vehicle engine. When fuel evaporates from fuel tank, vapors pass through vent hoses or tubes to a charcoal canister. The are temporarily held in the canister. When the engine is running, the vapors are drawn into intake manifold. Refer to Group 25, Emission Control System for additional information.

Inspect all hose connections to make sure they are secure and not leaking. Hoses should be replaced immediately if there is any evidence of degradation that could result in failure.

Avoid contact with clamps or other components that cause abrasions or scuffing. Be sure that the rubber hoses are properly routed to prevent pinching and to avoid heat sources.

The hoses used on fuel injected vehicles are of a special construction due to higher fuel pressures involved in system. If hoses need replacement, only use hoses marked EFM/EFI.

The hose clamps used on fuel injected vehicles have a special rolled edge construction. This prevents the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used on this system. Other clamps may cut into the hoses. This could cause high pressure fuel leaks.

FUEL INJECTORS

Six individual fuel injectors are used with the 4.0L 6-cylinder engine. Four individual fuel injectors are used with the 2.5L 4-cylinder engine. The injectors are attached to the fuel rail (Fig. 4).

The nozzle ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the powertrain control module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

During start up, battery voltage is supplied to the injectors through the ASD relay. When the engine is operating, voltage is supplied by the charging system. The PCM determines injector pulse width based on various inputs.

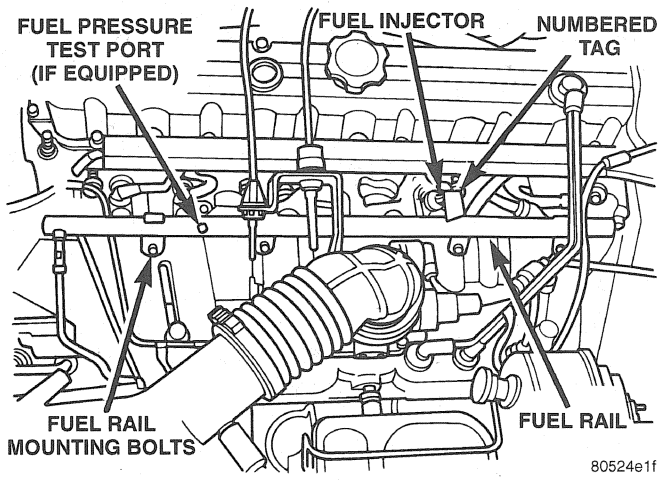


Fig. 4 Fuel Injectors—Typical—4.0L Shown

FUEL RAIL

The fuel rail supplies the necessary fuel to each individual fuel injector and is mounted to the intake manifold (Fig. 4). The fuel pressure regulator is no longer mounted to the fuel rail on any engine. It is now located on the fuel tank mounted fuel pump module. Refer to Fuel Pressure Regulator in this group for information.

Certain engines are equipped with a fuel pressure test port (Fig. 4). **Not all engines are equipped with this test port.**

The fuel rail is not repairable.

FUEL TANK FILLER TUBE CAP

The loss of any fuel or vapor out of filler neck is prevented by the use of a pressure-vacuum fuel tank filler tube cap. Relief valves inside cap will release only under significant pressure of 6.58 to 8.44 kPa (1.95 to 2.5 psi). The vacuum release for all fuel filler tube caps is between .97 and 2.0 kPa (.14 and .29 psi). This cap must be replaced by a similar unit if replacement is necessary. This is in order for the system to remain effective.

CAUTION: Remove fuel tank filler tube cap before servicing any fuel system component. This is done to help relieve tank pressure.

QUICK-CONNECT FITTINGS

Different types of quick-connect fittings are used to attach various fuel system components. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Refer to the Removal/Installation section for more information.

DESCRIPTION AND OPERATION (Continued)

CAUTION: The interior components (o-rings, spacers) of quick-connect fitting are not serviced separately, but new pull tabs are available for some types. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

DIAGNOSIS AND TESTING

FUEL PUMP PRESSURE TEST—2.5L ENGINE

NOTE: The fuel pressure test port is used on certain engines only. If equipped, the test port will be located on the fuel rail (Fig. 4). If not equipped, refer to the following procedure:

All fuel systems are equipped with a fuel tank module mounted, fuel pressure regulator. The fuel pressure regulator is not controlled by engine vacuum.

With engine at idle speed, system fuel pressure should be 338 kPa ± 14 kPa (49.0 psi ± 2 psi).

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. BEFORE DISCONNECTING FUEL LINE AT FUEL RAIL, THIS PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

(1) Release fuel pressure. Refer to the Fuel System Pressure Release Procedure.

(2) Disconnect latch clip and fuel line at fuel rail. Refer to Quick-Connect Fittings for procedures. This can be found in this section of the group.

(3) Connect adapter tool number 6539 or 6631 (Fig. 5) into the fuel rail. **Be sure adapter tool is fully seated into fuel rail.**

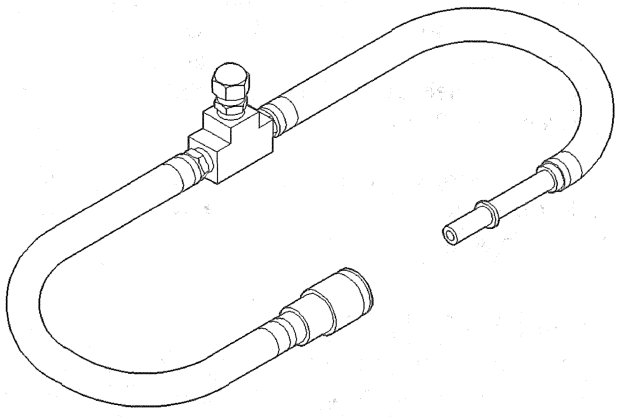


Fig. 5 Adapter Tool 6539 or 6631

(4) Install latch clip to fuel rail. If latch clip can not be fully seated into fuel rail, check for adapter tool not fully seated to fuel rail.

(5) Connect vehicle fuel line into adapter tool. Be sure fuel line is fully seated into adapter tool.

(6) Remove protective cap at test port "T" on adapter tool.

(7) Connect the 0–414 kPa (0-60 psi) fuel pressure gauge (from gauge set 5069) to the test port "T".

(8) Start engine and note pressure gauge reading. Fuel pressure should be 338 kPa ± 14 kPa (49.0 psi ± 2 psi) at idle.

(9) If pressure is at 0 psi, connect DRB scan tool and refer to operating instructions in the appropriate Powertrain Diagnostics Procedures service manual.

(10) If operating pressure is above 51.0 psi, fuel pump is OK but pressure regulator is defective. Regulator is not serviced separately. Replace fuel pump module assembly.

(11) After performing pressure test, install fuel line into fuel rail. Install latch clip into fuel rail. Refer to Quick-Connect Fittings for procedures. This can be found in this section of the group.

FUEL PUMP PRESSURE TEST–4.0L ENGINE

NOTE: The fuel pressure test port is used on certain engines only. If equipped, the test port will be located on the fuel rail (Fig. 4). A sealing cap is screwed onto the test port.

NOTE: The vacuum assisted fuel pressure regulator located at the front of the fuel rail is no longer used on any engine.

All fuel systems are equipped with a fuel tank module mounted, fuel pressure regulator. The fuel pressure regulator is not controlled by engine vacuum.

With engine at idle speed, system fuel pressure should be 338 kPa ± 14 kPa (49.0 psi ± 2 psi).

WARNING: DO NOT ALLOW FUEL TO SPILL ONTO THE ENGINE INTAKE OR EXHAUST MANIFOLDS. PLACE SHOP TOWELS UNDER AND AROUND THE PRESSURE PORT TO ABSORB FUEL.

WARNING: WEAR PROPER EYE PROTECTION WHEN TESTING FUEL SYSTEM PRESSURE.

(1) Remove the protective cap at the fuel rail test port. Connect the 0–414 kPa (0-60 psi) fuel pressure gauge (from gauge set 5069) to the test port pressure fitting on the fuel rail (Fig. 6).

DIAGNOSIS AND TESTING (Continued)

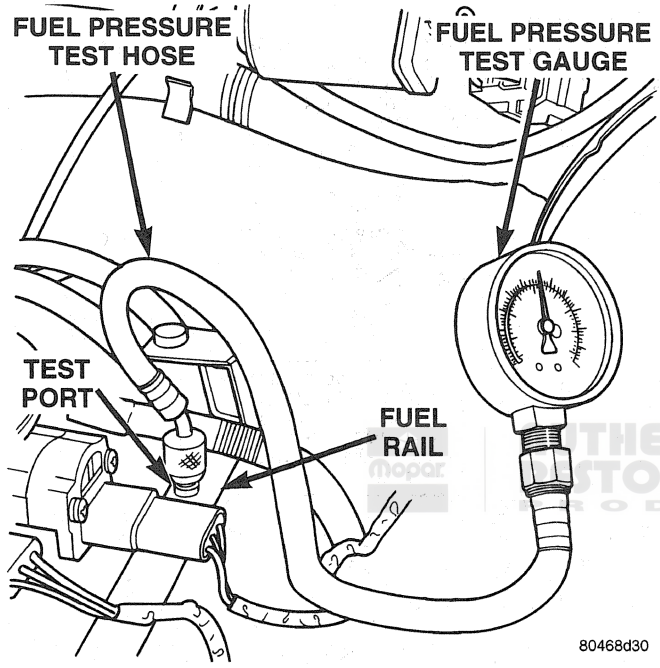


Fig. 6 Fuel Pressure Gauge Installation—Typical Test Port Shown

(2) Start the engine and note pressure gauge reading. Fuel pressure should be 338 kPa ± 14 kPa (49.0 psi ± 2 psi) at idle.

(3) If pressure is at O psi, connect DRB scan tool and refer to operating instructions in the appropriate Powertrain Diagnostics Procedures service manual.

(4) If operating pressure is above 51.0 psi, fuel pump is OK but pressure regulator is defective. Regulator is not serviced separately. Replace fuel pump module assembly.

FUEL GAUGE SENDING UNIT

For fuel gauge diagnosis, refer to Group 8E, Instrument Panel and Gauges.

FUEL INJECTOR TEST

To perform a complete test of the fuel injectors and their circuitry, refer to DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the injector only, refer to the following:

Disconnect the fuel injector wire harness connector from the injector (Fig. 4). Place an ohmmeter across the injector terminals. Resistance reading should be approximately 14.5 ohms ±1.2 ohms at 20°C (68°F). Proceed to following Injector Diagnosis chart. **When performing the following tests from the chart, do not leave electrical current applied to the injector for longer than five seconds. Damage to injector coil or internal injector seals (Fig. 7) could result.**

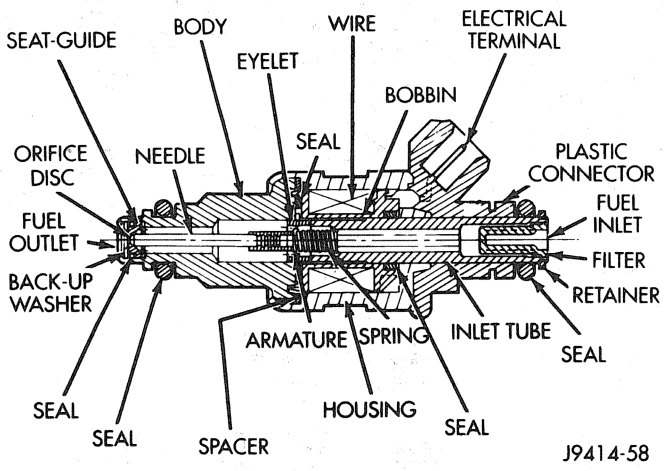
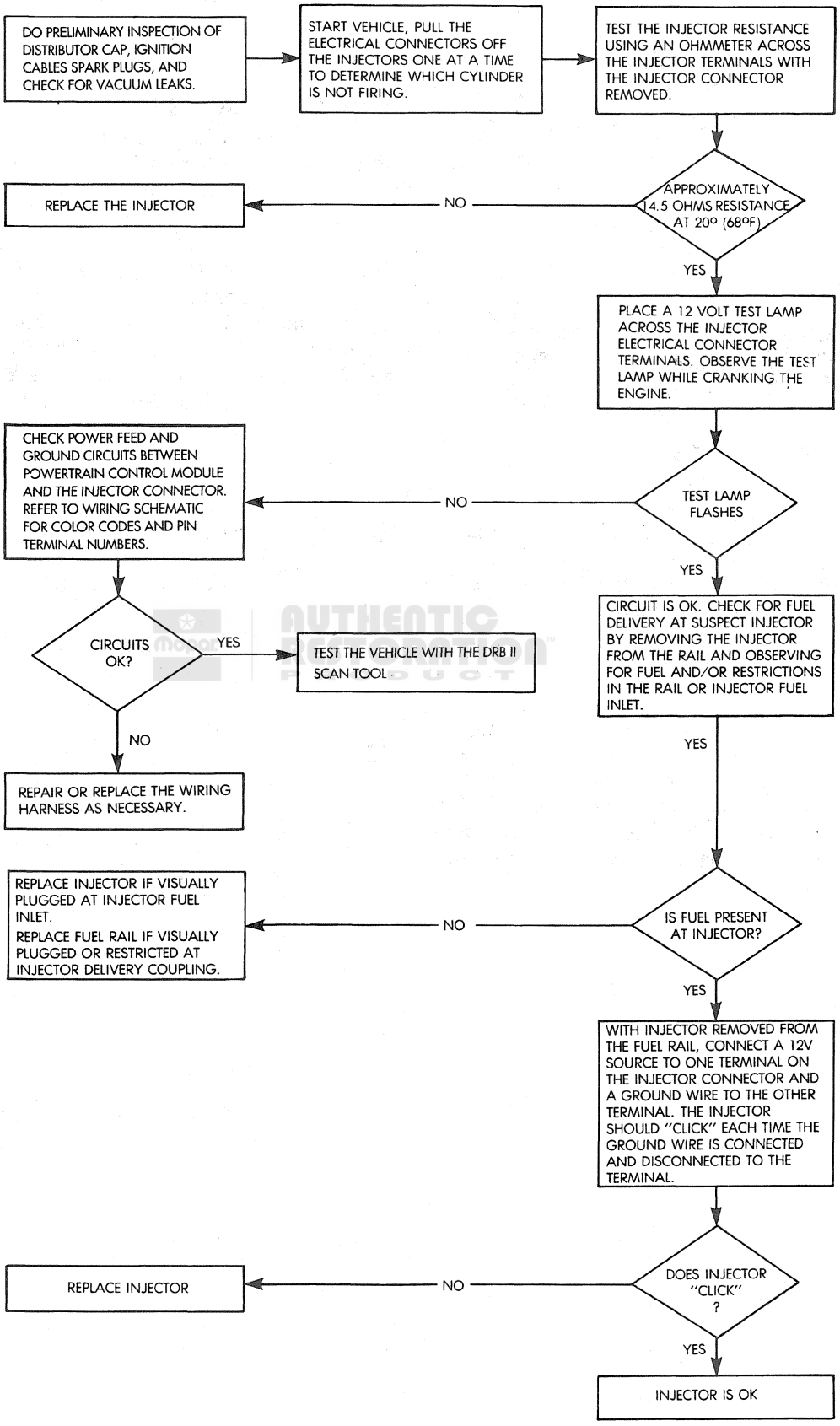


Fig. 7 Fuel Injector Internal Components—Typical

DIAGNOSIS AND TESTING (Continued)



INJECTOR DIAGNOSIS—VEHICLE RUNS ROUGH AND/OR HAS A MISS

SERVICE PROCEDURES

FUEL SYSTEM PRESSURE RELEASE PROCEDURE—2.5L ENGINE

Use the following procedure if the fuel rail is not equipped with a fuel pressure test port.

(1) Remove the Fuel Pump relay from the Power Distribution Center (PDC). For location of the relay, refer to the label on the underside of the PDC cover.

(2) Start and run engine it stalls.

(3) Attempt restarting engine until it will no longer run.

(4) Turn ignition key to OFF position.

CAUTION: Steps 1, 2, 3 and 4 must be performed to relieve high pressure fuel from within the fuel rail. Do not attempt to use the following steps to relieve this pressure as excessive fuel will be forced into a cylinder chamber.

(5) Unplug connector from any injector.

(6) Attach one end of a jumper wire with alligator clips (18 gauge or smaller) to either injector terminal.

(7) Connect the other end of the jumper wire to the positive side of the battery.

(8) Connect one end of a second jumper wire to the remaining injector terminal.

CAUTION: Supplying power to an injector for more than 4 seconds will permanently damage the injector. Do not leave the injector connected to power for more than 4 seconds.

(9) Momentarily touch the other end of this jumper wire to the negative terminal of the battery for no more than 4 seconds.

(10) Place a rag or towel below the fuel line at the quick connect to the rail.

(11) Disconnect the quick connect fitting to the rail. Refer to Quick-Connect Fittings in this section.

(12) Return the fuel pump relay to the PDC.

(13) One or more Diagnostic Trouble Codes (DTC's) may have been stored in the PCM memory due to fuel pump relay removal. The DRB scan tool must be used to erase a DTC. Refer to Group 25, Emission Control System. See On-Board Diagnostics.

FUEL SYSTEM PRESSURE RELEASE PROCEDURE–4.0L ENGINE

NOTE: The fuel pressure test port is used on certain engines only. If equipped, the test port will be located on the fuel rail (Fig. 4). A sealing cap is screwed onto the test port.

The fuel system is under constant fuel pressure (even with the engine off).

WARNING: BECAUSE THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE, THE PRESSURE MUST BE RELEASED BEFORE SERVICING ANY FUEL SYSTEM COMPONENT. THIS DOES NOT APPLY TO THROTTLE BODY REMOVAL.

(1) Disconnect negative battery cable.

(2) Remove the fuel tank filler tube cap to release fuel tank pressure.

(3) Remove protective cap from pressure test port on the fuel rail.

WARNING: DO NOT ALLOW FUEL TO SPILL ONTO THE ENGINE INTAKE OR EXHAUST MANIFOLDS. PLACE SHOP TOWELS UNDER AND AROUND THE PRESSURE PORT TO ABSORB FUEL WHEN THE PRESSURE IS RELEASED FROM THE FUEL RAIL.

WARNING: WEAR PROPER EYE PROTECTION WHEN RELEASING FUEL SYSTEM PRESSURE.

(4) Obtain the fuel pressure gauge/hose assembly from fuel pressure gauge tool set 5069. Remove the gauge from the hose.

(5) Place one end of hose (gauge end) into an approved gasoline container.

(6) Place a shop towel under the test port.

(7) To release fuel pressure, screw the other end of hose onto the fuel pressure test port.

(8) After fuel pressure has been released, remove the hose from the test port.

(9) Install protective cap to fuel test port.

FUEL TUBES/LINES/HOSES AND CLAMPS

Also refer to the section on Quick-Connect Fittings.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP.

Inspect all hose connections such as clamps, couplings and fittings to make sure they are secure and leaks are not present. The component should be replaced immediately if there is any evidence of degradation that could result in failure.

Never attempt to repair a plastic fuel line/tube. Replace as necessary.

Avoid contact of any fuel tubes/hoses with other vehicle components that could cause abrasions or scuffing. Be sure that the plastic fuel lines/tubes are properly routed to prevent pinching and to avoid heat sources.

SERVICE PROCEDURES (Continued)

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, only those marked EFM/EFI may be used.

The hose clamps used to secure rubber hoses on fuel injected vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause high-pressure fuel leaks.

Use new original equipment type hose clamps. Tighten hose clamps to 1 N·m (15 in. lbs.) torque.

QUICK-CONNECT FITTINGS

Also refer to the Fuel Tubes/Lines/Hoses and Clamps section.

Different types of quick-connect fittings are used to attach various fuel system components. These are: a single-tab type, a two-tab type, a plastic retainer ring type or a latch clip type.

SINGLE-TAB TYPE

This type of fitting is equipped with a single pull tab (Fig. 8). The tab is removable. After the tab is removed, the quick-connect fitting can be separated from the fuel system component.

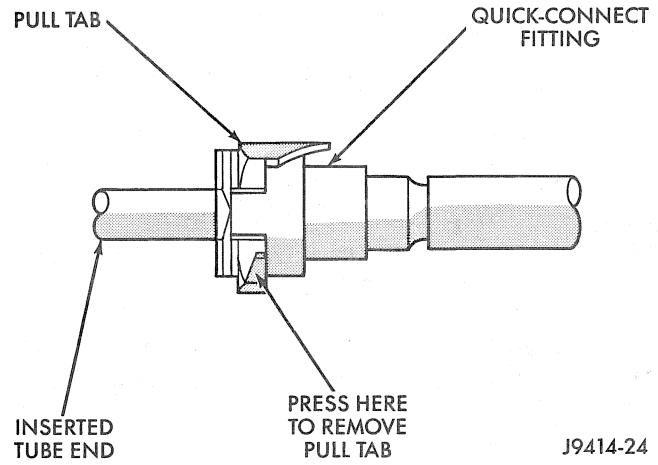


Fig. 8 Single-Tab Type Fitting

CAUTION: The interior components (o-rings, spacers) of this type of quick-connect fitting are not serviced separately, but new pull tabs are available. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP.

DISCONNECTION/CONNECTION

(1) Disconnect negative battery cable from battery.

(2) Perform the fuel pressure release procedure. Refer to the Fuel Pressure Release Procedure in this section.

(3) Clean the fitting of any foreign material before disassembly.

(4) Press the release tab on the side of fitting to release pull tab (Fig. 9).

CAUTION: If this release tab is not pressed prior to releasing the pull tab, the pull tab will be damaged.

(5) While pressing the release tab on the side of the fitting, use a screwdriver to pry up the pull tab (Fig. 9).

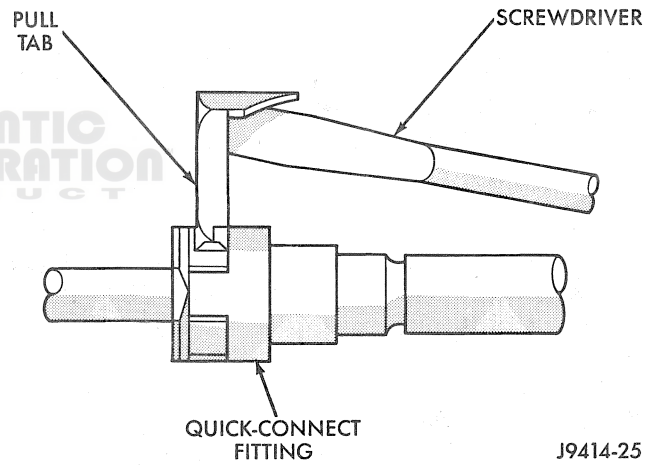


Fig. 9 Disconnecting Single-Tab Type Fitting

(6) Raise the pull tab until it separates from the quick-connect fitting (Fig. 10). Discard the old pull tab.

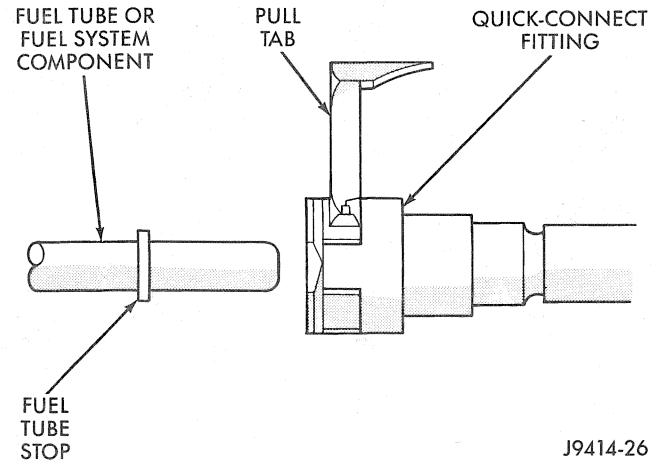


Fig. 10 Removing Pull Tab

SERVICE PROCEDURES (Continued)

(7) Disconnect the quick-connect fitting from the fuel system component being serviced.

(8) Inspect the quick-connect fitting body and fuel system component for damage. Replace as necessary.

(9) Prior to connecting the quick-connect fitting to component being serviced, check condition of fitting and component. Clean the parts with a lint-free cloth. Lubricate them with clean engine oil.

(10) Insert the quick-connect fitting into the fuel tube or fuel system component until the built-on stop on the fuel tube or component rests against back of fitting.

(11) Obtain a new pull tab. Push the new tab down until it locks into place in the quick-connect fitting.

(12) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(13) Connect negative cable to battery.

(14) Start engine and check for leaks.

TWO-TAB TYPE FITTING

This type of fitting is equipped with tabs located on both sides of the fitting (Fig. 11). These tabs are supplied for disconnecting the quick-connect fitting from component being serviced.

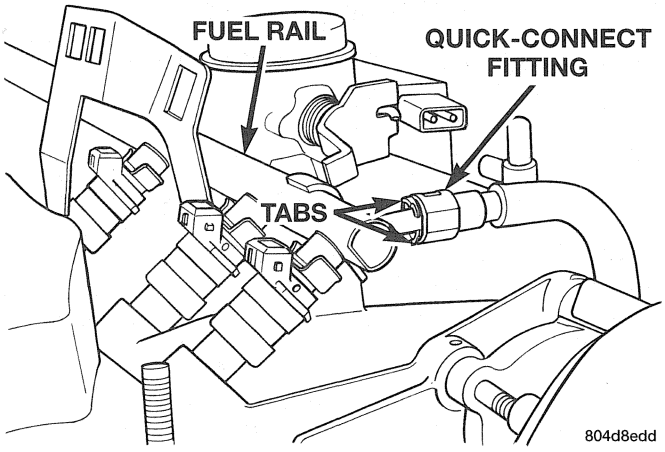


Fig. 11 Typical Two-Tab Type Quick-Connect Fitting

CAUTION: The interior components (o-rings, spacers) of this type of quick-connect fitting are not serviced separately, but new plastic retainers are available. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE IN THIS GROUP.

DISCONNECTION/CONNECTION

(1) Disconnect negative battery cable from the battery.

(2) Perform the fuel pressure release procedure. Refer to the Fuel Pressure Release Procedure in this section.

(3) Clean the fitting of any foreign material before disassembly.

(4) To disconnect the quick-connect fitting, squeeze the plastic retainer tabs (Fig. 11) against the sides of the quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer. Pull the fitting from the fuel system component being serviced. The plastic retainer will remain on the component being serviced after fitting is disconnected. The o-rings and spacer will remain in the quick- connect fitting connector body.

(5) Inspect the quick-connect fitting body and component for damage. Replace as necessary.

CAUTION: When the quick-connect fitting was disconnected, the plastic retainer will remain on the component being serviced. If this retainer must be removed, very carefully release the retainer from the component with two small screwdrivers. After removal, inspect the retainer for cracks or any damage.

(6) Prior to connecting the quick-connect fitting to component being serviced, check condition of fitting and component. Clean the parts with a lint-free cloth. Lubricate them with clean engine oil.

(7) Insert the quick-connect fitting to the component being serviced and into the plastic retainer. When a connection is made, a click will be heard.

(8) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(9) Connect negative cable to battery.

(10) Start engine and check for leaks.

SERVICE PROCEDURES (Continued)

PLASTIC RETAINER RING TYPE FITTING

This type of fitting can be identified by the use of a full-round plastic retainer ring (Fig. 12) usually black in color.

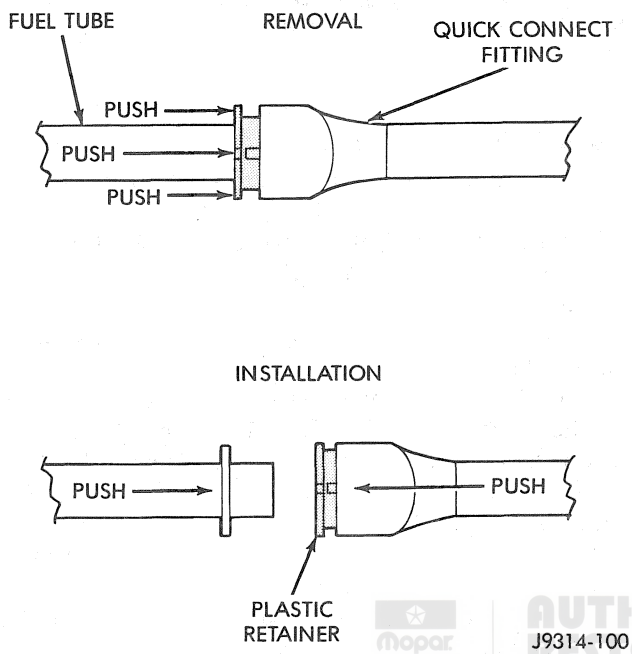


Fig. 12 Plastic Retainer Ring Type Fitting

CAUTION: The interior components (o-rings, spacers, retainers) of this type of quick-connect fitting are not serviced separately. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP.

DISCONNECTION/CONNECTION

(1) Disconnect negative battery cable from the battery.

(2) Perform the fuel pressure release procedure. Refer to the Fuel Pressure Release Procedure in this section.

(3) Clean the fitting of any foreign material before disassembly.

(4) To release the fuel system component from the quick-connect fitting, firmly push the fitting towards the component being serviced while firmly pushing the plastic retainer ring into the fitting (Fig. 12). With the plastic ring depressed, pull the fitting from the component. **The plastic retainer ring must be pressed squarely into the fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on the shoulder of the plastic retainer ring to aid in disconnection.**

(5) After disconnection, the plastic retainer ring will remain with the quick-connect fitting connector body.

(6) Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

(7) Prior to connecting the quick-connect fitting to component being serviced, check condition of fitting and component. Clean the parts with a lint-free cloth. Lubricate them with clean engine oil.

(8) Insert the quick-connect fitting into the component being serviced until a click is felt.

(9) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(10) Connect negative battery cable to battery.

(11) Start engine and check for leaks.

FUEL LINE AT FUEL RAIL

A latch clip is used to secure the fuel line to the fuel rail on certain engines (Fig. 13). A special tool will be necessary to separate the fuel line from the fuel rail after the latch clip is removed.

DISCONNECTION/CONNECTION AT FUEL RAIL

(1) Disconnect the negative battery cable from battery.

(2) Perform the fuel pressure release procedure. Refer to the Fuel Pressure Release Procedure in this section.

(3) Clean the fitting of any foreign material before disassembly.

(4) Pry up on the latch clip with a screwdriver (Fig. 13).

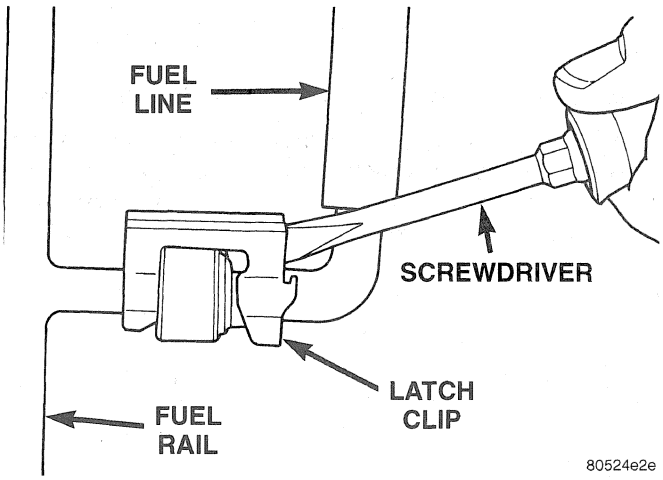


Fig. 13 Latch Clip Removal—Typical

SERVICE PROCEDURES (Continued)

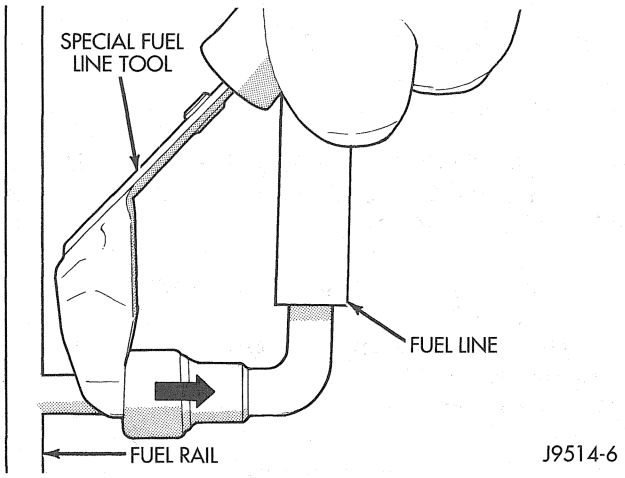


Fig. 14 Fuel Line Disconnection—Typical

(5) Slide the latch clip toward the fuel rail while lifting with the screwdriver.

(6) Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into the fuel line (Fig. 14). Use this tool to release the locking fingers in the end of the line.

(7) With the special tool still inserted, pull the fuel line from the fuel rail.

(8) After disconnection, the locking fingers will remain within the quick-connect fitting at the end of the fuel line.

(9) Inspect fuel line fitting, locking fingers and fuel rail fitting for damage. Replace as necessary.

(10) Prior to connecting the fuel line to the fuel rail, check condition of both fittings. Clean the parts with a lint-free cloth. Lubricate them with clean engine oil.

(11) Insert the fuel line onto the fuel rail until a click is felt.

(12) Verify a locked condition by firmly pulling on fuel line and fitting (15-30 lbs.).

(13) Install latch clip (snaps into position). **If the latch clip will not fit, this indicates the fuel line is not properly installed to the fuel rail. Recheck the fuel line connection.**

(14) Connect negative battery cable to battery.

(15) Start engine and check for leaks.

REMOVAL AND INSTALLATION

FUEL FILTER

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING THE FUEL FILTER.

(1) Disconnect negative battery cable at battery.

(2) Remove fuel filler cap.

(3) Release fuel system pressure. Refer to Fuel Pressure Release Procedure in this group.

(4) Raise and support vehicle.

(5) Remove hoses and clamps from inlet and outlet sides of filter (Fig. 15). For procedures, refer to Fuel Tubes/Lines/Hoses and Clamps. Also refer to Quick-Connect Fittings. These can be found in the Fuel Delivery System section of this group.

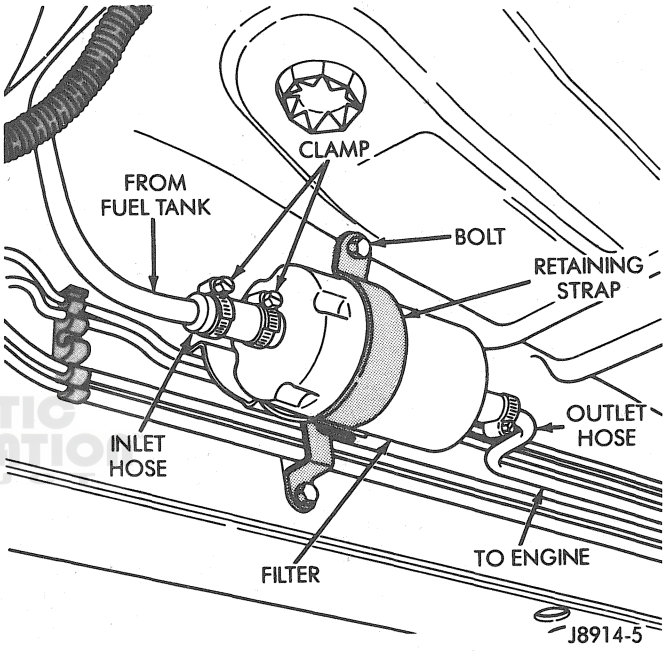


Fig. 15 Fuel Filter

(6) Remove retaining strap bolt.

(7) Remove filter from vehicle.

INSTALLATION

CAUTION: The ends of the fuel filter are marked for correct installation. Install filter with the end marked IN towards fuel tank and the end marked OUT towards engine.

(1) Place fuel filter in retaining strap with the marked ends in the correct position.

(2) Install retaining strap bolt and tighten to 12 N·m (106 in. lbs.) torque.

(3) Install inlet and outlet hoses and hose clamps. For procedures, refer to Fuel Tubes/Lines/Hoses and Clamps. Also refer to Quick-Connect Fittings. These can be found in the Fuel Delivery System section of this group.

(4) Lower vehicle.

(5) Connect negative battery cable.

(6) Start engine and check for leaks.

REMOVAL AND INSTALLATION (Continued)

FUEL PRESSURE REGULATOR

The pressure regulator is not serviced separately. If it needs servicing, the entire fuel pump module must be replaced. Refer to Fuel Pump Module for procedures.

FUEL PUMP RELAY

The fuel pump and automatic shutdown (ASD) relays are located in the Power Distribution Center (PDC). The PDC is located in the engine compartment near the windshield washer fluid bottle. (Fig. 16). Refer to label on PDC cover for relay location. Check the terminals in the PDC relay connector for corrosion or damage before installation.

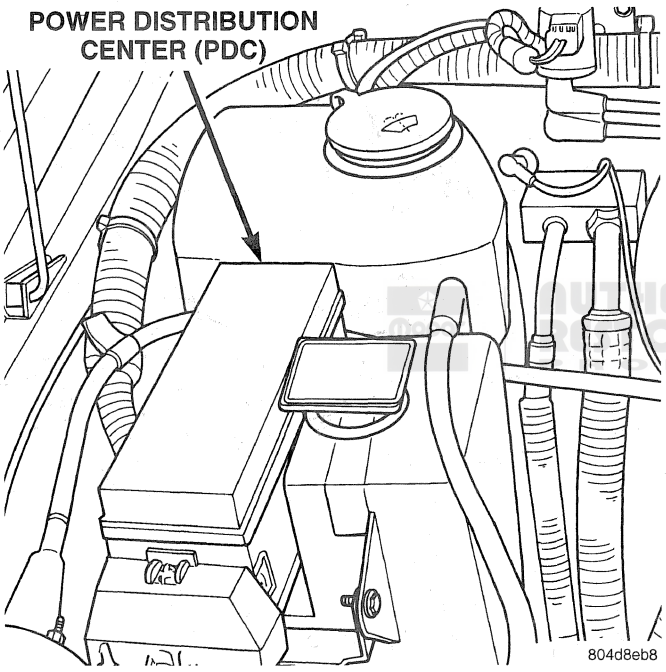


Fig. 16 Power Distribution Center

FUEL PUMP MODULE

The fuel pump module is installed in the top/front of the fuel tank (Fig. 17).

REMOVAL

The module assembly can be removed from the fuel tank without removing the tank from the vehicle.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING THE FUEL PUMP MODULE, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE IN THIS GROUP.

(1) Remove fuel filler cap. Perform the Fuel Pressure Release Procedure as outlined in this group.
(2) Disconnect negative battery cable.
(3) Using an approved portable gasoline siphon/storage tank, drain fuel tank until fuel level is below one quarter (1/4) full.
(4) Raise and support vehicle.

WARNING: WRAP SHOP TOWELS AROUND FUEL HOSES TO ABSORB ANY FUEL SPILLAGE DURING FUEL TANK REMOVAL.

(5) Disconnect fuel supply hose (Fig. 17) at fuel pump module.
(6) Disconnect fuel pump module electrical harness connector from main harness.
(7) Using a brass punch and hammer, remove fuel pump module lock ring by carefully tapping the lock ring tangs counterclockwise (Fig. 18).

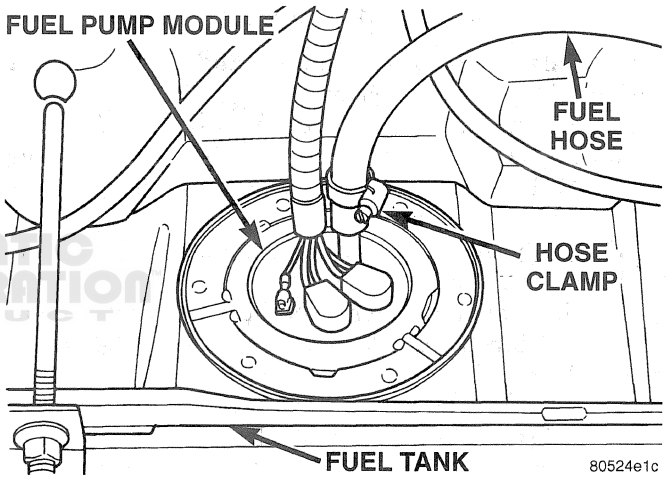


Fig. 17 Fuel Pump Module Location

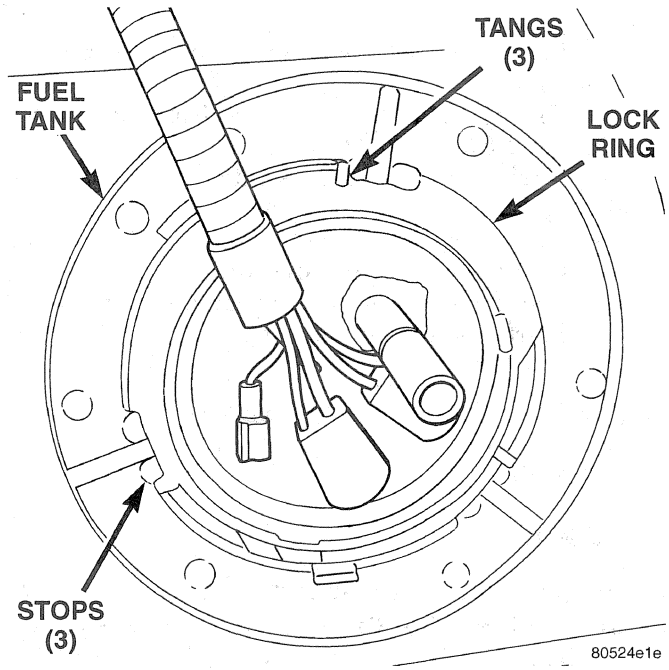


Fig. 18 Fuel Pump Module Lock Ring

REMOVAL AND INSTALLATION (Continued)

(8) Remove fuel pump module and o-ring seal. Discard old O-ring.

INSTALLATION

(1) Install fuel pump module assembly and new o-ring seal. The rubber stopper on the bottom of the module (Fig. 19) must be inserted into the cup in the fuel tank reservoir.

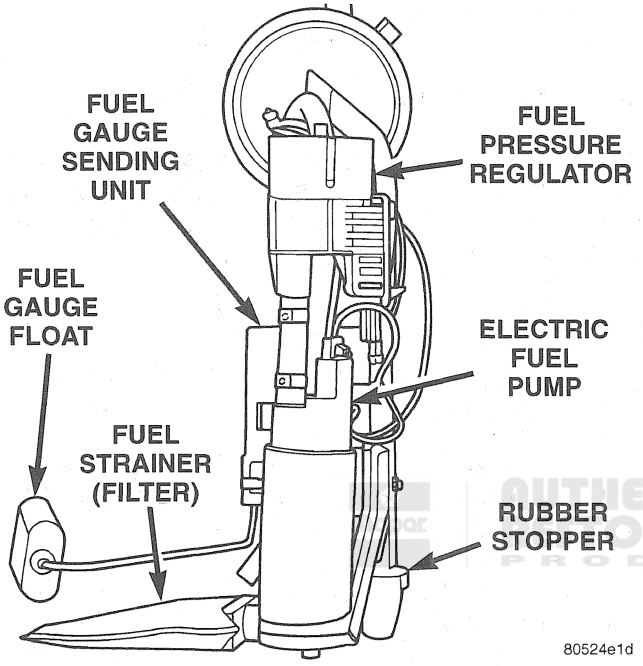


Fig. 19 Fuel Pump Module Components

(2) Install lock ring.

(3) Using a brass punch and a hammer, carefully tap lock ring tangs clockwise until all three tangs seat against all three of the stops (Fig. 18) on fuel tank.

(4) Connect fuel hose to fuel pump module. Tighten hose clamp to 1 N·m (15 in. lbs.) torque.

(5) Connect fuel pump module electrical harness connector to main harness connector.

(6) Lower vehicle.

(7) Fill fuel tank. Install fuel tank cap.

(8) Connect negative battery cable.

(9) Start vehicle and inspect for leaks.

FUEL PUMP INLET STRAINER

The fuel pump inlet strainer (in-tank fuel filter) is not serviced separately. If it needs service, the fuel pump module assembly must be replaced. Refer to Fuel Pump Module Removal/Installation.

FUEL LEVEL SENSOR

The fuel level sensor (fuel gauge sending unit) is not serviced separately. If it needs service, the fuel pump module assembly must be replaced. Refer to Fuel Pump Module Removal/Installation.

FUEL INJECTOR RAIL

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING THE FUEL RAIL.

(1) Remove fuel tank filler tube cap.

(2) Disconnect the negative battery cable from battery.

(3) Perform the Fuel System Pressure Release Procedure as described in this Group.

(4) Remove and numerically attach a tag (if fuel injector is not already tagged), the injector harness connectors. Do this at each injector (Fig. 20).

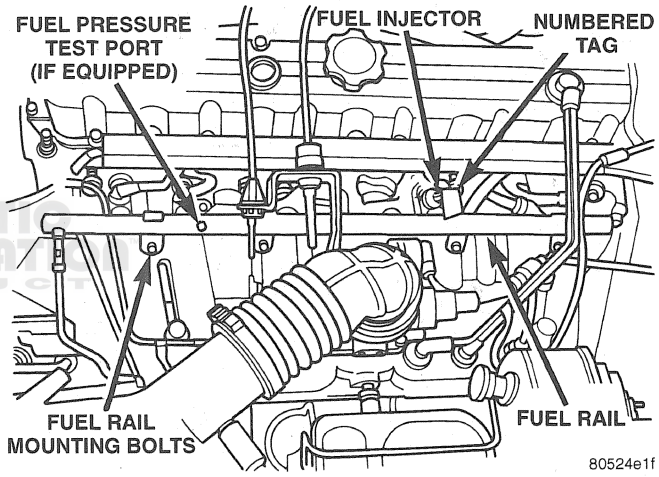


Fig. 20 Fuel Rail Mounting

(5) Disconnect fuel supply line latch clip and fuel line at fuel rail. Refer to Fuel Tubes/Lines/Hoses and Clamps, or Quick-Connect Fittings. These can both be found in the Fuel Delivery section of this group.

(6) Remove fuel rail mounting bolts (Fig. 20).

(7) On models with automatic transmissions, it may be necessary to remove automatic transmission throttle line pressure cable and bracket. This will aid in fuel rail assembly removal.

(8) Remove fuel rail by gently rocking until all the fuel injectors are out of the intake manifold.

INSTALLATION

(1) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

(2) Position tips of all fuel injectors into the corresponding injector bore in the intake manifold. Seat injectors into manifold.

(3) Tighten fuel rail mounting bolts to 27 N·m (20 ft. lbs.) torque.

(4) Connect injector harness connectors to appropriate (tagged) injector.

REMOVAL AND INSTALLATION (Continued)

(5) Connect fuel line and fuel line latch clip to fuel rail. Refer to this group for procedures.
(6) Install protective cap to pressure test port fitting (if equipped).
(7) Install fuel tank cap.
(8) Connect negative battery cable to battery.
(9) Start engine and check for fuel leaks.

FUEL INJECTORS

REMOVAL

(1) Remove the fuel rail. Refer to Fuel Rail Removal in this section.
(2) Remove the clip(s) that retain the fuel injector(s) to the fuel rail (Fig. 21) or (Fig. 22).

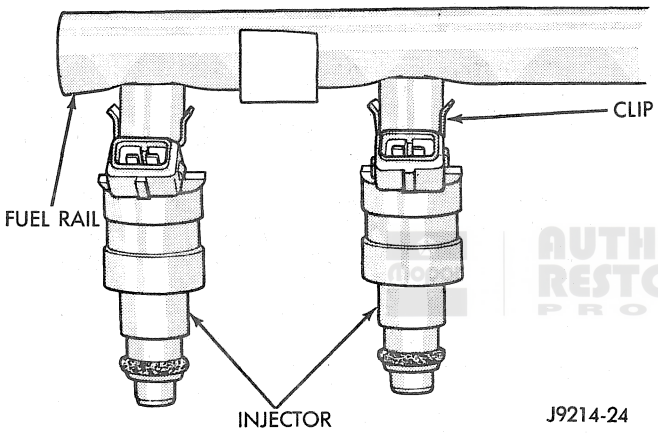


Fig. 21 Injector Mounting

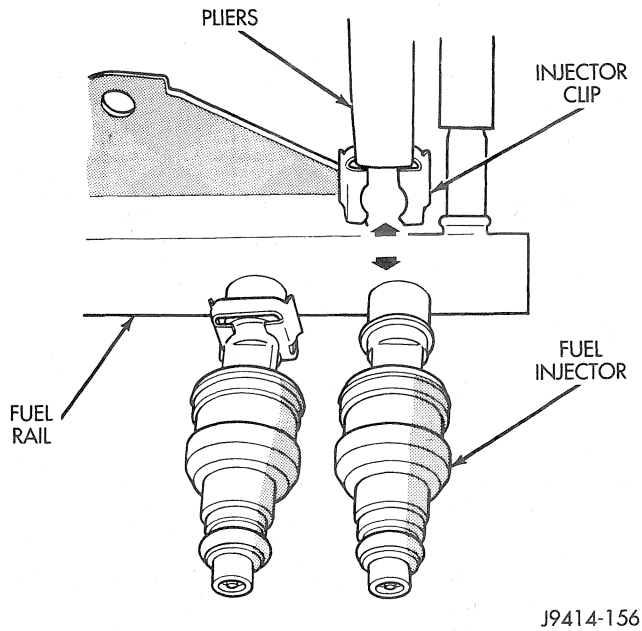


Fig. 22 Injector Retaining Clips—Typical Injector

INSTALLATION

(1) Install the fuel injector(s) into the fuel rail assembly and install retaining clip(s).
(2) If the same injector(s) is being reinstalled, install new o- ring(s).
(3) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.
(4) Install fuel rail. Refer to Fuel Rail Installation in this section.
(5) Start engine and check for fuel leaks.

FUEL TANK

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL TANK.

REMOVAL

Perform the Fuel System Pressure Release Procedure.
(1) Disconnect negative battery cable.
(2) Remove the fuel filler cap. Using an approved portable gasoline siphon/storage tank, drain fuel tank.
(3) Raise and support vehicle.
(4) Disconnect fuel fill hose and fill vent hose from filler neck (Fig. 23).

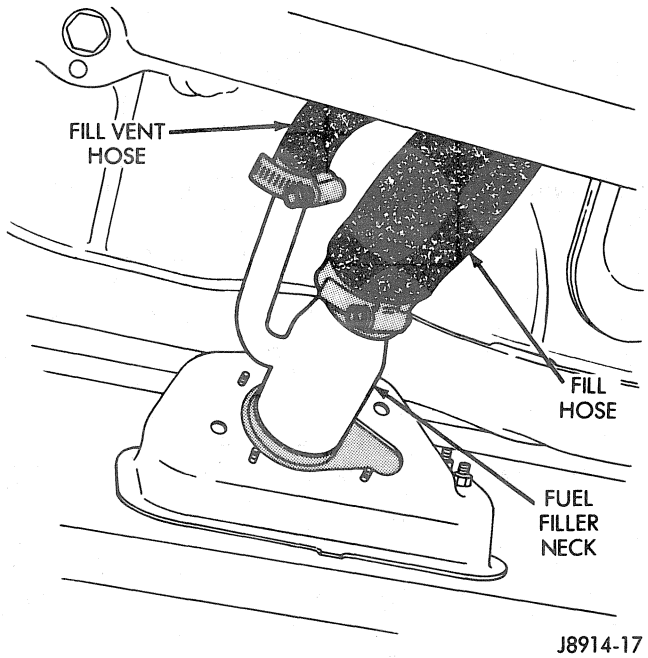


Fig. 23 Filler Neck Hoses

(5) Disconnect fuel pump module wire connector. Remove tie straps securing connector harness to fuel hoses.

REMOVAL AND INSTALLATION (Continued)

WARNING: WRAP SHOP TOWELS AROUND FUEL HOSES TO ABSORB ANY FUEL SPILLAGE DURING FUEL TANK REMOVAL.

(6) Disconnect fuel tank vent hose from vent tube.
(7) Disconnect fuel supply hose at pump module.
(8) If equipped, remove skid plate (Fig. 24).

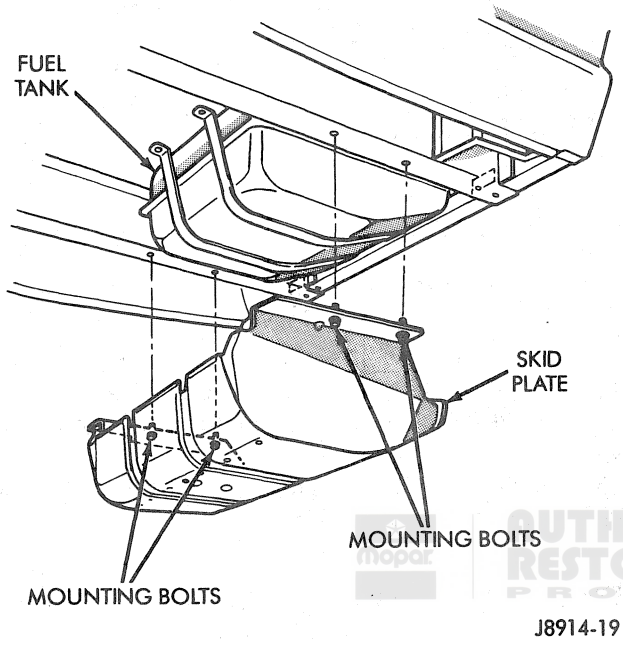


Fig. 24 Skid Plate

(9) Remove fuel tank shield (Fig. 25).

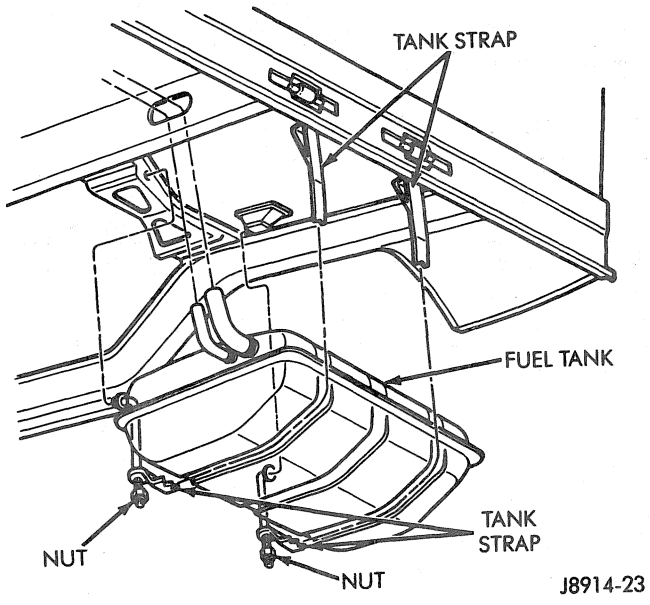


Fig. 25 Fuel Tank Remove/Install

(10) Center a transmission jack under the fuel tank.
(11) Remove support strap nuts. Move straps away from tank.
(12) Lower fuel tank on transmission jack.

INSTALLATION

(1) Raise fuel tank into position. Connect fuel fill hose and vent hose to filler neck and tighten clamps.
(2) Wrap support straps around tank and over studs. Tighten strap nuts to 11.3 N·m (100 in. lbs.) torque.
(3) Remove transmission jack.
(4) Install tank shield.
(5) If equipped, install tank skid plate.
(6) Connect vent hose to vent tube.
(7) Connect fuel supply hose and clamp to pump module. Tighten hose clamp to 1 N·m (15 in. lbs.) torque.
(8) Connect fuel pump module wire connector to harness connector. Secure fuel pump module wire harness to fuel tubes with tie straps.
(9) Lower vehicle.
(10) Fill fuel tank. Install filler cap.
(11) Connect negative battery cable to battery.
(12) Start vehicle and inspect for leaks.

ACCELERATOR PEDAL

The accelerator pedal is connected to the throttle body linkage by the throttle cable. The cable is protected by a plastic sheathing and is connected to the throttle body linkage by a ball socket. It is connected to the upper part of the accelerator pedal arm by a plastic retainer (clip) (Fig. 26). This retainer (clip) snaps into the top of the accelerator pedal arm. Retainer tabs (built into the cable sheathing) (Fig. 26) fasten the cable to the dash panel.

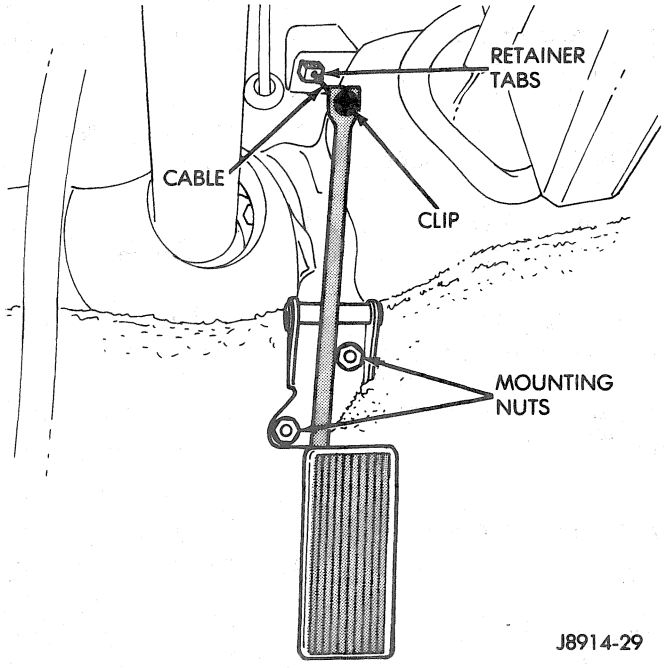


Fig. 26 Accelerator Pedal Mounting—Typical

Dual throttle return springs (attached to the throttle shaft) are used to close the throttle.

REMOVAL AND INSTALLATION (Continued)

CAUTION: Never attempt to remove or alter these springs.

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing the accelerator pedal or throttle cable.

REMOVAL

(1) From inside the vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of accelerator pedal arm (Fig. 26). Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove accelerator pedal mounting bracket nuts. Remove accelerator pedal assembly.

INSTALLATION

(1) Place accelerator pedal assembly over studs protruding from floor pan. Tighten mounting nuts to 5 N·m (36 in. lbs.) torque.

(2) Slide throttle cable into opening in top of pedal arm. Push plastic cable retainer (clip) into accelerator pedal arm opening until it snaps into place.

(3) Before starting engine, operate accelerator pedal to check for any binding.

THROTTLE CABLE

REMOVAL

(1) From inside the vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of accelerator pedal arm (Fig. 26). Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove the cable core wire at pedal arm.

(3) From inside the vehicle, pinch both sides of the cable housing retainer tabs (Fig. 26) at the dash panel. Remove cable housing from dash panel and pull into the engine compartment.

(4) Remove cable from clip on the engine cylinder head (valve) cover.

(5) Remove the throttle cable ball end socket at throttle body linkage (snaps off) (Fig. 27).

(6) Remove throttle cable from throttle body mounting bracket by compressing retainer tabs and pushing cable through hole in bracket.

(7) Remove throttle cable from vehicle.

INSTALLATION

(1) Slide throttle cable through hole in throttle body bracket until retainer tabs lock into bracket. Connect cable ball end to throttle body linkage ball (snaps on).

(2) Snap cable into clip on the engine cylinder head (valve) cover.

(3) Push other end of cable through opening in dash panel until retaining tabs lock into panel.

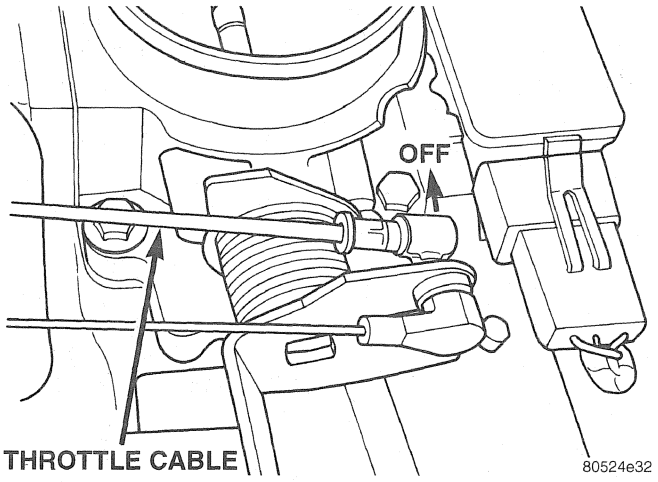


Fig. 27 Throttle (Accelerator) Cable at Throttle Body—Typical

(4) From inside drivers compartment, slide throttle cable core wire into opening in top of accelerator pedal arm. Push cable retainer (clip) into pedal arm opening until it snaps in place.

(5) Before starting engine, operate accelerator pedal to check for any binding.

Mopar AUTHENTIC RESTORATION PRODUCT

SPECIFICATIONS

VECI LABEL SPECIFICATIONS

If anything differs between the specifications found on the Vehicle Emission Control Information (VECI) label and the following specifications, use specifications on VECI label. The VECI label is located in the engine compartment.

FUEL TANK CAPACITY

Models	Liters	U.S. Gallons
All	76	20.02
Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerance and refill procedure.		

FUEL SYSTEM PRESSURE

338 kPa ± 14 kPa (49.0 psi ± 2 psi).

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Accelerator Pedal Bracket Mounting Nuts	.5 N·m (36 in. lbs.)
Fuel Rail Mounting Bolts	.27 N·m (20 ft. lbs.)
Fuel Tank Mounting Nuts	.11.3 N·m (100 in. lbs.)
Fuel Hose Clamps	.1 N·m (15 in. lbs.)

FUEL INJECTION SYSTEM

INDEX

page

GENERAL INFORMATION
INTRODUCTION 20
MODES OF OPERATION 20
DESCRIPTION AND OPERATION
AIR CONDITIONING (A/C) CLUTCH RELAY—PCM OUTPUT 28
AIR CONDITIONING (A/C) CONTROLS—PCM INPUT 23
AUTO SHUTDOWN (ASD) RELAY—PCM OUTPUT . 28
AUTOMATIC SHUTDOWN (ASD) RELAY—PCM INPUT 24
BATTERY TEMPERATURE SENSOR—PCM INPUT 24
BATTERY VOLTAGE—PCM INPUT 24
BRAKE SWITCH—PCM INPUT 24
CAMSHAFT POSITION SENSOR—PCM INPUT . 24
CRANKSHAFT POSITION SENSOR—PCM INPUT . 25
DATA LINK CONNECTOR—PCM INPUT AND OUTPUT 29
DUTY CYCLE EVAP PURGE SOLENOID VALVE-PCM OUTPUT 29
ENGINE COOLANT TEMPERATURE SENSOR—PCM INPUT 25
EXTENDED IDLE SWITCH—PCM INPUT 25
FIVE VOLT SENSOR SUPPLY—PRIMARY 24
FIVE VOLT SENSOR SUPPLY—SECONDARY . . 24
FUEL INJECTORS—PCM OUTPUT 29
FUEL LEVEL SENSOR—PCM INPUT 24
FUEL PUMP RELAY-PCM OUTPUT 29
GENERATOR FIELD—PCM OUTPUT 28
GENERATOR LAMP—PCM OUTPUT 28
HEATED OXYGEN SENSOR (O2S)—PCM INPUT 26
IDLE AIR CONTROL (IAC) MOTOR—PCM OUTPUT 29
IGNITION CIRCUIT SENSE—PCM INPUT 26
IGNITION COIL—PCM OUTPUT 30
INTAKE MANIFOLD AIR TEMPERATURE SENSOR—PCM INPUT 26
MALFUNCTION INDICATOR LAMP—PCM OUTPUT 30
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—PCM INPUT 27
POWER GROUND 28
POWER STEERING PRESSURE SWITCH—PCM INPUT 27
POWERTRAIN CONTROL MODULE (PCM) 23
RADIATOR FAN RELAY—PCM OUTPUT 30
SPEED CONTROL SOLENOIDS—PCM OUTPUT . . 30
SPEED CONTROL SWITCH—PCM INPUT 27
SYSTEM DIAGNOSIS 23
TACHOMETER—PCM OUTPUT 30
THROTTLE BODY 30
THROTTLE POSITION SENSOR (TPS)—PCM INPUT 27
TRANSMISSION PARK/NEUTRAL SWITCH—PCM INPUT 27
VEHICLE SPEED AND DISTANCE SENSOR—PCM INPUT 27
DIAGNOSIS AND TESTING
ASD AND FUEL PUMP RELAYS 33
CAMSHAFT AND CRANKSHAFT POSITION SENSORS 35
ENGINE COOLANT TEMPERATURE SENSOR . 35
EXTENDED IDLE SWITCH TEST 36
HEATED OXYGEN (O2S) SENSORS 35
IDLE AIR CONTROL (IAC) MOTOR 36
INTAKE MANIFOLD AIR TEMPERATURE SENSOR . 36
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR TEST 34
POWER STEERING PRESSURE SWITCH 36
THROTTLE POSITION SENSOR (TPS) 37
VEHICLE SPEED SENSOR 36
VISUAL INSPECTION 31
REMOVAL AND INSTALLATION
AIR CLEANER ELEMENT 41
AIR CLEANER HOUSING 41
AUTOMATIC SHUTDOWN (ASD) RELAY 37
CAMSHAFT POSITION SENSOR 40
CRANKSHAFT POSITION SENSOR 40
DOWNSTREAM OXYGEN SENSOR 41
DUTY CYCLE EVAP CANISTER PURGE SOLENOID 39
ENGINE COOLANT TEMPERATURE SENSOR . . 42
FUEL PUMP RELAY 37
IDLE AIR CONTROL (IAC) MOTOR 38
INTAKE MANIFOLD AIR TEMPERATURE SENSOR . 42
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR 38
POWER STEERING PRESSURE SWITCH—2.5L ENGINE 40
POWERTRAIN CONTROL MODULE (PCM) 39
THROTTLE BODY 37
THROTTLE POSITION SENSOR (TPS) 38
UPSTREAM OXYGEN SENSOR 40
VEHICLE SPEED SENSOR 42
SPECIFICATIONS
TORQUE SPECIFICATIONS 43
VECI LABEL SPECIFICATIONS 43
SPECIAL TOOLS
FUEL SYSTEM 44

GENERAL INFORMATION

INTRODUCTION

All engines are equipped with sequential Multi-Port Fuel Injection (MFI). The MFI system provides precise air/fuel ratios for all driving conditions.

The powertrain control module (PCM) operates the fuel system. The PCM was formerly referred to as the SBEC or engine controller. The PCM (Fig. 1) is a pre-programmed, dual microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

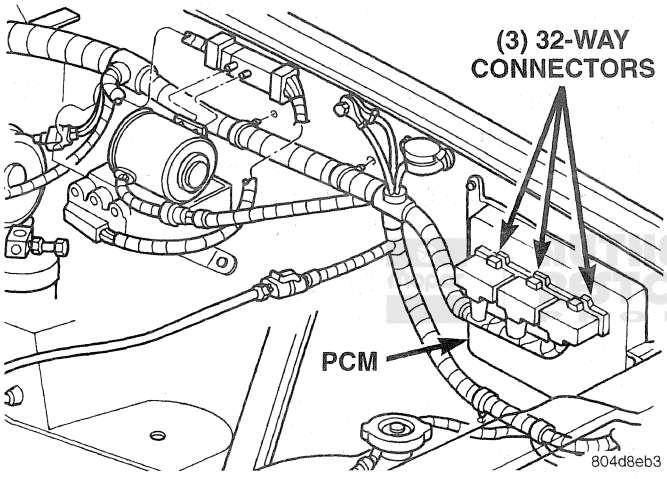


Fig. 1 Powertrain Control Module (PCM) Location

Powertrain Control Module (PCM) Inputs represent the instantaneous engine operating conditions. Air-fuel mixture and ignition timing calibrations for various driving and atmospheric conditions are pre-programmed into the PCM. The PCM monitors and analyzes various inputs. It then computes engine fuel and ignition timing requirements based on these inputs. Fuel delivery control and ignition timing will then be adjusted accordingly.

Other inputs to the PCM are provided by the brake light switch, air conditioning select switch and the speed control switches. All inputs to the PCM are converted into signals.

Electrically operated fuel injectors spray fuel in precise metered amounts into the intake port directly above the intake valve. The injectors are fired in a specific sequence by the PCM. The PCM maintains an air/fuel ratio of 14.7 to 1 by constantly adjusting injector pulse width. Injector pulse width is the length of time that the injector opens and sprays fuel into the chamber. The PCM adjusts injector pulse width by opening and closing the ground path to the injector.

Manifold absolute pressure (air density) and engine rpm (speed) are the primary inputs that determine fuel injector pulse width. The PCM also monitors other inputs when adjusting air-fuel ratio.

MODES OF OPERATION

As input signals to the powertrain control module (PCM) change, the PCM adjusts its response to the output devices. For example, the PCM must calculate different injector pulse width and ignition timing for idle than it does for wide open throttle (WOT).

There are two different areas of operation: Open Loop and Closed Loop.

During Open Loop modes, the powertrain control module (PCM) receives input signals and responds only according to preset PCM programming. Input from the oxygen (O2S) sensor is not monitored during Open Loop modes.

During Closed Loop modes, the PCM will monitor the oxygen (O2S) sensor input. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel. By monitoring the exhaust oxygen content through the O2S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch On, engine start-up (crank), engine warm-up, acceleration, deceleration and wide open throttle modes are Open Loop modes. The idle and cruise modes, (with the engine at operating temperature) are Closed Loop modes.

IGNITION SWITCH (KEY-ON) MODE

This is an Open Loop mode. When the fuel system is activated by the ignition switch, the following actions occur:

- The powertrain control module (PCM) pre-positions the idle air control (IAC) motor.
- The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.
- The PCM monitors the engine coolant temperature sensor input. The PCM modifies fuel strategy based on this input.

GENERAL INFORMATION (Continued)

- Intake manifold air temperature sensor input is monitored
- Throttle position sensor (TPS) is monitored
- The auto shutdown (ASD) relay is energized by the PCM for approximately three seconds.
- The fuel pump is energized through the fuel pump relay by the PCM. The fuel pump will operate for approximately three seconds unless the engine is operating or the starter motor is engaged
- The O2S sensor heater element is energized through the fuel pump relay. The O2S sensor input is not used by the PCM to calibrate air-fuel ratio during this mode of operation.
- The up-shift indicator lamp is illuminated (manual transmission only).

ENGINE START-UP MODE

This is an Open Loop mode. The following actions occur when the starter motor is engaged.

The powertrain control module (PCM) receives inputs from:

- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Starter motor relay
- Camshaft position sensor signal

The PCM monitors the crankshaft position sensor. If the PCM does not receive a crankshaft position sensor signal within 3 seconds of cranking the engine, it will shut down the fuel injection system.

The fuel pump is activated by the PCM through the fuel pump relay.

Voltage is applied to the fuel injectors with the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.

The PCM determines the proper ignition timing according to input received from the crankshaft position sensor.

ENGINE WARM-UP MODE

This is an Open Loop mode. During engine warm-up, the powertrain control module (PCM) receives inputs from:

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)

Based on these inputs the following occurs:

- Voltage is applied to the fuel injectors with the powertrain control module (PCM). The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM adjusts engine idle speed through the idle air control (IAC) motor and adjusts ignition timing.
- The PCM operates the A/C compressor clutch through the clutch relay. This is done if A/C has been selected by the vehicle operator and requested by the A/C thermostat.
- If the vehicle has a manual transmission, the up-shift lamp is operated by the PCM.
- When engine has reached operating temperature, the PCM will begin monitoring O2S sensor input. The system will then leave the warm-up mode and go into closed loop operation.

IDLE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At idle speed, the powertrain control module (PCM) receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Battery voltage
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen sensor

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the powertrain control module (PCM). The PCM will then control injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio by varying injector pulse width. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by increasing and decreasing spark advance.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

GENERAL INFORMATION (Continued)

The optional Extended Idle Switch is used to raise the engine idle speed to approximately 1000 rpm. This is when the shifter is in either the Park or Neutral position. A rocker-type 2-wire switch (extended idle switch) is mounted to the instrument panel. This switch will supply a ground circuit to the powertrain control module (PCM). **The switch is available only with 4.0L engine when supplied with the optional police package.**

CRUISE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At cruising speed, the powertrain control module (PCM) receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen (O2S) sensor

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the PCM. The PCM will then adjust the injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

ACCELERATION MODE

This is an Open Loop mode. The powertrain control module (PCM) recognizes an abrupt increase in throttle position or MAP pressure as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased throttle opening.

DECELERATION MODE

When the engine is at operating temperature, this is an Open Loop mode. During hard deceleration, the powertrain control module (PCM) receives the following inputs.

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Park/neutral switch (gear indicator signal—auto. trans. only)

If the vehicle is under hard deceleration with the proper rpm and closed throttle conditions, the PCM will ignore the oxygen sensor input signal. The PCM will enter a fuel cut-off strategy in which it will not supply ground to the injectors. If a hard deceleration does not exist, the PCM will determine the proper injector pulse width and continue injection.

Based on the above inputs, the PCM will adjust engine idle speed through the idle air control (IAC) motor.

The PCM adjusts ignition timing by turning the ground path to the coil on and off.

The PCM opens the ground circuit to the A/C clutch relay to disengage the A/C compressor clutch. This is done until the vehicle is no longer under deceleration (if the A/C system is operating).

WIDE OPEN THROTTLE MODE

This is an Open Loop mode. During wide open throttle operation, the powertrain control module (PCM) receives the following inputs.

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)

During wide open throttle conditions, the following occurs:

- Voltage is applied to the fuel injectors with the powertrain control module (PCM). The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off. The PCM ignores the oxygen sensor input signal and provides a predetermined amount of additional fuel. This is done by adjusting injector pulse width.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.
- The PCM opens the ground circuit to the A/C clutch relay to disengage the A/C compressor clutch. This will be done for approximately 15 seconds (if the air conditioning system is operating).

If the vehicle has a manual transmission, the upshift lamp is operated by the PCM.

GENERAL INFORMATION (Continued)

IGNITION SWITCH OFF MODE

When ignition switch is turned to OFF position, the PCM stops operating the injectors, ignition coil, ASD relay and fuel pump relay.

DESCRIPTION AND OPERATION

SYSTEM DIAGNOSIS

The PCM can test many of its own input and output circuits. If the PCM senses a fault in a major system, the PCM stores a Diagnostic Trouble Code (DTC) in memory.

Technicians can display stored DTC's by two different methods. The first is to cycle the ignition switch On - Off - On - Off - On within 3 seconds. Then count the number of times the malfunction indicator (check engine) lamp on the instrument panel flashes on and off. The number of flashes represents the DTC. There is a slight pause between the flashes representing the first and second digits of the code. Longer pauses separate individual trouble codes.

The second method of reading DTC's uses the DRB scan tool. For DTC information, refer to Group 25, Emission Control Systems. See On-Board Diagnostics.

POWERTRAIN CONTROL MODULE (PCM)

The powertrain control module (PCM) (Fig. 1) operates the fuel system. The PCM was formerly referred to as the SBEC or engine controller. The PCM is a pre-programmed, dual microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

NOTE: Powertrain Control Module (PCM) Inputs:

- A/C request (if equipped with factory A/C)
- A/C select (if equipped with factory A/C)
- Auto shutdown (ASD) sense
- Intake manifold air temperature sensor
- Battery voltage
- Brake switch
- Engine coolant temperature sensor
- Crankshaft position sensor
- Ignition circuit sense (ignition switch in run position)
- Manifold absolute pressure (MAP) sensor
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- SCI receive (DRB scan tool connection)
- Speed control resume switch
- Speed control set switch
- Speed control on/off switch
- Camshaft position sensor signal
- Throttle position sensor
- Vehicle speed sensor
- Sensor return
- Power ground
- Signal ground

NOTE: Powertrain Control Module (PCM) Outputs:

- A/C clutch relay
- Idle air control (IAC) motor
- Auto shutdown (ASD) relay
- Generator field
- Malfunction indicator lamp (Check engine lamp)
- Fuel injectors
- Fuel pump relay
- Ignition coil
- EVAP canister purge solenoid
- SCI transmit (DRB scan tool connection)
- Speed control vacuum solenoid
- Speed control vent solenoid
- Tachometer (on instrument panel, if equipped)

The powertrain control module (PCM) contains a voltage convertor. This converts battery voltage to a regulated 5.0 volts.

AIR CONDITIONING (A/C) CONTROLS—PCM INPUT

The A/C control system information applies to factory installed air conditioning units.

A/C SELECT SIGNAL: When the A/C switch is in the ON position, an input signal is sent to the powertrain control module (PCM). The signal informs the PCM that the A/C has been selected. The PCM

DESCRIPTION AND OPERATION (Continued)

adjusts idle speed to a pre-programmed rpm through the idle air control (IAC) motor to compensate for increased engine load.

A/C REQUEST SIGNAL: Once A/C has been selected, the powertrain control module (PCM) receives the A/C request signal from the evaporator switch. The input indicates that the evaporator temperature is in the proper range for A/C application. The PCM uses this input to cycle the A/C compressor clutch (through the A/C relay). It will also determine the correct engine idle speed through the idle air control (IAC) motor position.

If the A/C low-pressure switch opens (indicating a low refrigerant level), the PCM will not receive an A/C receive signal. The PCM will then remove the ground from the A/C relay. This will deactivate the A/C compressor clutch.

If the evaporator switch opens, (indicating that evaporator is not in proper temperature range), the PCM will not receive the A/C request signal. The PCM will then remove the ground from the A/C relay, deactivating the A/C compressor clutch.

AUTOMATIC SHUTDOWN (ASD) RELAY—PCM INPUT

A 12 volt signal at this input indicates to the PCM that the ASD has been activated. The ASD relay is located in the Power Distribution Center (PDC). The PDC is located in the engine compartment (Fig. 2). Refer to label on PDC cover for relay location. The relay is used to connect the oxygen sensor heater elements, ignition coil, generator field winding and fuel injectors to 12 volt + power supply.

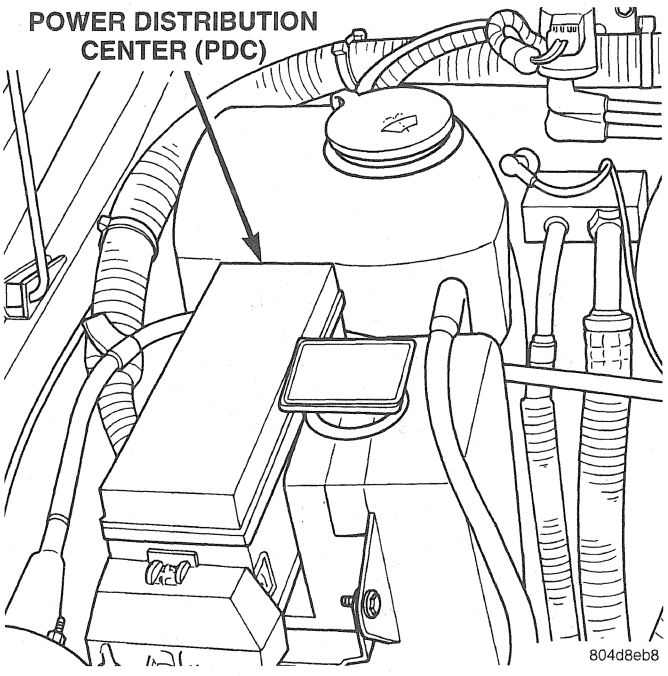


Fig. 2 Power Distribution Center (PDC)

This input is used only to sense that the ASD relay is energized. If the powertrain control module (PCM) does not see 12 volts at this input when the ASD should be activated, it will set a diagnostic trouble code (DTC).

BATTERY TEMPERATURE SENSOR—PCM INPUT

Provides a signal to the PCM corresponding to the battery temperature. Refer to Group 8C, Charging System for additional information.

BATTERY VOLTAGE—PCM INPUT

The battery voltage input provides power to the powertrain control module (PCM). It also informs the PCM what voltage level is supplied to the ignition coil and fuel injectors.

If battery voltage is low, the PCM will increase injector pulse width (period of time that the injector is energized). This is done to compensate for the reduced flow through injector caused by the lowered voltage.

FIVE VOLT SENSOR SUPPLY—PRIMARY

Supplies the required 5 volt power source to the crankshaft position sensor, camshaft position sensor, MAP sensor and throttle position sensor.

FIVE VOLT SENSOR SUPPLY—SECONDARY

Supplies the required 5 volt source to the vehicle speed sensor.

FUEL LEVEL SENSOR—PCM INPUT

The fuel level sensor sends a variable voltage to the PCM to indicate fuel level. The purpose of this feature is to prevent a false setting of misfire and fuel system monitor trouble codes if the fuel level is less than 15 percent of its rated capacity.

BRAKE SWITCH—PCM INPUT

When the brake light switch is activated, the powertrain control module (PCM) receives an input indicating that the brakes are being applied. After receiving this input, the PCM maintains idle speed to a scheduled rpm through control of the idle air control (IAC) motor. The brake switch input is also used to operate the speed control system.

CAMSHAFT POSITION SENSOR—PCM INPUT

A sync signal is provide by the camshaft position sensor located in the distributor (Fig. 3). The sync signal from this sensor works in conjunction with the crankshaft position sensor to provide the powertrain control module (PCM) with inputs. This is done to establish and maintain correct injector firing order.

Refer to Camshaft Position Sensor in Group 8D, Ignition System for more information.

DESCRIPTION AND OPERATION (Continued)

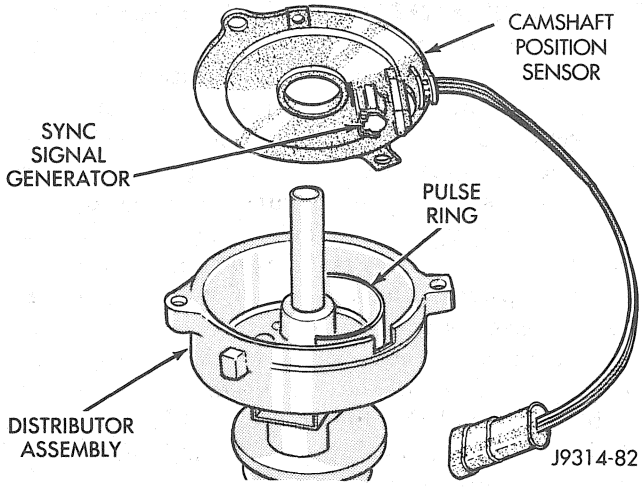


Fig. 3 Camshaft Position Sensor

CRANKSHAFT POSITION SENSOR—PCM INPUT

This sensor is a hall effect device that detects notches in the flywheel (manual transmission) or flexplate (automatic transmission).

This sensor is used to indicate to the powertrain control module (PCM) that a spark and or fuel injection event is to be required. The output from this sensor, in conjunction with the camshaft position sensor signal, is used to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

The sensor is bolted to the transmission bellhousing (Fig. 4).

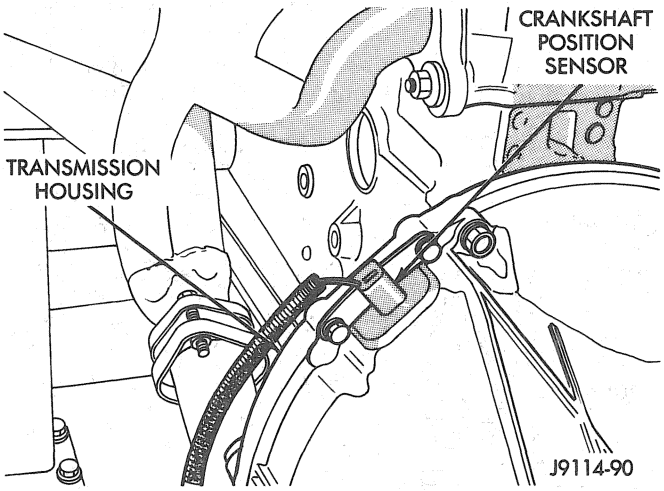


Fig. 4 Crankshaft Position Sensor—Typical

Refer to Group 8D, Ignition System for more crankshaft position sensor information.

The engine will not operate if the PCM does not receive a crankshaft position sensor input.

ENGINE COOLANT TEMPERATURE SENSOR—PCM INPUT

The engine coolant temperature sensor is installed in the thermostat housing (Fig. 5) and protrudes into the water jacket. The sensor provides an input voltage to the powertrain control module (PCM) relating coolant temperature. The PCM uses this input along with inputs from other sensors to determine injector pulse width and ignition timing. As coolant temperature varies, the coolant temperature sensor's resistance changes. The change in resistance results in a different input voltage to the PCM.

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

Refer to Open Loop/Closed Loop Modes of Operation in this section of the group for more information.

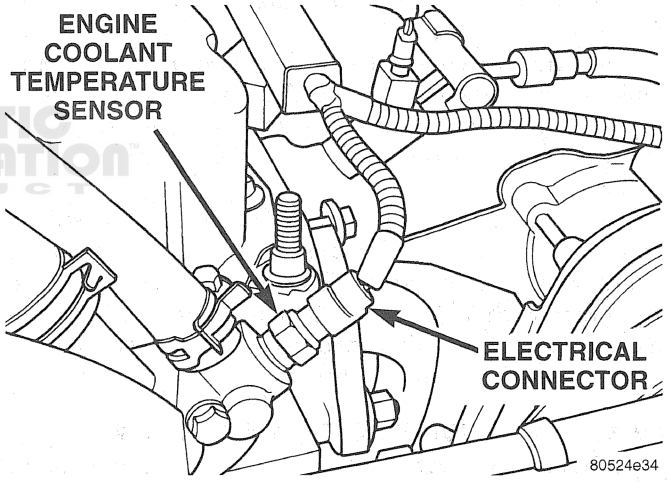


Fig. 5 Engine Coolant Temperature Sensor—Typical

EXTENDED IDLE SWITCH—PCM INPUT

OPTIONAL POLICE PACKAGE ONLY

The extended idle switch is used to raise the engine idle speed to approximately 1000 rpm. This is when the shifter is in either the Park or Neutral position. A rocker-type 2-wire switch (extended idle switch) is mounted to the instrument panel. This switch will supply a ground circuit to the powertrain control module (PCM). **The switch is available only with 4.0L engine when supplied with the optional police package.**

For testing and diagnosis of this switch and its circuit, refer to the General Diagnosis section of this group.

DESCRIPTION AND OPERATION (Continued)

HEATED OXYGEN SENSOR (O2S)—PCM INPUT

Two heated O2S sensors are used. The sensors produce voltages from 0 to 1 volt, depending upon the oxygen content of the exhaust gas in the exhaust manifold. When a large amount of oxygen is present (caused by a lean air/fuel mixture), the sensors produces a low voltage. When there is a lesser amount present (rich air/fuel mixture) it produces a higher voltage. By monitoring the oxygen content and converting it to electrical voltage, the sensors act as a rich-lean switch.

The oxygen sensors are equipped with a heating element that keeps the sensors at proper operating temperature during all operating modes. Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

In Closed Loop operation, the PCM monitors the O2S sensor input (along with other inputs) and adjusts the injector pulse width accordingly. During Open Loop operation, the PCM ignores the O2 sensor input. The PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

The Automatic Shutdown (ASD) relay supplies battery voltage to both the upstream and downstream heated oxygen sensors. The oxygen sensors are equipped with a heating element. The heating elements reduce the time required for the sensors to reach operating temperature.

UPSTREAM HEATED OXYGEN SENSOR

The upstream O2S sensor is located in the exhaust downpipe (Fig. 6). It provides an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune the air/fuel ratio by adjusting injector pulse width.

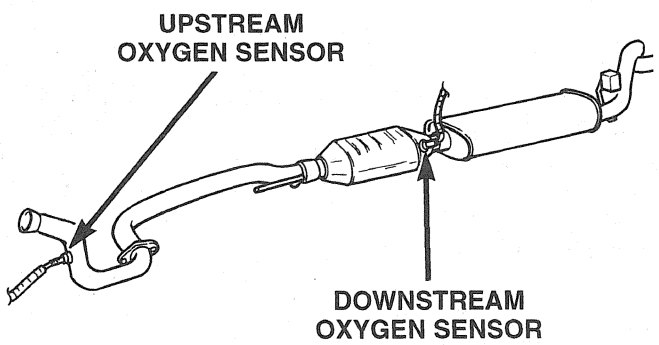


Fig. 6 Heated Oxygen Sensors

DOWNSTREAM HEATED OXYGEN SENSOR

The downstream heated oxygen sensor is located near the outlet end of the catalytic convertor (Fig. 6). The downstream heated oxygen sensor input is used to detect catalytic convertor deterioration. As the convertor deteriorates, the input from the downstream sensor begins to match the upstream sensor input except for a slight time delay. By comparing the downstream heated oxygen sensor input to the input from the upstream sensor, the PCM calculates catalytic convertor efficiency.

When the catalytic converter efficiency drops below emission standards, the PCM stores a diagnostic trouble code and illuminates the Malfunction Indicator Lamp (MIL). For more information, refer to Group 25, Emission Control Systems.

IGNITION CIRCUIT SENSE—PCM INPUT

The ignition circuit sense input tells the Powertrain Control Module (PCM) the ignition switch has energized the ignition circuit. Refer to the wiring diagrams for circuit information.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR—PCM INPUT

The intake manifold air temperature sensor is installed in the intake manifold with the sensor element extending into the air stream (Fig. 7). The sensor provides an input voltage to the powertrain control module (PCM) indicating intake manifold air temperature. The input is used along with inputs from other sensors to determine injector pulse width. As the temperature of the air-fuel stream in the manifold varies, the sensor resistance changes. This results in a different input voltage to the PCM.

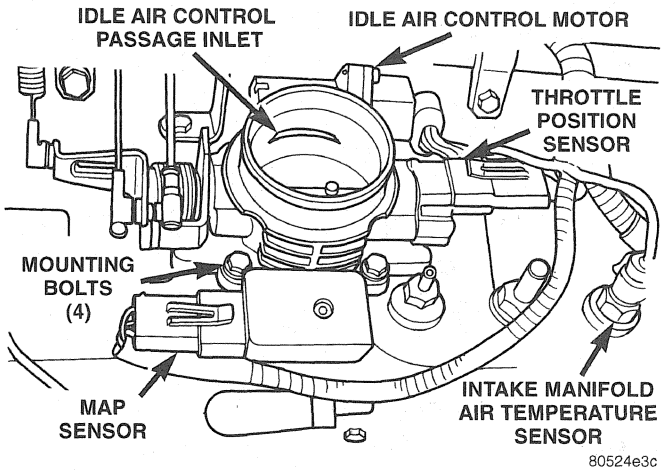


Fig. 7 Intake Air Temp. Sensor Location—Typical

DESCRIPTION AND OPERATION (Continued)

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—PCM INPUT

The MAP sensor reacts to absolute pressure in the intake manifold. It provides an input voltage to the powertrain control module (PCM). As engine load changes, manifold pressure varies. The change in manifold pressure causes MAP sensor voltage to change. The change in MAP sensor voltage results in a different input voltage to the PCM. The input voltage level supplies the PCM with information about ambient barometric pressure during engine start-up (cranking) and engine load while the engine is running. The PCM uses this input along with inputs from other sensors to adjust air-fuel mixture.

The MAP sensor is mounted on the side of the engine throttle body (Fig. 7). The sensor is connected to the throttle body with a rubber L-shaped fitting.

SPEED CONTROL SWITCH—PCM INPUT

Six different speed control functions, using three momentary contact switches, are monitored through this **multiplexed** input. The resistance monitored at this input, in combination with the length of time the PCM measures the resistance, determines which switch feature has been selected. The three switches are: On/Off, Set/Coast and Resume/Accelerate.

Refer to Group 8H, Vehicle Speed Control System for further speed control information.

TRANSMISSION PARK/NEUTRAL SWITCH—PCM INPUT

The park/neutral switch is located on the transmission housing and provides an input to the powertrain control module (PCM). This will indicate that the automatic transmission is in Park, Neutral or a drive gear selection. This input is used to determine idle speed (varying with gear selection), fuel injector pulse width, ignition timing advance and vehicle speed control operation. Refer to Group 21, Transmissions, for testing, replacement and adjustment information.

THROTTLE POSITION SENSOR (TPS)—PCM INPUT

The throttle position sensor (TPS) is mounted on the throttle body (Fig. 7). The TPS is a variable resistor that provides the powertrain control module (PCM) with an input signal (voltage) that represents throttle blade position. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the resistance of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range of from 1 volt at minimum throttle opening (idle), to 4 volts at wide open throttle. Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. In response to engine operating conditions, the PCM will adjust fuel injector pulse width and ignition timing.

VEHICLE SPEED AND DISTANCE SENSOR—PCM INPUT

The vehicle speed sensor is located on the speedometer pinion gear adapter (Fig. 8). The pinion gear adapter is located on the extension housing of the transmission (drivers side). The sensor input is used by the powertrain control module (PCM) to determine vehicle speed and distance traveled.

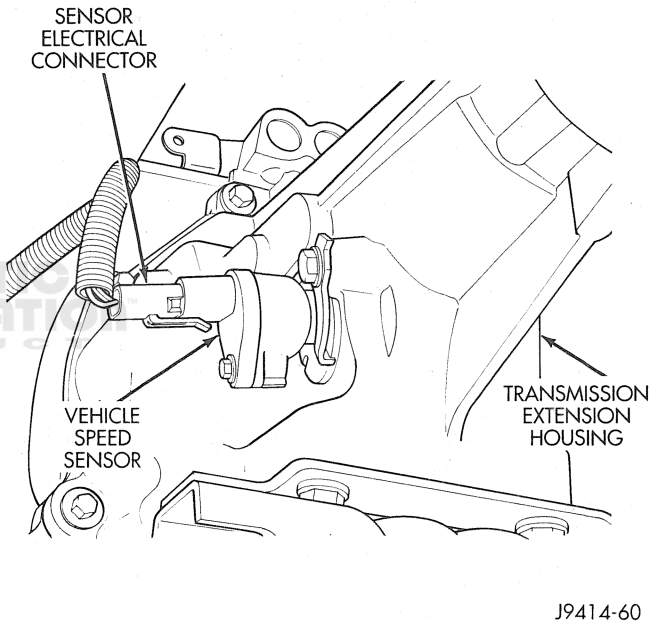


Fig. 8 Vehicle Speed Sensor Location—Typical

The speed sensor generates 8 pulses per sensor revolution. These signals, in conjunction with a closed throttle signal from the throttle position sensor, indicate a closed throttle deceleration to the PCM. When the vehicle is stopped at idle, a closed throttle signal is received by the PCM (but a speed sensor signal is not received).

Under deceleration conditions, the PCM adjusts the idle air control (IAC) motor to maintain a desired MAP value. Under idle conditions, the PCM adjusts the IAC motor to maintain a desired engine speed.

POWER STEERING PRESSURE SWITCH—PCM INPUT

A pressure sensing switch is included in the power steering system (mounted on the high-pressure line). This switch will be on vehicles equipped with a 2.5L engine and power steering. The switch (Fig. 9) pro-

DESCRIPTION AND OPERATION (Continued)

vides an input to the PCM. This input is provided during periods of high pump load and low engine rpm; such as during parking maneuvers. The PCM will then increase the idle speed through the idle air control (IAC) motor. This is done to prevent the engine from stalling under the increased load.

When steering pump pressure exceeds 1896 kPa ± 172 kPa (275 ± 25 psi) the PCM will increase the engine idle speed. This will prevent the engine from stalling.

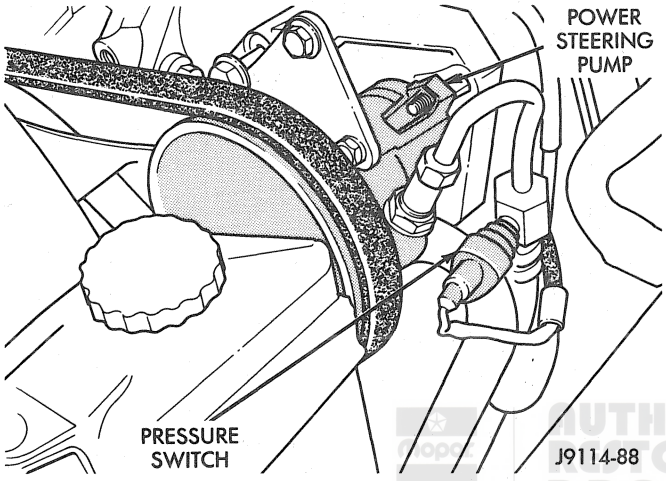


Fig. 9 Power Steering Pump Pressure Switch

POWER GROUND

The power ground is used to control ground circuits for the following powertrain control module (PCM) loads:

- Generator field winding
- Fuel injectors
- Ignition coil

AIR CONDITIONING (A/C) CLUTCH RELAY—PCM OUTPUT

The A/C relay is located in the Power Distribution Center (PDC). The PDC is located in the engine compartment (Fig. 10). Refer to label on PDC cover for relay location.

The powertrain control module (PCM) activates the A/C compressor through the A/C clutch relay. The PCM regulates A/C compressor operation by switching the ground circuit for the A/C clutch relay on and off.

When the PCM receives a request for A/C from A/C evaporator switch, it will adjust idle air control (IAC) motor position. This is done to increase idle speed. The PCM will then activate the A/C clutch through the A/C clutch relay. The PCM adjusts idle air control (IAC) stepper motor position to compensate for increased engine load from the A/C compressor.

By switching the ground path for the relay on and off, the PCM is able to cycle the A/C compressor

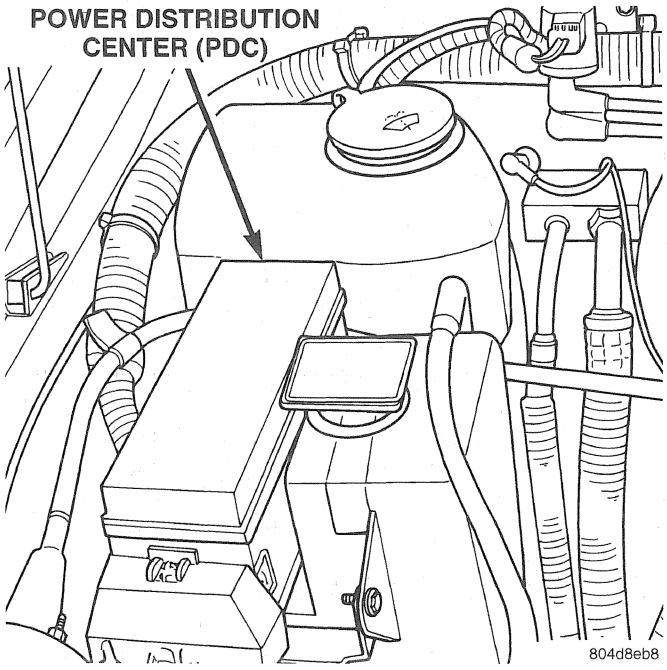


Fig. 10 Power Distribution Center (PDC)

clutch. This is based on changes in engine operating conditions. If, during A/C operation, the PCM senses low idle speeds or a wide open throttle condition, it will de-energize the relay. This prevents A/C clutch engagement. The relay will remain de-energized until the idle speed increases or the wide open throttle condition exceeds 15 seconds or no longer exists. The PCM will also de-energize the relay if coolant temperature exceeds 125°C (257°F).

GENERATOR FIELD—PCM OUTPUT

The powertrain control module (PCM) regulates the charging system voltage within a range of 12.9 to 15.0 volts. Refer to Groups 8A and 8C for charging system information.

GENERATOR LAMP—PCM OUTPUT

If the powertrain control module (PCM) senses a low charging condition in the charging system, it will illuminate the generator lamp (if equipped) on the instrument panel. For example, during low idle with all accessories turned on, the lamp may momentarily go on. Once the PCM corrects idle speed to a higher rpm, the lamp will go out. Refer to Groups 8A and 8C for charging system information.

AUTO SHUTDOWN (ASD) RELAY—PCM OUTPUT

The ASD relay is located in the Power Distribution Center (PDC) (Fig. 10).

The ASD supplies battery voltage to the fuel pump, fuel injector, ignition coil, generator field winding and oxygen (O2S) sensor heating elements. The ground circuit for the coil in the ASD relay is con-

DESCRIPTION AND OPERATION (Continued)

trolled by the powertrain control module (PCM). The PCM operates the relay by switching the ground circuit on and off.

The fuel pump relay is controlled by the PCM through same circuit that the ASD relay is controlled.

FUEL PUMP RELAY-PCM OUTPUT

The PCM energizes the electric fuel pump through the fuel pump relay. Battery voltage is applied to the fuel pump relay when the ignition key is ON. The relay is energized when a ground signal is provided by the PCM.

Refer to Automatic Shutdown Relay—PCM Output for additional information.

The fuel pump will operate for approximately one second unless the engine is operating or the starter motor is engaged.

The fuel pump relay is located in the Power Distribution Center (PDC) (Fig. 10).

IDLE AIR CONTROL (IAC) MOTOR—PCM OUTPUT

The IAC motor is mounted on the throttle body (Fig. 7) and is controlled by the powertrain control module (PCM).

The throttle body has an air control passage that provides air for the engine at idle (the throttle plate is closed). The IAC motor pintle protrudes into the air control passage and regulates air flow through it. Based on various sensor inputs, the powertrain control module (PCM) adjusts engine idle speed by moving the IAC motor pintle in and out of the air control passage. The IAC motor is positioned when the ignition key is turned to the On position.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

DUTY CYCLE EVAP PURGE SOLENOID VALVE-PCM OUTPUT

Refer to Group 25, Emission Control System for information.

DATA LINK CONNECTOR—PCM INPUT AND OUTPUT

The 16–way data link connector (diagnostic scan tool connector) links the Diagnostic Readout Box (DRB) scan tool or the Mopar Diagnostic System (MDS) with the powertrain control module (PCM). The data link connector is located under the instrument panel to the left of the steering column (Fig. 11). For operation of the DRB scan tool, refer to the appropriate Powertrain Diagnostic Procedures service manual.

FUEL INJECTORS—PCM OUTPUT

Six individual fuel injectors are used with the 4.0L 6-cylinder engine. Four individual fuel injectors are

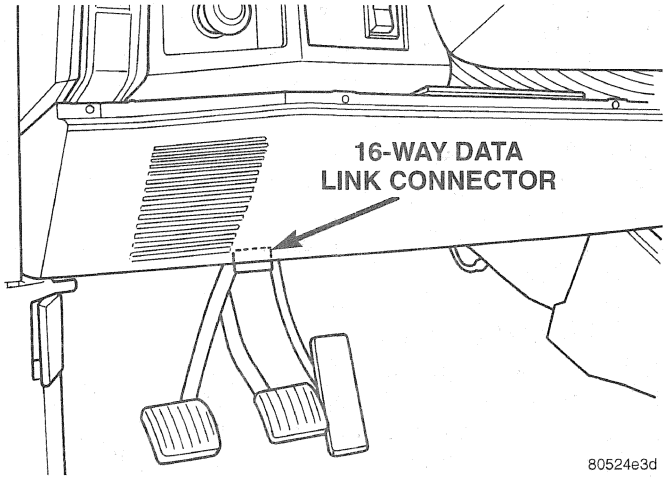


Fig. 11 Data Link Connector Location

used with the 2.5L 4-cylinder engine. The injectors are attached to the fuel rail (Fig. 12).

The nozzle ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the powertrain control module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

During start up, battery voltage is supplied to the injectors through the ASD relay. When the engine is operating, voltage is supplied by the charging system. The PCM determines injector pulse width based on various inputs.

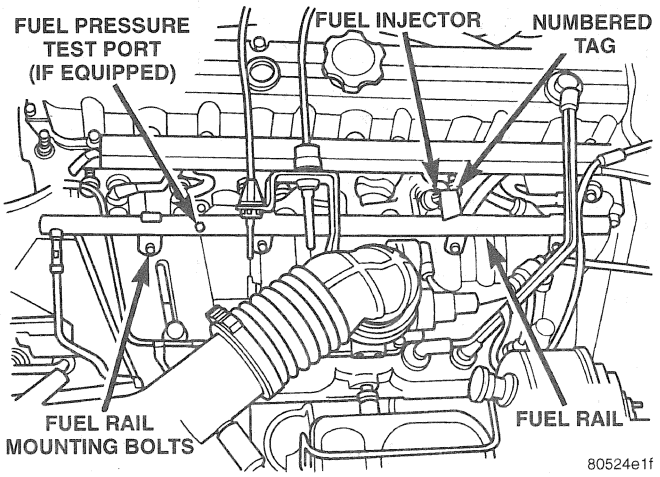


Fig. 12 Fuel Injectors—Typical 4.0L Shown

DESCRIPTION AND OPERATION (Continued)

IGNITION COIL—PCM OUTPUT

System voltage from the ASD relay is supplied to the ignition coil positive terminal. The powertrain control module (PCM) operates the ignition coil. **Ignition timing is not adjustable.** The PCM adjusts ignition timing to meet changing engine operating conditions.

Refer to Group 8D, Ignition System for additional information.

RADIATOR FAN RELAY—PCM OUTPUT

The electric radiator cooling fan is used in models equipped with a 4.0L engine, heavy duty cooling, and/or air conditioning. It is controlled by the powertrain control module (PCM) through the radiator fan relay. The relay is energized when coolant temperature is above 103°C (217°F). It will then de-energize when coolant temperature drops to 98°C (208°F). Refer to Group 7, Cooling Systems for more information.

The relay is located in the power distribution center (PDC) (Fig. 10).

MALFUNCTION INDICATOR LAMP—PCM OUTPUT

The malfunction indicator lamp illuminates each time the ignition key is turned on. It will stay on for approximately three seconds as a bulb test. The lamp is displayed on the instrument panel as the CHECK ENGINE lamp (Fig. 13).

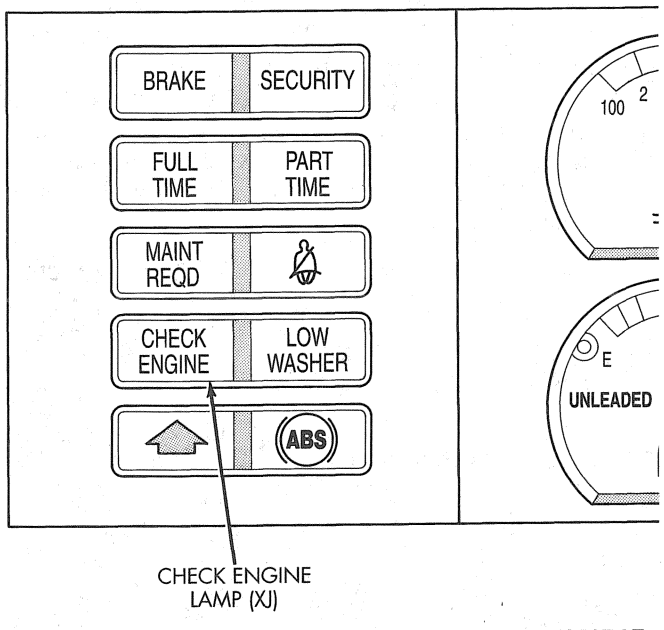


Fig. 13 Check Engine Lamp——Typical

If the powertrain control module (PCM) receives an incorrect signal, or no signal from certain sensors or emission related systems, the lamp is turned on. This is a warning that the PCM has recorded a system or sensor malfunction. In some cases, when a problem is declared, the PCM will go into a limp-in mode. This is an attempt to keep the system operating. It signals an immediate need for service.

The lamp can also be used to display a Diagnostic Trouble Code (DTC). Cycle the ignition switch On-Off-On-Off-On within three seconds and any codes stored in the PCM memory will be displayed. This is done in a series of flashes representing digits. Refer to On-Board Diagnostics in the General Diagnosis section of this group for more information.

The lamp is also used to detect certain engine misfires. Refer to Group 25, Emission Control system for additional information.

SPEED CONTROL SOLENOIDS—PCM OUTPUT

Speed control operation is regulated by the powertrain control module (PCM). The PCM controls the vacuum to the throttle actuator through the speed control vacuum and vent solenoids. Refer to Group 8H for Speed Control Information.

TACHOMETER—PCM OUTPUT

The powertrain control module (PCM) supplies engine rpm values to the instrument cluster tachometer. Refer to Group 8E for tachometer information.

THROTTLE BODY

Filtered air from the air cleaner enters the intake manifold through the throttle body (Fig. 14). Fuel does not enter the intake manifold through the throttle body. Fuel is sprayed into the manifold by the fuel injectors. The throttle body is mounted on the intake manifold. It contains an air control passage (Fig. 14) controlled by an idle air control (IAC) motor. The air control passage is used to supply air for idle conditions. A throttle valve (plate) is used to supply air for above idle conditions.

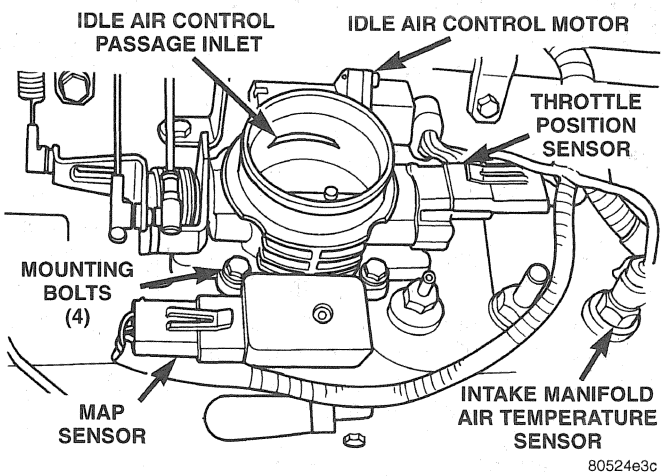


Fig. 14 Throttle Body

DESCRIPTION AND OPERATION (Continued)

The throttle position sensor (TPS), idle air control (IAC) motor and manifold absolute pressure sensor (MAP) are attached to the throttle body. The accelerator pedal cable, speed control cable and transmission control cable (when equipped) are connected to the throttle arm.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

DIAGNOSIS AND TESTING

VISUAL INSPECTION

A visual inspection for loose, disconnected or incorrectly routed wires and hoses should be made. This should be done before attempting to diagnose or service the fuel injection system. A visual check will help spot these faults and save unnecessary test and diagnostic time. A thorough visual inspection will include the following checks:

(1) Verify that the three 32–way electrical connectors are fully inserted into the connector of the powertrain control module (PCM) (Fig. 15).

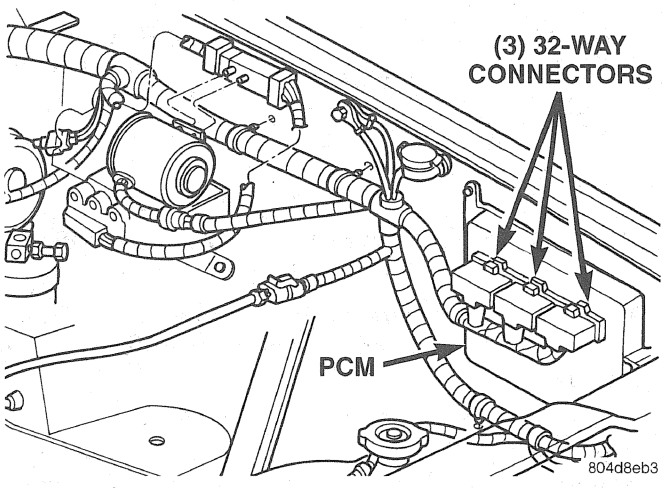


Fig. 15 Powertrain Control Module (PCM)

(2) Inspect the battery cable connections. Be sure that they are clean and tight.

(3) Inspect fuel pump relay and air conditioning compressor clutch relay (if equipped). Inspect the ASD relay connections. Inspect starter motor relay connections. Inspect relays for signs of physical damage and corrosion. The relays are located in the Power Distribution Center (PDC) (Fig. 16). Refer to label on PDC cover for relay location.

(4) Inspect ignition coil connections. Verify that coil secondary cable is firmly connected to coil (Fig. 17).

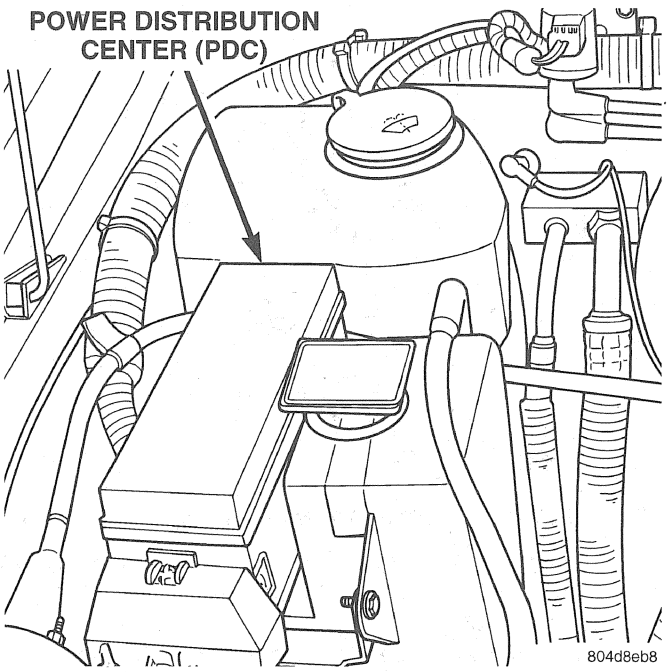


Fig. 16 Power Distribution Center (PDC)

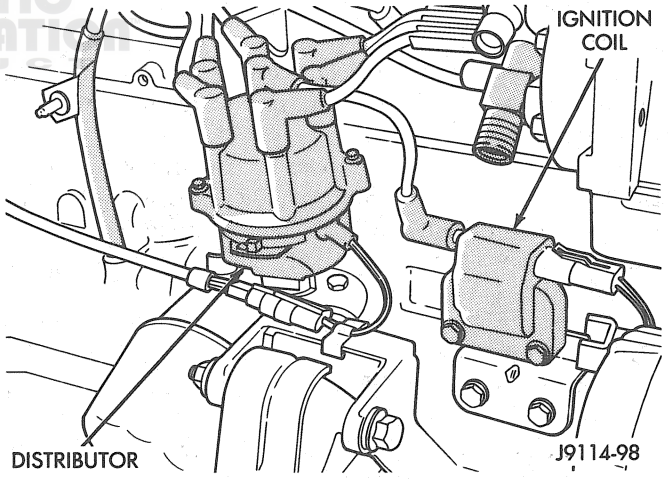


Fig. 17 Ignition Coil—4.0L Engine Shown

(5) Verify that distributor cap is correctly attached to distributor. Be sure that spark plug cables are firmly connected to the distributor cap and the spark plugs are in their correct firing order (Fig. 18). Be sure that coil cable is firmly connected to distributor cap and coil. Be sure that camshaft position sensor wire connector (at the distributor) is firmly connected to harness connector. Inspect spark plug condition. Refer to Group 8D, Ignition. Connect vehicle to an oscilloscope and inspect spark events for fouled or damaged spark plugs or cables.

(6) Verify that generator output wire, generator connector and ground wire are firmly connected to the generator.

DIAGNOSIS AND TESTING (Continued)

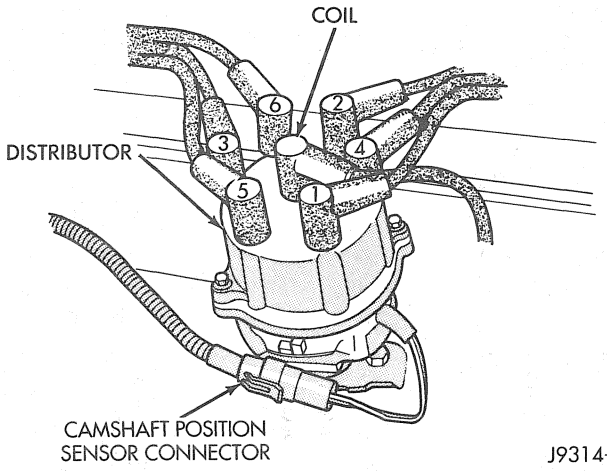


Fig. 18 Distributor and Wiring—4.0L Engine Shown

(7) Inspect the system body grounds for loose or dirty connections. Refer to Group 8, Wiring for ground locations.

(8) Verify crankcase ventilation (CCV) operation. Refer to Group 25, Emission Control System for additional information.

(9) Inspect fuel tube quick-connect fitting-to-fuel rail connections.

(10) Verify that hose connections to all ports of vacuum fittings on intake manifold are tight and not leaking.

(11) Inspect accelerator cable, transmission throttle cable (if equipped) and cruise control cable connections (if equipped). Check their connections to the throttle arm of throttle body for any binding or restrictions.

(12) If equipped with vacuum brake booster, verify that vacuum booster hose is firmly connected to fitting on intake manifold. Also check connection to brake vacuum booster.

(13) Inspect the air cleaner inlet and air cleaner element for dirt or restrictions.

(14) Inspect radiator grille area, radiator fins and air conditioning condenser for restrictions.

(15) Verify that the intake manifold air temperature sensor wire connector is firmly connected to harness connector (Fig. 19).

(16) Verify that MAP sensor electrical connector is firmly connected to MAP sensor (Fig. 19). Also verify that rubber L-shaped fitting from MAP sensor to the throttle body is firmly connected (Fig. 20).

(17) Verify that fuel injector wire harness connectors are firmly connected to injectors in the correct order. Each harness connector is numerically tagged with the injector number (INJ 1, INJ 2 etc.) of its corresponding fuel injector and cylinder number.

(18) Verify harness connectors are firmly connected to idle air control (IAC) motor and throttle position sensor (TPS) (Fig. 19).

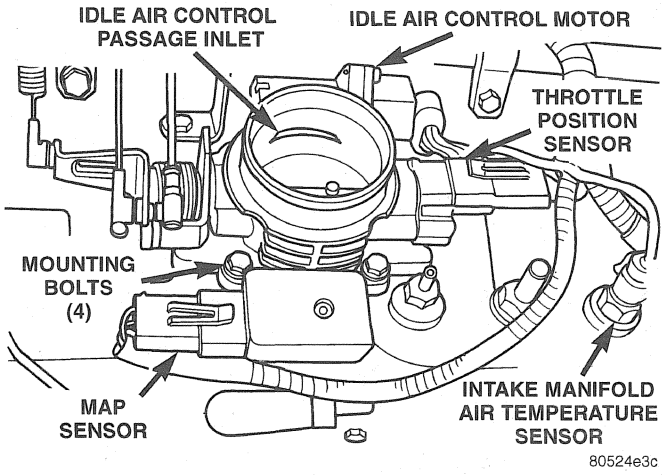


Fig. 19 Sensor Locations—4.0L Engine Shown

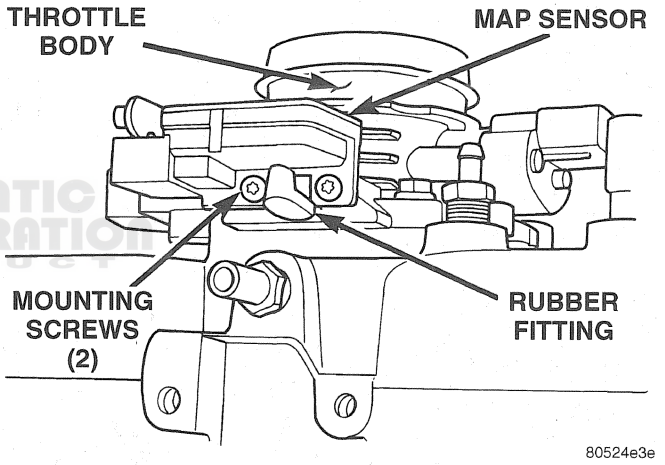


Fig. 20 Rubber L-Shaped Fitting—MAP Sensor-to-Throttle Body

(19) Verify that wire harness connector is firmly connected to the engine coolant temperature sensor (Fig. 21).

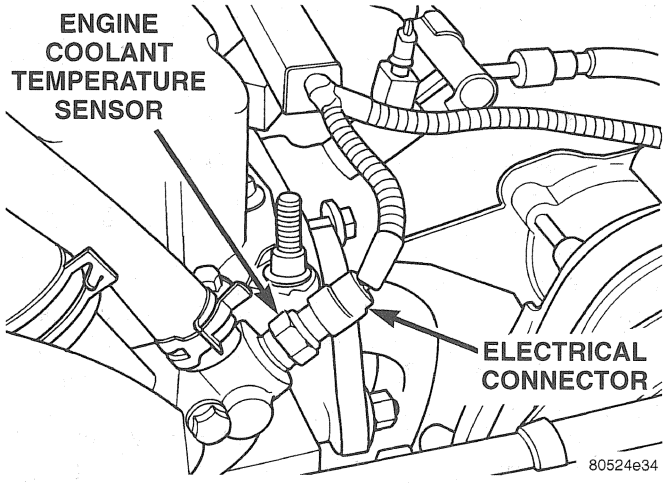


Fig. 21 Engine Coolant Temp. Sensor—4.0L Shown

DIAGNOSIS AND TESTING (Continued)

(20) Raise and support the vehicle.

(21) Verify that both of the oxygen sensor wire connectors are firmly connected to the sensors. Inspect sensors and connectors for damage (Fig. 22).

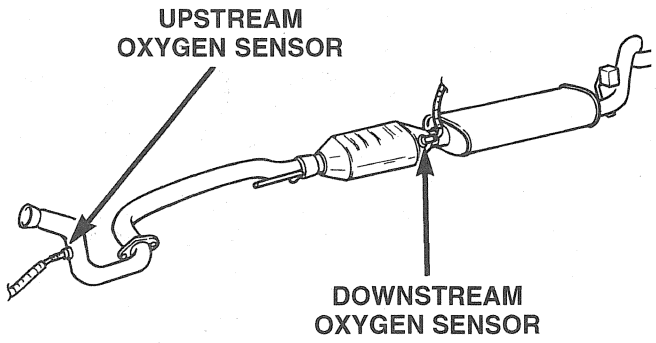


Fig. 22 Location of Oxygen Sensors

(22) Inspect for pinched or leaking fuel tubes. Inspect for pinched, cracked or leaking fuel hoses.

(23) Inspect for exhaust system restrictions such as pinched exhaust pipes, collapsed muffler or plugged catalytic convertor.

(24) If equipped with automatic transmission, verify that electrical harness is firmly connected to park/neutral switch. Refer to Automatic Transmission section of Group 21.

(25) Verify that the electrical harness connector is firmly connected to the vehicle speed sensor (Fig. 23).

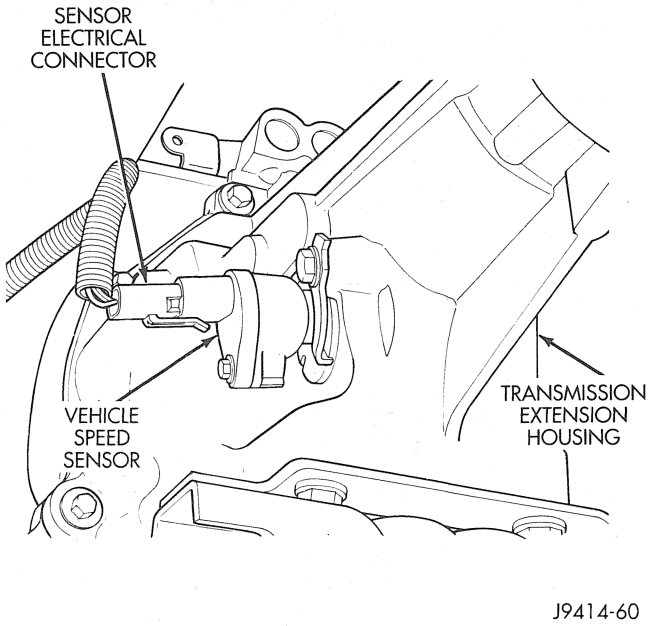


Fig. 23 Vehicle Speed Sensor—Typical

(26) Verify that fuel pump/gauge sender unit wire connector is firmly connected to harness connector.

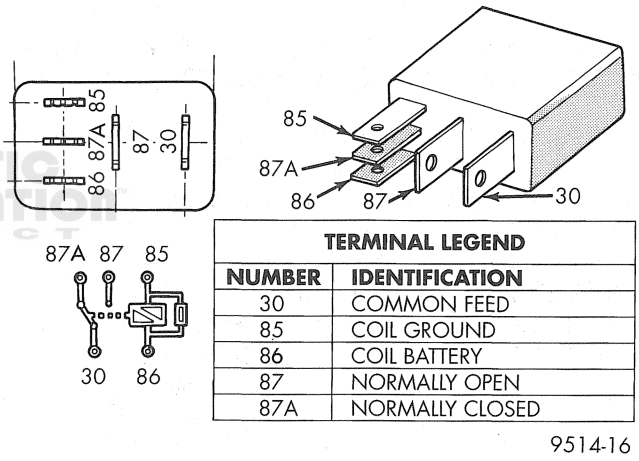
(27) Inspect fuel hoses at fuel pump/gauge sender unit for cracks or leaks.

(28) Inspect transmission torque convertor housing (automatic transmission) or clutch housing (manual transmission) for damage to timing ring on drive plate/flywheel.

(29) Verify that battery cable and solenoid feed wire connections to the starter solenoid are tight and clean. Inspect for chaffed wires or wires rubbing up against other components.

ASD AND FUEL PUMP RELAYS

The following description of operation and tests apply only to the Automatic Shutdown (ASD) and fuel pump relays. The terminals on the bottom of each relay are numbered (Fig. 24).



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 24 ASD and Fuel Pump Relay Terminals

OPERATION

- Terminal number 30 is connected to battery voltage. For both the ASD and fuel pump relays, terminal 30 is connected to battery voltage at all times.
- The PCM grounds the coil side of the relay through terminal number 85.
- Terminal number 86 supplies voltage to the coil side of the relay.
- When the PCM de-energizes the ASD and fuel pump relays, terminal number 87A connects to terminal 30. This is the Off position. In the off position, voltage is not supplied to the rest of the circuit. Terminal 87A is the center terminal on the relay.
- When the PCM energizes the ASD and fuel pump relays, terminal 87 connects to terminal 30. This is the On position. Terminal 87 supplies voltage to the rest of the circuit.

TESTING

The following procedure applies to the ASD and fuel pump relays.

DIAGNOSIS AND TESTING (Continued)

(1) Remove relay from connector before testing.
(2) With the relay removed from the vehicle, use an ohmmeter to check the resistance between terminals 85 and 86. The resistance should be between 75 ±5 ohms.
(3) Connect the ohmmeter between terminals 30 and 87A. The ohmmeter should show continuity between terminals 30 and 87A.
(4) Connect the ohmmeter between terminals 87 and 30. The ohmmeter should not show continuity at this time.
(5) Connect one end of a jumper wire (16 gauge or smaller) to relay terminal 85. Connect the other end of the jumper wire to the ground side of a 12 volt power source.
(6) Connect one end of another jumper wire (16 gauge or smaller) to the power side of the 12 volt power source. **Do not attach the other end of the jumper wire to the relay at this time.**

WARNING: DO NOT ALLOW OHMMETER TO CONTACT TERMINALS 85 OR 86 DURING THIS TEST.

(7) Attach the other end of the jumper wire to relay terminal 86. This activates the relay. The ohmmeter should now show continuity between relay terminals 87 and 30. The ohmmeter should not show continuity between relay terminals 87A and 30.
(8) Disconnect jumper wires.
(9) Replace the relay if it did not pass the continuity and resistance tests. If the relay passed the tests, it operates properly. Check the remainder of the ASD and fuel pump relay circuits. Refer to group 8W, Wiring Diagrams.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR TEST

To perform a complete test of MAP sensor (Fig. 25) and its circuitry, refer to DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the MAP sensor only, refer to the following:
(1) Inspect the rubber L-shaped fitting from the MAP sensor to the throttle body (Fig. 26). Repair as necessary.

CAUTION: When testing the MAP sensor, be sure that the harness wires are not damaged by the test meter probes.

(2) Test the MAP sensor output voltage at the MAP sensor connector between terminals A and B (Fig. 27). With the ignition switch ON and the engine OFF, output voltage should be 4-to-5 volts. The voltage should drop to 1.5-to-2.1 volts with a hot, neutral idle speed condition.

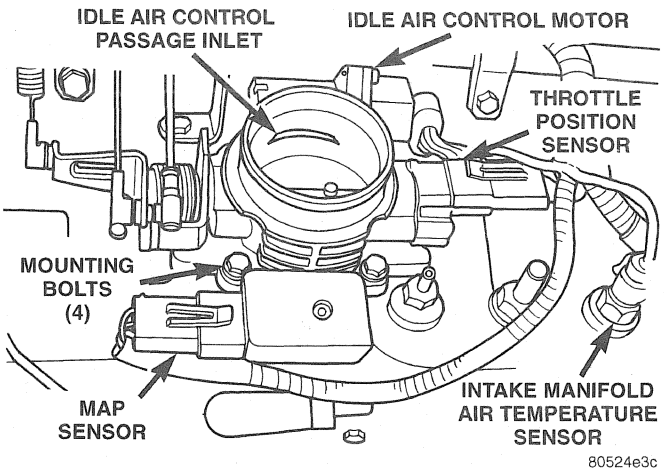


Fig. 25 Sensor Location—4.0L Shown

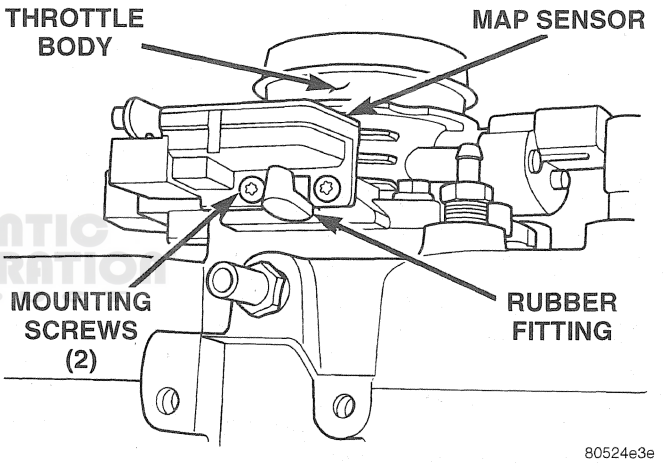


Fig. 26 Rubber L-Shaped Fitting—MAP Sensor-to-Throttle Body

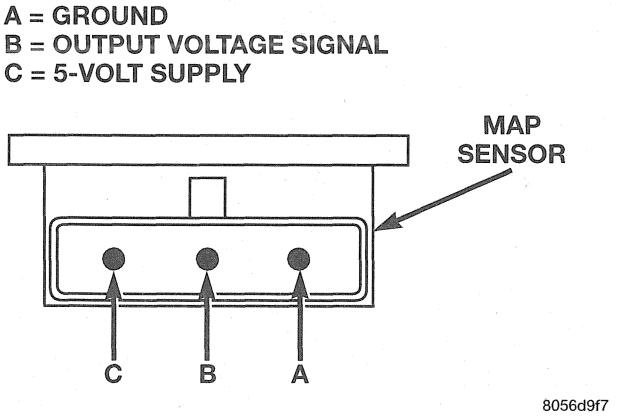


Fig. 27 MAP Sensor Connector Terminals—Typical

(3) Test powertrain control module (PCM) cavity A-27 for the same voltage described above to verify the wire harness condition. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

(4) Test MAP sensor supply voltage at sensor connector between terminals A and C (Fig. 27) with the ignition ON. The voltage should be approximately 5 volts (±0.5V). Five volts (±0.5V) should also be at cavity A-17 of the PCM wire harness connector. Repair or replace the wire harness as necessary.

(5) Test the MAP sensor ground circuit at sensor connector terminal—A (Fig. 27) and PCM connector A-4. Repair the wire harness if necessary.

Refer to Group 8W, Wiring Diagrams for cavity locations.

HEATED OXYGEN (O2S) SENSORS

To perform a complete test of the O2S sensors and their circuitry, refer to the DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the O2S sensors only, refer to the following:

The upstream O2S sensor is located on the exhaust downpipe (Fig. 28).

The downstream O2S sensor is located near the outlet end of the catalytic converter (Fig. 28).

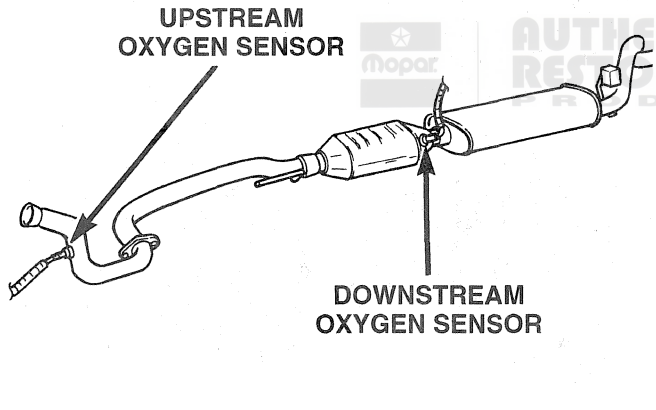


Fig. 28 Oxygen Sensor Location

Each O2S heating element can be tested with an ohmmeter as follows:

Disconnect the O2S sensor connector. Connect the ohmmeter test leads across the white wire terminals of the sensor connector. Resistance should be between 5 and 7 ohms. Replace the sensor if the ohmmeter displays an infinity (open) reading.

CAMSHAFT AND CRANKSHAFT POSITION SENSORS

Refer to Group 8D, Ignition System for information.

ENGINE COOLANT TEMPERATURE SENSOR

To perform a complete test of the engine coolant temperature sensor and its circuitry, refer to DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the sensor only, refer to the following:

(1) Disconnect wire harness connector from coolant temperature sensor (Fig. 29).

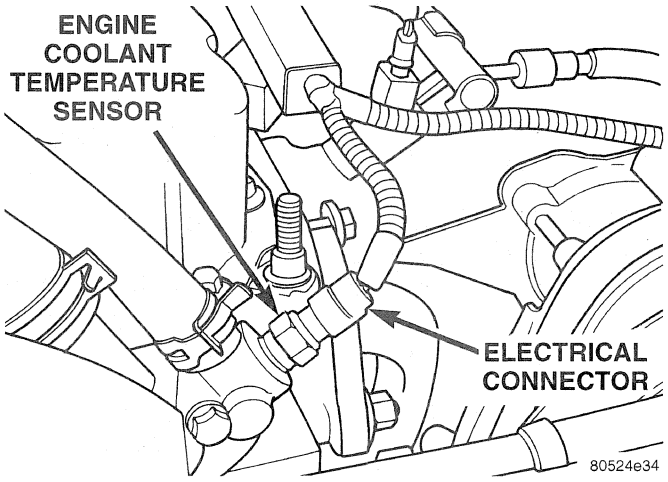


Fig. 29 Engine Coolant Temperature Sensor—Typical

(2) Test the resistance of the sensor with a high input impedance (digital) volt-ohmmeter. The resistance (as measured across the sensor terminals) should be less than 1340 ohms with the engine warm. Refer to the Coolant Temperature sensor/Intake Air Temperature sensor resistance chart. Replace the sensor if it is not within the range of resistance specified in the chart.

TEMPERATURE		RESISTANCE (OHMS)	
C	F	MIN	MAX
-40	-40	291,490	381,710
-20	-4	85,850	108,390
-10	14	49,250	61,430
0	32	29,330	35,990
10	50	17,990	21,810
20	68	11,370	13,610
25	77	9,120	10,880
30	86	7,370	8,750
40	104	4,900	5,750
50	122	3,330	3,880
60	140	2,310	2,670
70	158	1,630	1,870
80	176	1,170	1,340
90	194	860	970
100	212	640	720
110	230	480	540
120	248	370	410

J928D-4

SENSOR RESISTANCE (OHMS)—COOLANT TEMPERATURE SENSOR/INTAKE AIR TEMPERATURE SENSOR

DIAGNOSIS AND TESTING (Continued)

(3) Test continuity of the wire harness between the PCM wire harness connector and the coolant sensor connector terminals. Refer to Group 8, Wiring for terminal/cavity locations. Repair the wire harness if an open circuit is indicated.

IDLE AIR CONTROL (IAC) MOTOR

To perform a complete test of the IAC motor and its circuitry, refer to DRB scan tool and appropriate Powertrain Diagnostics Procedures manual.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR

To perform a complete test of the intake manifold air temperature sensor and its circuitry, refer to DRB tester and appropriate Powertrain Diagnostics Procedures manual. To test the sensor only, refer to the following:

(1) Disconnect the wire harness connector from the intake manifold air temperature sensor (Fig. 30).

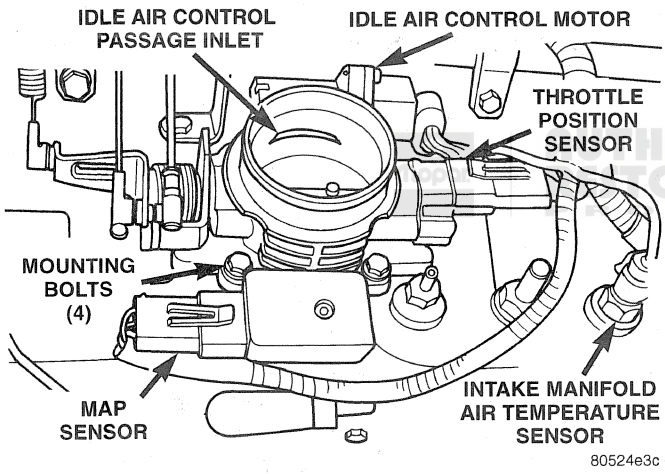


Fig. 30 Intake Manifold Air Temperature Sensor—Typical

(2) Test the resistance of the sensor with an input impedance (digital) volt-ohmmeter. The resistance (as measured across the sensor terminals) should be less than 1340 ohms with the engine warm. Refer to the Coolant Temperature sensor/Intake Air Temperature sensor resistance chart. Replace the sensor if it is not within the range of resistance specified in the chart.

(3) Test the resistance of the wire harness. Do this between the PCM wire harness connector A-15 and the sensor connector terminal. Also check between PCM connector A-4 to the sensor connector terminal. Repair the wire harness as necessary if the resistance is greater than 1 ohm.

POWER STEERING PRESSURE SWITCH

2.5L 4-Cylinder Engine Only

This switch (Fig. 31) provides an input to the PCM. This input is provided during periods of high pump load and low engine rpm; such as during parking maneuvers. The PCM will then increase the idle speed through the idle air control (IAC) motor. This is done to prevent the engine from stalling under the increased load.

When steering pump pressure exceeds 1896 kPa ± 172 kPa (275 ± 25 psi), the switch circuit will close and the PCM will increase the engine idle speed. This will prevent the engine from stalling.

To test the switch:

(1) Disconnect the electrical connector at switch.

(2) Connect a pair of jumper wires to the switch terminals. Route and secure the jumper wires away from the fan blades and fan belt.

(3) Connect an ohmmeter to the jumper wires and observe continuity. Circuit should be open with engine not running. If continuity is observed, replace switch.

(4) Start the engine and observe the ohmmeter. With engine at idle speed, continuity should not be observed until the steering wheel has been turned to the full left or right position. **Do not hold the steering wheel in the full left or right position for more than a few seconds. Damage to power steering pump may occur.**

(5) If continuity is not observed, replace switch.

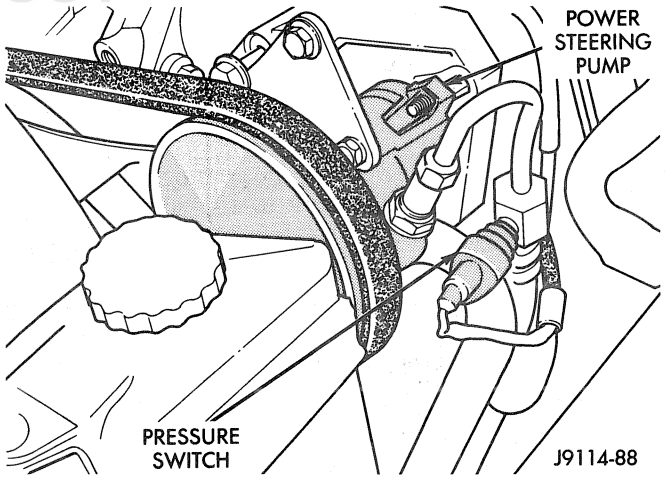


Fig. 31 Power Steering Pump Pressure Switch

VEHICLE SPEED SENSOR

To perform a complete test of the sensor and its circuitry, refer to DRB scan tool and appropriate Powertrain Diagnostics Procedures manual.

EXTENDED IDLE SWITCH TEST

OPTIONAL POLICE PACKAGE ONLY

The extended idle switch is used to raise the engine idle speed to approximately 1000 rpm when the shifter is in either the Park or Neutral position. A rocker-type 2-wire switch (extended idle switch) is mounted to the instrument panel. **This switch is**

DIAGNOSIS AND TESTING (Continued)

available only with 4.0L engine when supplied with the optional police package.

The extended idle switch will control a ground circuit going to the powertrain control module (PCM). When a ground signal (through this switch) has been received at pin/cavity A-12 of the PCM, engine idle speed will increase.

Bring the engine to normal operating temperature and turn the extended idle switch to the ON position. Engine speed should now increase to approximately 1000 rpm when the shifter is in either the Park or Neutral position. If engine speed does not increase, apply a good ground to pin/cavity A-12 at the PCM using a small paper clip. Be careful not to damage the wiring with the paper clip. If the engine speed now increases, it can be assumed that the PCM is functioning correctly. Check the instrument panel mounted switch for a closed circuit to ground when switch is in the ON position. If the engine speed will not increase after applying a ground to pin/cavity A-12, replace the PCM. Refer to Group 8W, Wiring Diagrams for circuit and wiring information.

THROTTLE POSITION SENSOR (TPS)

To perform a complete test of the TPS (Fig. 30) and its circuitry, refer to the DRB scan tool and appropriate Powertrain Diagnostics Procedures manual. To test the TPS only, refer to the following:

The TPS can be tested with a digital voltmeter. The center terminal of the TPS is the output terminal.

With the ignition key in the ON position, check the TPS output voltage at the center terminal wire of the connector. Check this at idle (throttle plate closed) and at wide open throttle (WOT). At idle, TPS output voltage should must be greater than 200 millivolts. At wide open throttle, TPS output voltage must be less than 4.8 volts. The output voltage should increase gradually as the throttle plate is slowly opened from idle to WOT.

REMOVAL AND INSTALLATION

AUTOMATIC SHUTDOWN (ASD) RELAY

The ASD relay is located in the Power Distribution Center (PDC) (Fig. 32). Refer to label on PDC cover for relay location.

FUEL PUMP RELAY

The fuel pump relay is located in the Power Distribution Center (PDC) (Fig. 32). Refer to label on PDC cover for relay location.

THROTTLE BODY

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the powertrain control module (PCM).

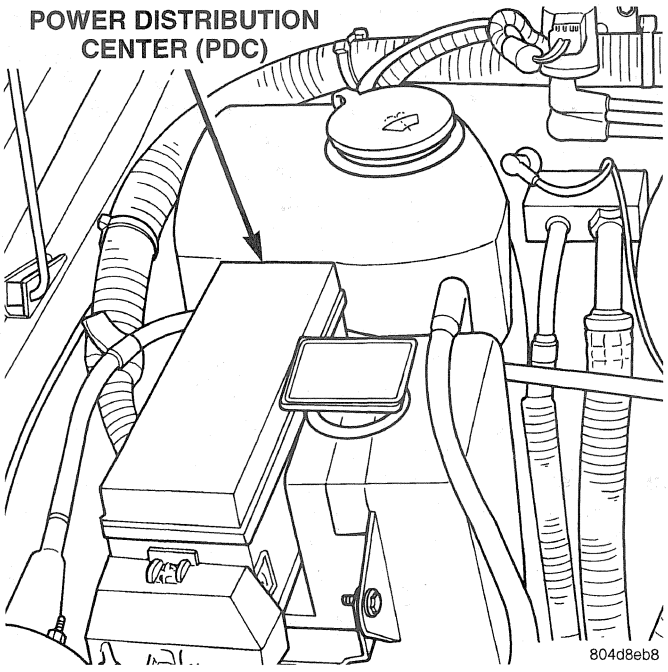


Fig. 32 Power Distribution Center (PDC)

REMOVAL

(1) Remove the air cleaner tube at throttle body.

(2) Disconnect throttle body electrical connectors at MAP sensor, IAC motor and TPS (Fig. 33).

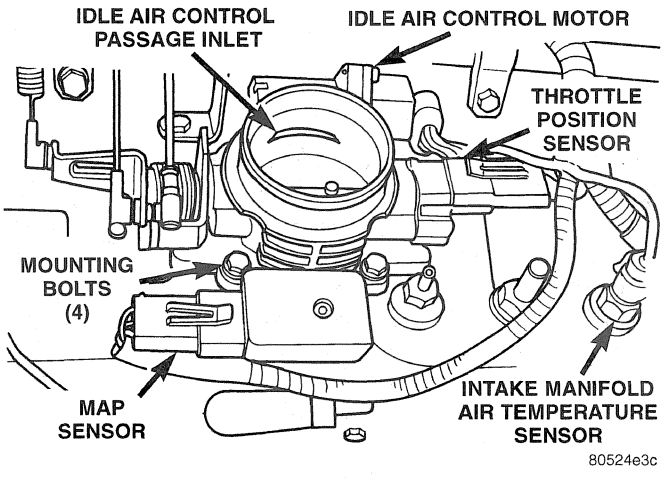


Fig. 33 Throttle Body and Sensor Locations—4.0L Shown

(3) Remove all control cables from throttle body (lever) arm. Refer to the Accelerator Pedal and Throttle Cable section of this group for additional information.

(4) Remove four throttle body mounting bolts.

(5) Remove throttle body from intake manifold.

(6) Discard old throttle body-to-intake manifold gasket.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Clean the mating surfaces of the throttle body and the intake manifold.
(2) Install new throttle body-to-intake manifold gasket.
(3) Install throttle body to intake manifold.
(4) Install four mounting bolts. Tighten bolts to 12 N·m (108 in. lbs.) torque.
(5) Install control cables.
(6) Install electrical connectors.
(7) Install air cleaner at throttle body.

THROTTLE POSITION SENSOR (TPS)

The TPS is mounted to the throttle body (Fig. 33).

REMOVAL

(1) Disconnect TPS electrical connector.
(2) Remove TPS mounting screws (Fig. 34).
(3) Remove TPS.

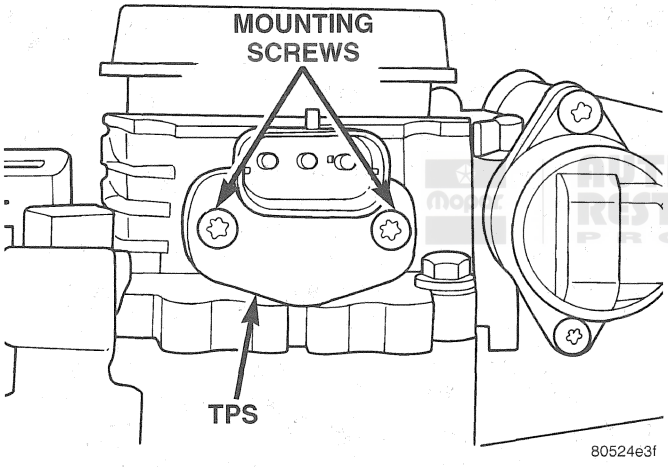


Fig. 34 TPS Mounting Screws

INSTALLATION

The throttle shaft end of the throttle body slides into a socket in the TPS (Fig. 35). The TPS must be installed so that it can be rotated a few degrees. (If the sensor will not rotate, install the sensor with the throttle shaft on the other side of the socket tangs). The TPS will be under slight tension when rotated.
(1) Install the TPS and retaining screws.
(2) Tighten screws to 7 N·m (60 in. lbs.) torque.
(3) Connect TPS electrical connector to TPS.
(4) Manually operate the throttle (by hand) to check for any TPS binding before starting the engine.

IDLE AIR CONTROL (IAC) MOTOR

The IAC motor is located on the side of the throttle body (Fig. 33).

REMOVAL

(1) Remove air cleaner tube at throttle body.
(2) Disconnect electrical connector from IAC motor.

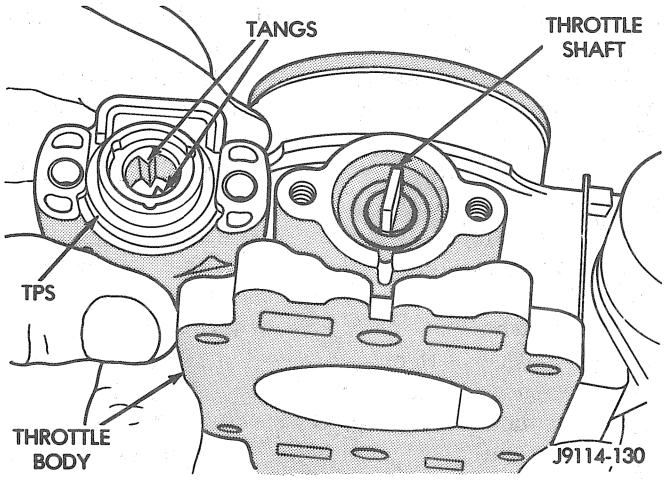


Fig. 35 Throttle Position Sensor—Installation

(3) Remove two mounting bolts (screws) (Fig. 36).
(4) Remove IAC motor from throttle body.

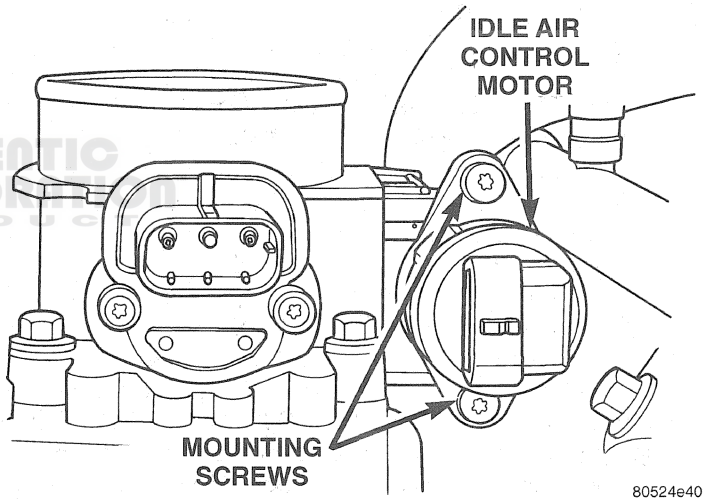


Fig. 36 Mounting Bolts (Screws)—IAC Motor

INSTALLATION

(1) Install IAC motor to throttle body.
(2) Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.
(3) Install electrical connector.
(4) Install air cleaner tube to throttle body.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

The MAP sensor is mounted to the side of the throttle body (Fig. 33). An L-shaped rubber fitting is used to connect the MAP sensor to throttle body (Fig. 37).

REMOVAL

(1) Remove air cleaner intake tube at throttle body.
(2) Remove two MAP sensor mounting bolts (screws) (Fig. 37).

REMOVAL AND INSTALLATION (Continued)

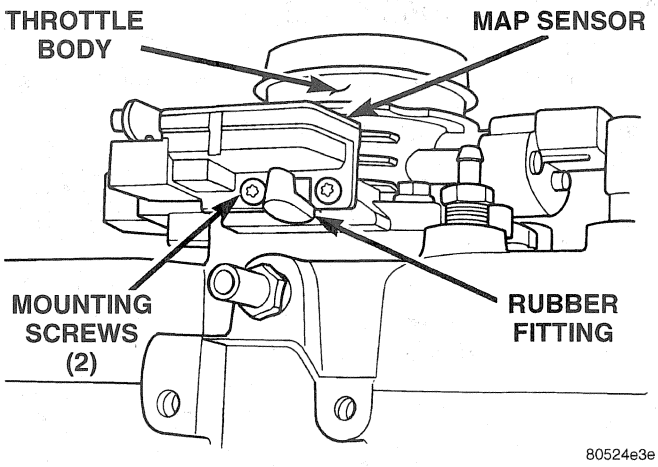


Fig. 37 MAP Sensor Mounting

(3) While removing MAP sensor, slide the rubber L-shaped fitting (Fig. 37) from the throttle body.

(4) Remove rubber L-shaped fitting from MAP sensor.

INSTALLATION

(1) Install rubber L-shaped fitting to MAP sensor.

(2) Position sensor to throttle body while guiding rubber fitting over throttle body vacuum nipple.

(3) Install MAP sensor mounting bolts (screws). Tighten screws to 3 N·m (25 in. lbs.) torque.

(4) Install air cleaner intake tube.

DUTY CYCLE EVAP CANISTER PURGE SOLENOID

The purge solenoid is located in the engine compartment (Fig. 38).

REMOVAL

(1) Disconnect wiring connector at solenoid (Fig. 38).

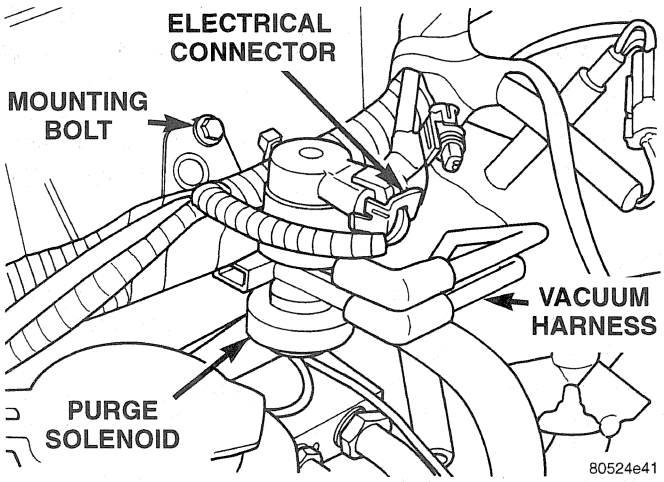


Fig. 38 EVAP Canister Purge Solenoid Location

(2) Disconnect vacuum harness at solenoid (Fig. 38).

(3) Remove solenoid and its support bracket from dash panel.

INSTALLATION

(1) Install EVAP canister purge solenoid and its mounting bracket to dash panel.

(2) Connect vacuum harness and wiring connector.

POWERTRAIN CONTROL MODULE (PCM)

The PCM is located in the engine compartment next to the air cleaner assembly (Fig. 39).

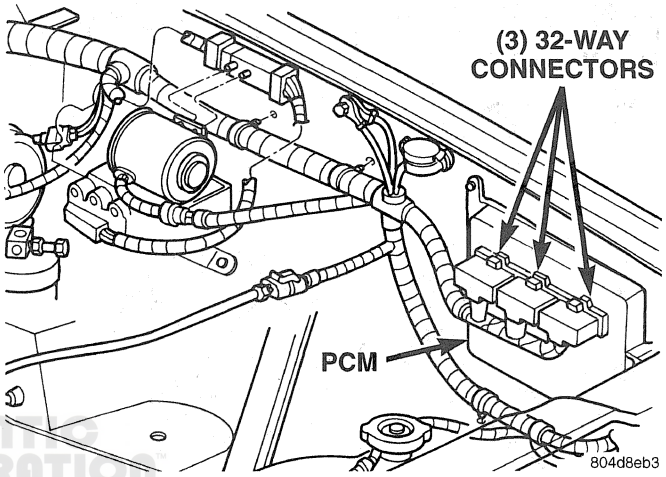


Fig. 39 PCM Location

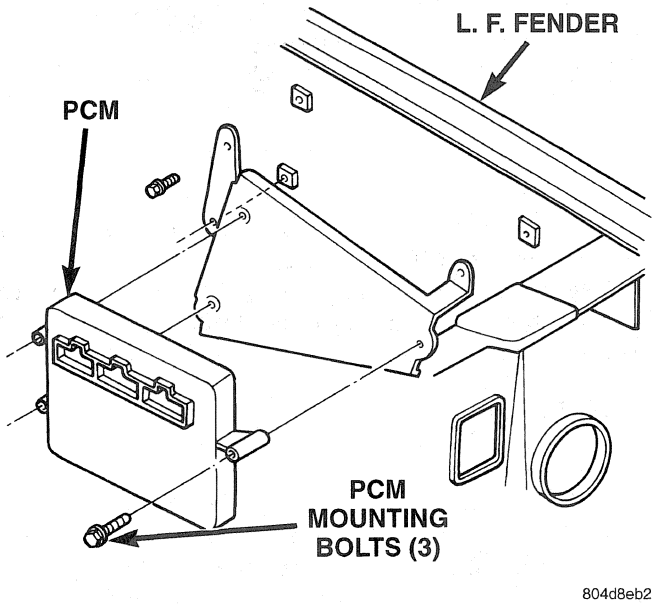


Fig. 40 PCM Mounting

REMOVAL

(1) Disconnect the negative battery cable at battery.

(2) Carefully unplug the three 32–way connectors (Fig. 40) from PCM.

REMOVAL AND INSTALLATION (Continued)

(3) Remove three PCM mounting bolts and remove PCM from vehicle.

INSTALLATION

(1) Install PCM and mounting bolts to vehicle.
(2) Tighten bolts to 4 N·m (35 in. lbs.).
(3) Check pin connectors in the PCM and the three 32–way connectors for corrosion or damage. Repair as necessary.
(4) Install three 32–way connectors.
(5) Install battery cable.

POWER STEERING PRESSURE SWITCH—2.5L ENGINE

This switch is not used with 4.0L six-cylinder engines.

The power steering pressure switch is installed in the power steering high-pressure hose (Fig. 41).

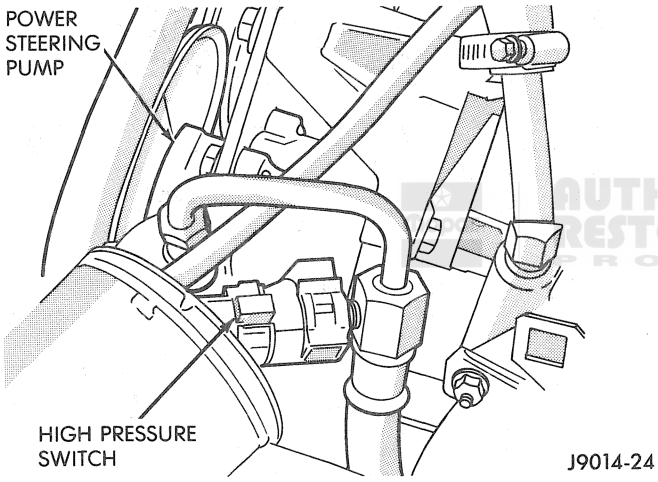


Fig. 41 Power Steering Pressure Switch

REMOVAL

(1) Disconnect the electrical connector from the power steering pressure switch.
(2) Place a small container or shop towel beneath the switch to collect any excess fluid.
(3) Remove the switch.

INSTALLATION

(1) Install the power steering switch into power steering line.
(2) Tighten to 28 N·m (252 in. lbs.) torque.
(3) Connect the electrical connector to the switch.
(4) Check power steering fluid and add as necessary.
(5) Start the engine and again check power steering fluid. Add fluid if necessary.

CRANKSHAFT POSITION SENSOR

Refer to Group 8D, Ignition System for removal/installation procedures.

CAMSHAFT POSITION SENSOR

For removal/installation procedures, refer to Group 8D, Ignition System. See Camshaft Position Sensor.

UPSTREAM OXYGEN SENSOR

The upstream O2S sensor is located in the exhaust downpipe. The downstream sensor is located near outlet end of catalytic converter. Refer to (Fig. 42).

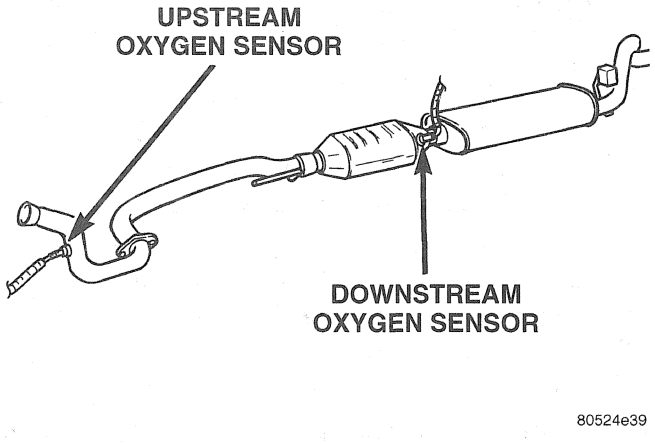


Fig. 42 Oxygen Sensor Locations

REMOVAL

WARNING: THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

(1) Raise and support the vehicle.
(2) Disconnect the wire connector from the O2S sensor.

CAUTION: When disconnecting the sensor electrical connector, do not pull directly on wire going into sensor.

(3) Remove the O2S sensor. Snap-On oxygen sensor wrench (number YA 8875) may be used for removal and installation.

INSTALLATION

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to the threads of a new oxygen sensor.**

(1) Install the O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.
(2) Connect the O2S sensor wire connector.
(3) Lower the vehicle.

REMOVAL AND INSTALLATION (Continued)

DOWNSTREAM OXYGEN SENSOR

Refer to Upstream Oxygen Sensor for procedures.

AIR CLEANER HOUSING

REMOVAL

(1) Unlock clean air hose clamp (Fig. 43) at air cleaner cover. To unlock the clamp, attach adjustable pliers to clamp and rotate pliers as shown in (Fig. 44).

(2) Remove clean air hose at cover.

(3) Disconnect vacuum lines at air cleaner housing.

(4) Remove the housing cover and remove air cleaner element.

(5) Remove housing mounting bolts/nuts.

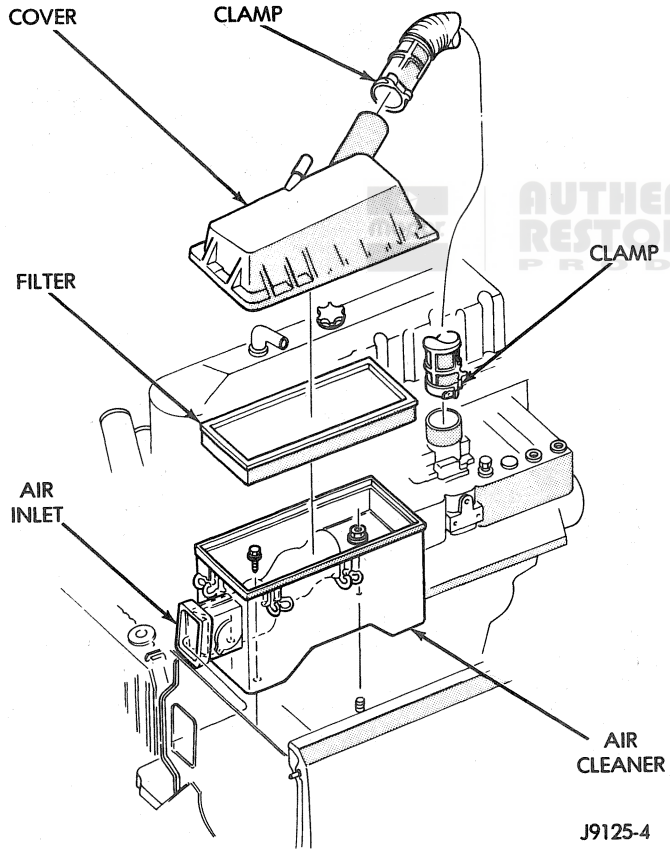


Fig. 43 Air Cleaner Housing—Typical

(6) Release the air cleaner housing from the ambient air inlet tube and remove housing from vehicle.

INSTALLATION

(1) Position air cleaner housing to body and ambient air inlet.

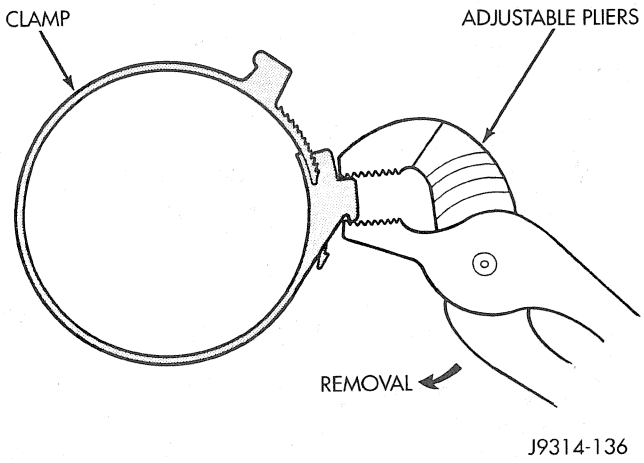


Fig. 44 Clamp Removal

(2) Install bolts/nuts to housing. Tighten to 8 N·m (71 in. lbs.) torque.

(3) Install air cleaner element and cover.

(4) Install vacuum lines to housing.

(5) Install clean air hose and clamp to cover. Compress the clamp snugly with adjustable pliers as shown in (Fig. 45).

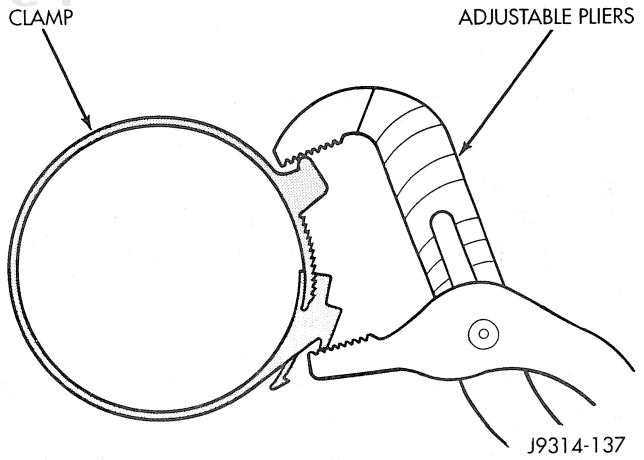


Fig. 45 Clamp Installation

AIR CLEANER ELEMENT

REMOVAL/INSTALLATION

(1) Pry back the three clips retaining the air cleaner cover to the air cleaner housing.

(2) Lift the cover up (Fig. 43) and position to the side.

(3) Remove air cleaner element.

(4) Clean the inside of air cleaner housing and its cover before installing new element.

(5) Reverse the preceding operation for installation. Be sure the air cleaner cover is properly seated to air cleaner housing.

REMOVAL AND INSTALLATION (Continued)

ENGINE COOLANT TEMPERATURE SENSOR

The coolant temperature sensor is installed in the thermostat housing (Fig. 46).

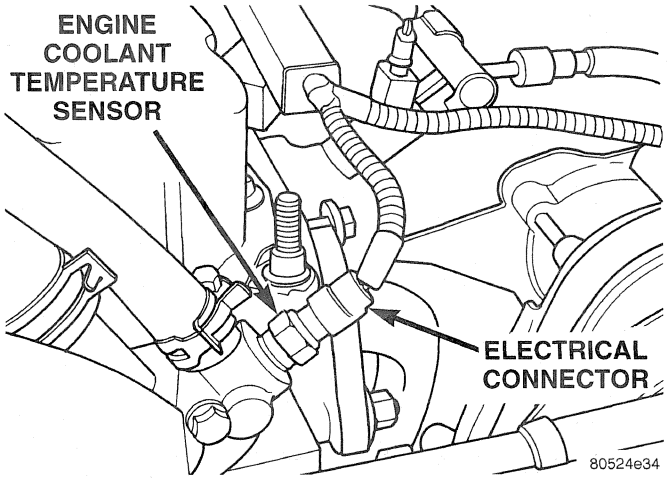


Fig. 46 Engine Coolant Temperature Sensor—Typical

REMOVAL

(1) Partially drain cooling system until the coolant level is below the cylinder head. Observe the **WARNINGS** in Group 7, Cooling.

(2) Disconnect the coolant temperature sensor wire connector.

(3) Remove the sensor from the thermostat housing.

INSTALLATION

(1) Apply sealant to sensor threads.

(2) Install coolant temperature sensor into the thermostat housing. Tighten to 11 N·m (8 ft. lbs.) torque.

(3) Connect the wire connector.

(4) Fill the cooling system. Refer to Group 7, Cooling System.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR

The intake manifold air temperature sensor is installed into the intake manifold plenum near the throttle body (Fig. 47).

REMOVAL

(1) Disconnect the electrical connector from the sensor.

(2) Remove the sensor from the intake manifold.

INSTALLATION

(1) Install the sensor into the intake manifold. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect the electrical connector to the sensor.

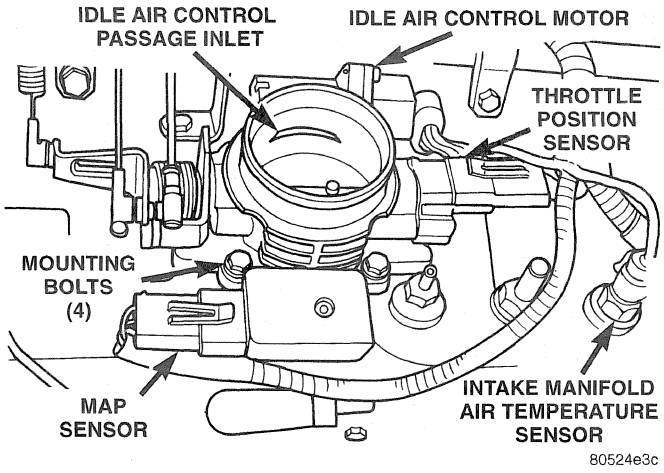


Fig. 47 Intake Air Sensor Location—Typical—4.0L Shown

VEHICLE SPEED SENSOR

The vehicle speed sensor is located on the speedometer pinion gear adapter (Fig. 48). The pinion gear adapter is located on the extension housing of the transmission (drivers side).

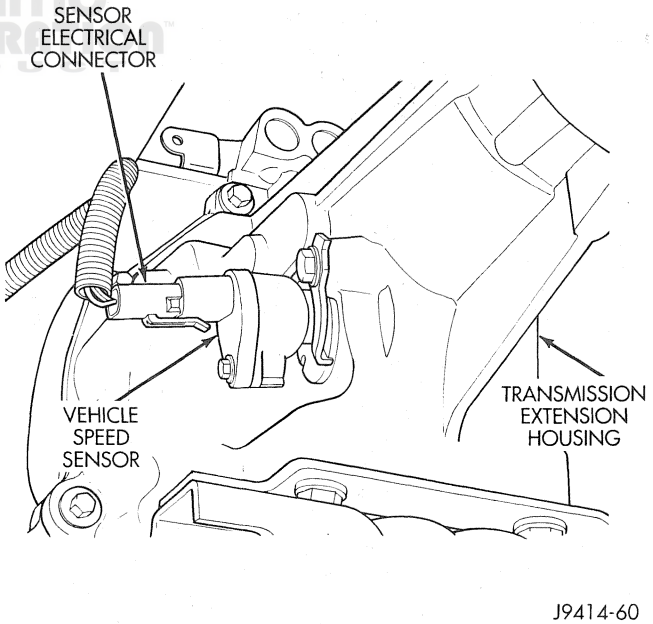


Fig. 48 Vehicle Speed Sensor Location—Typical

REMOVAL

(1) Raise and support vehicle.

(2) Disconnect the electrical connector from the sensor.

(3) Remove the sensor mounting bolt (Fig. 49).

(4) Remove the sensor (pull straight out) from the speedometer pinion gear adapter (Fig. 49). Do not remove the gear adapter from the transmission.

REMOVAL AND INSTALLATION (Continued)

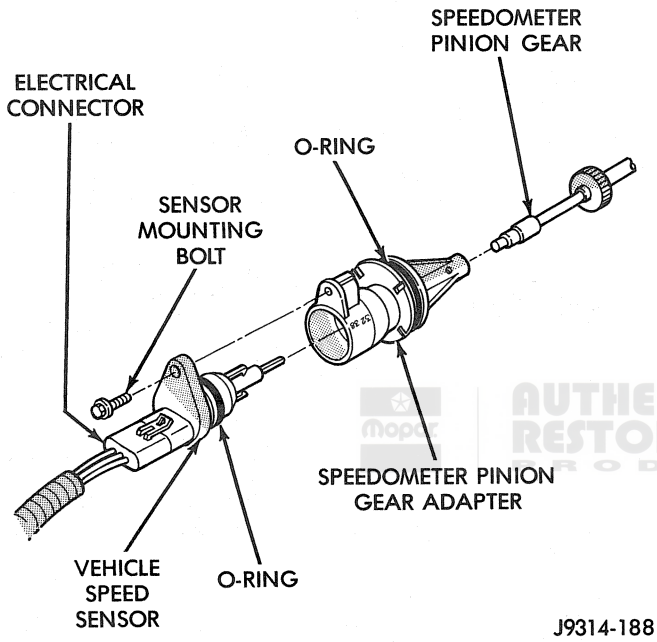


Fig. 49 Sensor Removal/Installation

INSTALLATION

(1) Clean the inside of speedometer pinion gear adapter before installing speed sensor.

(2) Install sensor into speedometer gear adapter and install mounting bolt. **Before tightening bolt, verify speed sensor is fully seated (mounted flush) to speedometer pinion gear adapter.**

(3) Tighten sensor mounting bolt to 2.2 N·m (20 in. lbs.) torque.

(4) Connect electrical connector to sensor.

SPECIFICATIONS

VECI LABEL SPECIFICATIONS

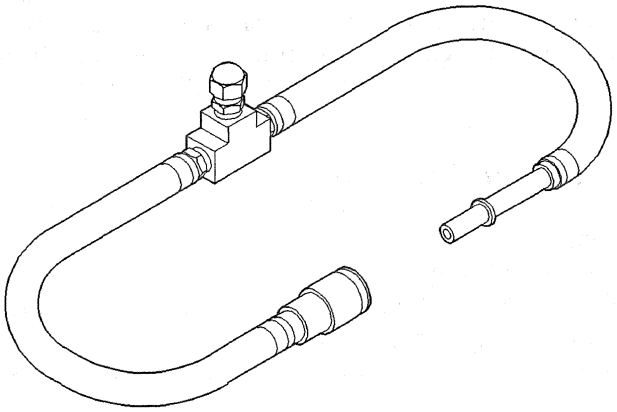
If anything differs between the specifications found on the Vehicle Emission Control Information (VECI) label and the following specifications, use specifications on VECI label. The VECI label is located in the engine compartment.

TORQUE SPECIFICATIONS

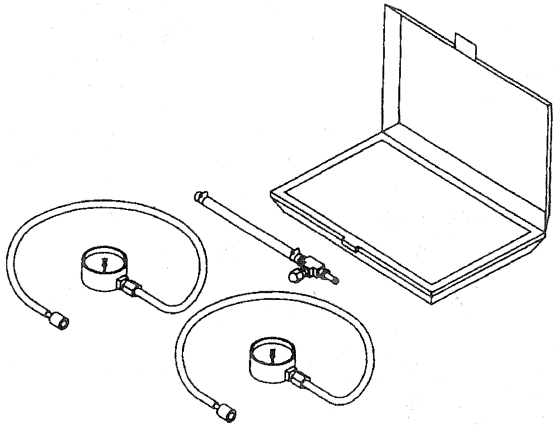
DESCRIPTION	TORQUE
Accelerator Pedal Bracket Mounting Nuts	.5 N·m (36 in. lbs.)
Air Cleaner Housing Mount. Bolts	.8 N·m (71 in. lbs.)
Engine Coolant Temperature Sensor	.11 N·m (96 in. lbs.)
Fuel Tank Mounting Nuts	.11 N·m (100 in. lbs.)
Fuel Hose Clamps	.1 N·m (10 in. lbs.)
IAC Motor-To-Throttle Body Bolts	.7 N·m (60 in. lbs.)
Intake Manifold Air Temp. Sensor	.28 N·m (20 ft. lbs.)
MAP Sensor Mounting Screws	.3 N·m (25 in. lbs.)
Oxygen Sensor	.30 N·m (22 ft. lbs.)
PCM Mounting Screws	.4 N·m (35 in. lbs.)
Power Steering Pressure Switch	.28 N·m (252 in. lbs.)
Throttle Body Mounting Bolts	.12 N·m (108 in. lbs.)
Throttle Position Sensor Mounting Screws	.7 N·m (60 in. lbs.)
Vehicle Speed Sensor Mounting Bolt	.2.2 N·m (20 in. lbs.)

SPECIAL TOOLS

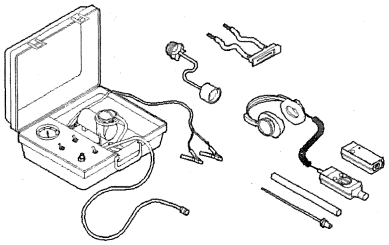
FUEL SYSTEM



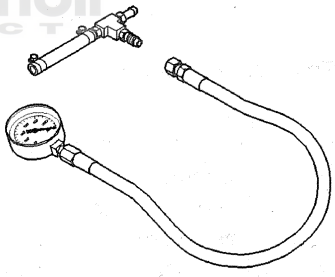
Adapters, Fuel Pressure Test—6541, 6539, 6631 or 6923



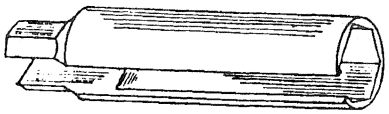
Test Kit, Fuel Pressure—5069



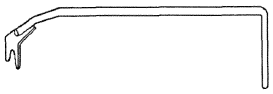
Pump, IM240 EVAP Service Pressure—6917



Test Kit, Fuel Pressure—C-4799-B



O2S (Oxygen Sensor) Remover/Installer—C-4907



Fuel Line Removal Tool—6782

STEERING

CONTENTS

	page		page
POWER STEERING GEAR	11	STEERING COLUMN	23
POWER STEERING PUMP	5	STEERING LINKAGE	27
POWER STEERING	1		

POWER STEERING

INDEX

	page		page
GENERAL INFORMATION		CHARTS	4
STEERING SYSTEM	1		
DIAGNOSIS AND TESTING			
POWER STEERING SYSTEM DIAGNOSIS			

AUTHENTIC RESTORATION PRODUCT

GENERAL INFORMATION

STEERING SYSTEM

The power steering system has a hydraulic pump. The pump on the 4.0L engine has a reservoir mounted to it (Fig. 1). The 2.5L engine has a seperate pump reservoir mounted to the closure panel (Fig. 2).

The steering gear used is a recirculating ball type gear. This gear is used on all models.

The power steering system consists of;

- Hydraulic pump
- Recirculating ball steering gear
- Steering column
- Steering linkage

NOTE: Right hand drive (RHD) and left hand drive (LHD) service procedures and torque specifications for steering linkage, gear and column are the same. The power steering pump procedures are different. Refer to appropriate service procedures regarding each component in the system.

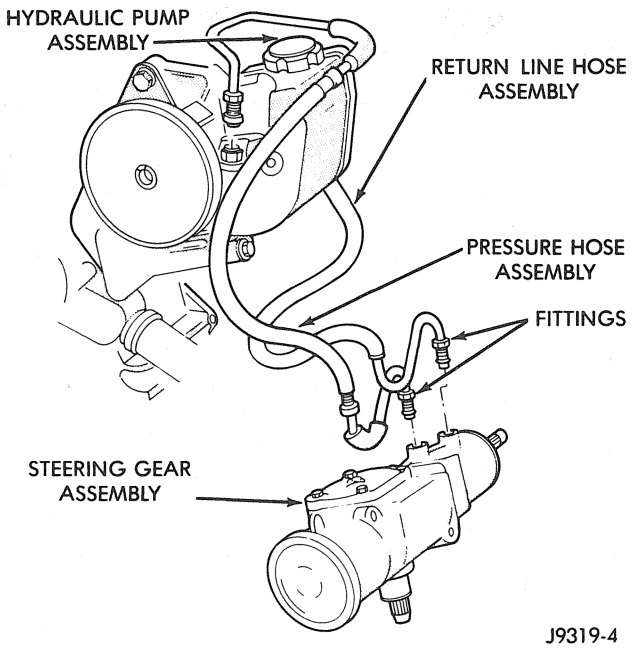


Fig. 1 Power Steering Gear & Pump—4.0L

DIAGNOSIS AND TESTING

There is some noise in all power steering systems. One of the most common is a hissing sound evident at a standstill parking. Or when the steering wheel is at the end of it's travel. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance.

DIAGNOSIS AND TESTING (Continued)

STEERING NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONAL HISS OR WHISTLE	1. Damaged steering coupler to dash panel seal. 2. Noisy valve in power steering gear.	1. Check and repair seal at dash panel. 2. Replace steering gear.
RATTLE OR CLUNK	1. Gear mounting bolts loose. 2. Loose or damaged suspension components. 3. Loose or damaged steering linkage. 4. Internal gear noise. 5. Pressure hose in contact with other components.	1. Tighten bolts to specification. 2. Inspect and repair suspension. 3. Inspect and repair steering linkage. 4. Replace gear. 5. Reposition hose.
CHIRP OR SQUEAL	1. Loose belt.	1. Adjust or replace.
WHINE OR GROWL	1. Low fluid level. 2. Pressure hose in contact with other components. 3. Internal pump noise.	1. Fill to proper level. 2. Reposition hose. 3. Replace pump.
SUCKING AIR SOUND	1. Loose return line clamp. 2. O-ring missing or damaged on hose fitting. 3. Low fluid level. 4. Air leak between pump and reservoir.	1. Replace clamp. 2. Replace o-ring. 3. Fill to proper level. 4. Repair as necessary.
SCRUBBING OR KNOCKING	1. Wrong tire size. 2. Wrong gear.	1. Verify tire size. 2. Verify gear.

DIAGNOSIS AND TESTING (Continued)

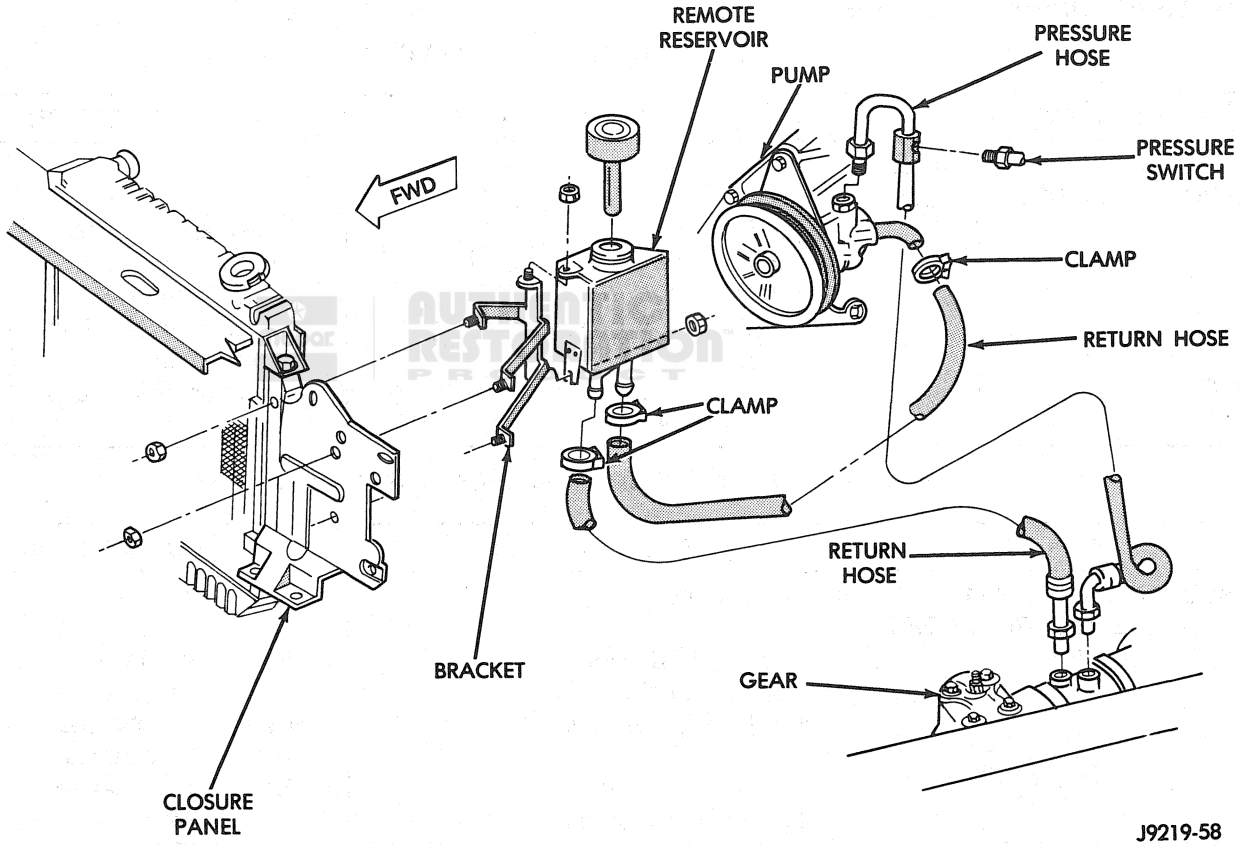


Fig. 2 Power Steering Gear & Pump—2.5 L

DIAGNOSIS AND TESTING (Continued)

POWER STEERING SYSTEM DIAGNOSIS CHARTS

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level.	2. Fill to proper level.
	2. Tire pressure.	2. Adjust tire pressure.
	3. Steering components.	3. Inspect and lube.
	4. Loose belt.	4. Adjust or replace.
	5. Pump flow control valve.	5. Test and replace if necessary.
	6. Column coupler binding.	6. Replace coupler.
	7. Steering gear worn or out of adjustment.	7. Repair or replace gear.

INSUFFICIENT ASST. OR POOR RETURN TO CENTER

CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure.	1. Adjust tire pressure.
	2. Low fluid level.	2. Fill to proper level.
	3. Loose belt.	3. Adjust or replace.
	4. Lack of lubrication.	4. Inspect and lubricate steering and suspension compnents.
	5. Low pump pressure.	5. Test and repair as necessary.
	6. Internal gear leak.	6. Test and repair as necessary.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure.	1. Adjust tire pressure.
	2. Wheel alignment.	2. Align front end.
	3. Lack of lubrication.	3. Inspect and lubricate steering and suspension compnents.
	4. High friction in steering gear.	4. Test and repair as necessary.

LOOSE STEERING AND VEHICLE LEAD

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE PLAY IN STEERING WHEEL	1. Worn or loose suspension or steering components.	1. Inspect and repair as necessary.
	2. Worn or loose wheel bearings.	2. Inspect and repair or adjust bearings.
	3. Steering gear mounting.	3. Tighten gear to specification.
	4. Gear out of adjustment.	4. Adjust gear to specification.
	5. Worn or loose steering coupler.	5. Inspect and replace as necessary.
VEHICLE PULLS OR LEADS TO ONE SIDE.	1. Radial tire lead.	1. Rotate tires.
	2. Brakes dragging.	2. Repair as necessary.
	3. Wheel alignment.	3. Align front end.

POWER STEERING PUMP

INDEX

page

DESCRIPTION AND OPERATION
POWER STEERING PUMP 5
DIAGNOSIS AND TESTING
POWER STEERING PUMP PRESSURE TEST . . . 5
PUMP LEAKAGE DIAGNOSIS 6
SERVICE PROCEDURES
POWER STEERING PUMP—INITIAL OPERATION 6
REMOVAL AND INSTALLATION
POWER STEERING PUMP 7

page

DISASSEMBLY AND ASSEMBLY
FLOW CONTROL VALVE 9
PUMP PULLEY 7
TC-SERIES PUMP RESERVOIR 8
SPECIFICATIONS
TORQUE CHART 9
SPECIAL TOOLS
POWER STEERING PUMP 10

DESCRIPTION AND OPERATION

POWER STEERING PUMP

Hydraulic pressure is provided for operation of the power steering gear by a belt driven power steering pump. The power steering pump is a constant flow rate and displacement, vane-type pump. The internal parts in the housing operate submerged in fluid. The flow control orifice is part of the high pressure line fitting. The pressure relief valve inside the flow control valve limits the pump pressure. The reservoir is attached to the pump body with spring clips on the 4.0 L engine. On the 2.5 L engine the reservoir is seperate from the pump. It is mounted to the closer panel.

The power steering pump is connected to the steering gear by the suppy and return hoses. The pump shaft has a pressed-on drive pulley that is belt driven by the crankshaft pulley (Fig. 1).

NOTE: Power steering pumps have different pressure rates and are not interchangeable with other pumps.

DIAGNOSIS AND TESTING

POWER STEERING PUMP PRESSURE TEST

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the flow rate of the power steering pump along with the maximum relief pressure. Perform test any time a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Pressure/Flow tester, Special Tool 6815 (Fig. 2).

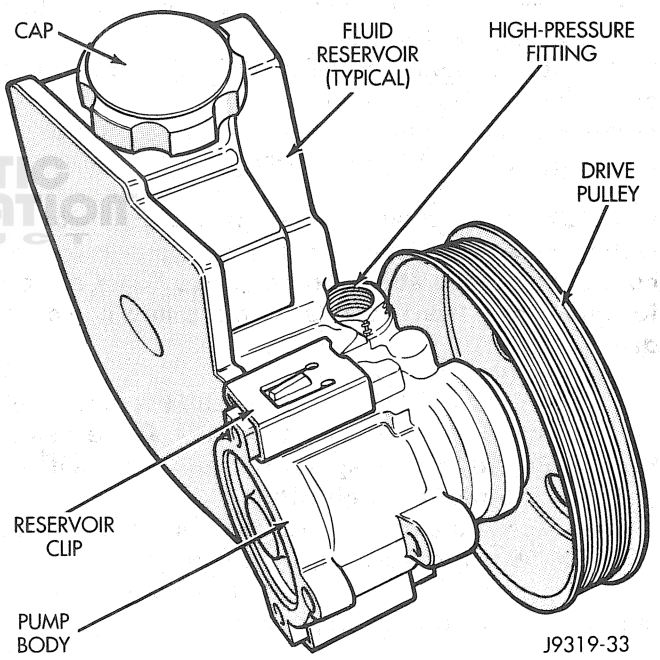


Fig. 1 TC Series Pump With Integral Reservoir

PUMP PRESSURE TEST

(1) Check belt tension and adjust as necessary.

(2) Disconnect high pressure hose at gear or pump. Use a container for dripping fluid.

(3) Connect pressure gauge from Power Steering Analyzer Tool Kit 6815 to both hoses using adapter from Adapter Kit 6893. Connect spare pressure hose to gear or pump.

(4) Open the test valve completely.

(5) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test

DIAGNOSIS AND TESTING (Continued)

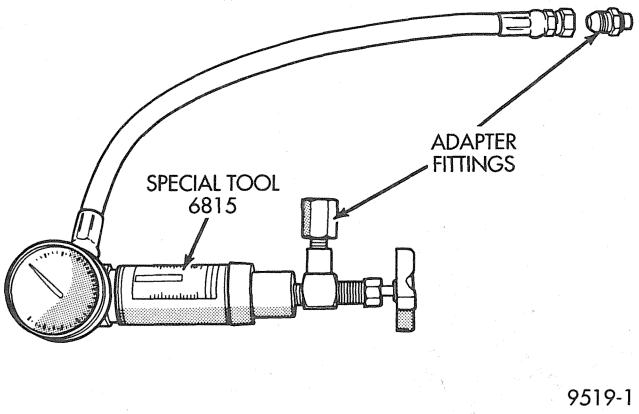


Fig. 2 Pressure Test Gauge

gauge and to get air out of the fluid. Then shut off engine.

(6) Check fluid level, add fluid as necessary. Start engine again and let idle.

(7) Gauge should read below 862 kPa (125 psi), if above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi).

CAUTION: The following test procedure involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than five seconds as the pump could be damaged.

(8) Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**

- Pressures above specifications but not within 345 kPa (50 psi) of each other, replace pump.
- Pressures within 345 kPa (50 psi) of each other but below specifications, replace pump.

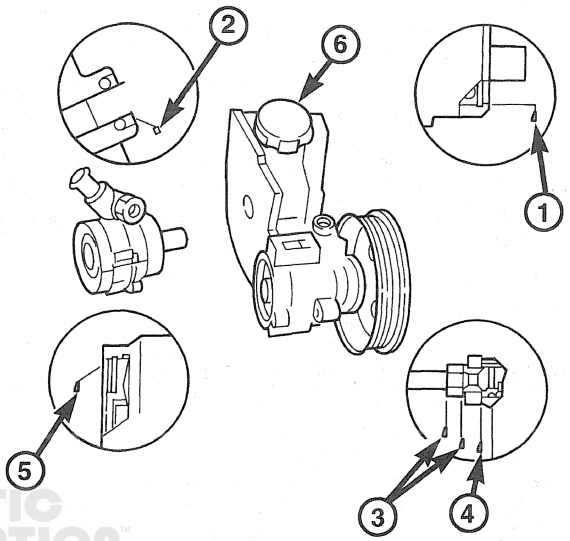
NOTE: Refer to pump relief pressure chart.

CAUTION: Do not force the pump to operate against the stops for more than 2 to 4 seconds at a time because, pump damage will result.

(9) Open the test valve, turn steering wheel extreme left and right positions against the stops. Record the highest indicated pressure at each position. Compare readings to specifications. If highest output pressures are not the same against either stop, the gear is leaking internally and must be repaired.

ENGINE	RELIEF PRESSURE ± 50
2.5L	9653 kPa (1400 psi)
4.0L	9653 kPa (1400 psi)

PUMP LEAKAGE DIAGNOSIS



1. BUSHING (BEARING) WORN, SEAL WORN. REPLACE PUMP.
2. REPLACE RESERVOIR O-RING SEAL.
3. TORQUE HOSE FITTING NUT TO 35 N•m(25ft. lbs.). IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
4. TORQUE FITTING TO 75 N•m (55ft. lbs.). IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
5. REPLACE PUMP.
6. CHECK OIL LEVEL; IF LEAKAGE PERSISTS WITH THE LEVEL CORRECT AND CAP TIGHT, REPLACE THE CAP.

803f5896

SERVICE PROCEDURES

POWER STEERING PUMP—INITIAL OPERATION

CAUTION: The fluid level should be checked with engine off to prevent injury from moving components. Use MOPAR Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal temperature.

(1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two (2) minutes.

(2) Start the engine and let run for a few seconds then turn engine off.

(3) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(4) Raise the front wheels off the ground.

SERVICE PROCEDURES (Continued)

(5) Start the engine and slowly turn the steering wheel right and left, lightly contacting the wheel stops.

(6) Turn off the engine and check the fluid level add if necessary.

(7) Lower the vehicle, start the engine and turn the steering wheel slowly from lock to lock.

(8) Stop the engine and check the fluid level and refill as required.

(9) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the procedure.

REMOVAL AND INSTALLATION

POWER STEERING PUMP

NOTE: The power steering pump is mounted in the same position on LHD and RHD vehicles. On 4.0L RHD vehicles the front bracket is difference. The service pocedures are the same.

REMOVAL

(1) Remove serpentine drive belt, refer to Group 7 Cooling.

(2) Remove pressure and return hoses from pump, and drain pump.

(3) Remove 3 pump mounting bolts through pulley access holes.

(4) Loosen the 3 pump bracket bolts (Fig. 3) and (Fig. 4).

(5) Tilt pump downward and remove from engine.

(6) Remove pulley from pump.

INSTALLATION

(1) Install pulley on pump.

(2) Install pump on engine.

(3) Tighten pump bracket bolts to 47 N·m (35 ft. lbs.).

(4) Install 3 pump mounting bolts and tighten to 27 N·m (20 ft. lbs.).

(5) Install the pressure and return hoses to pump.

(6) Install drive belt, refer to Group 7 Cooling.

(7) Add power steering fluid. Refer to Power Steering Pump Initial Operation in this section.

DISASSEMBLY AND ASSEMBLY

PUMP PULLEY

REMOVAL

(1) Remove pump assembly.

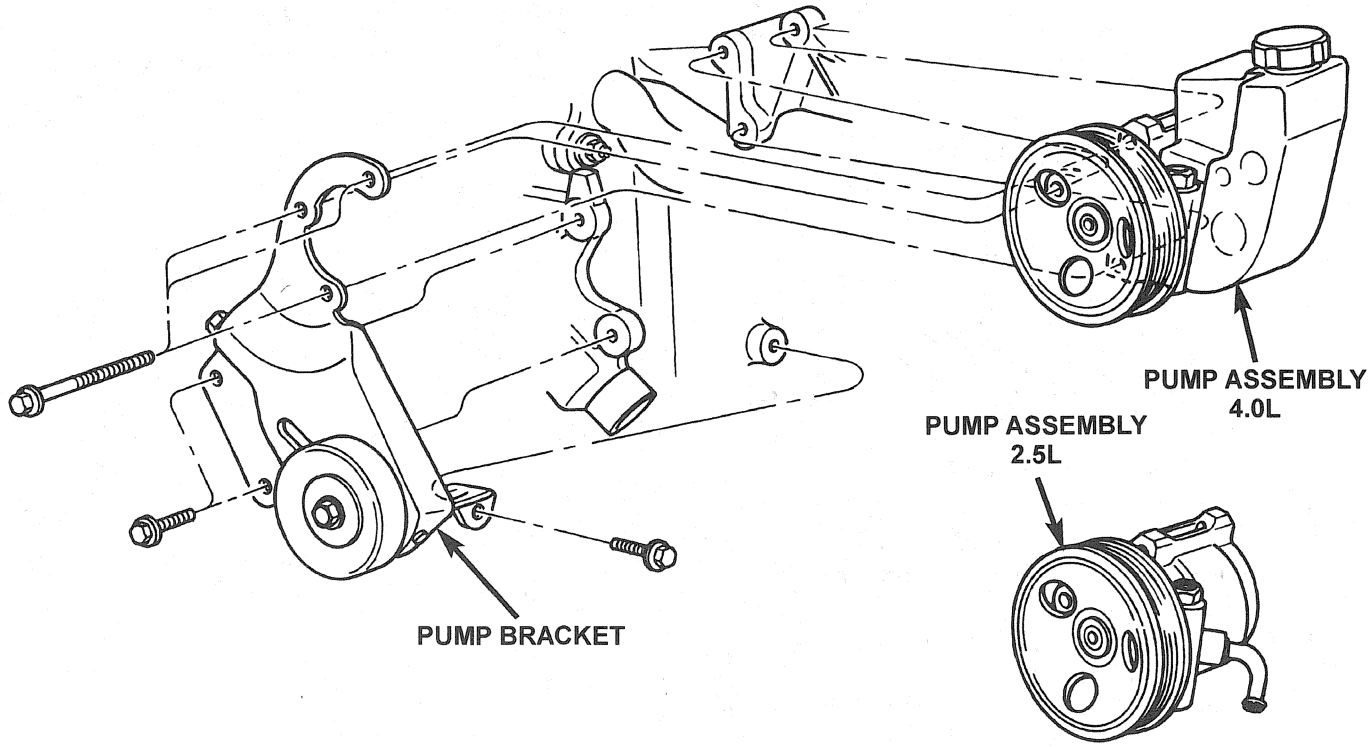


Fig. 3 Pump Mounting

DISASSEMBLY AND ASSEMBLY (Continued)

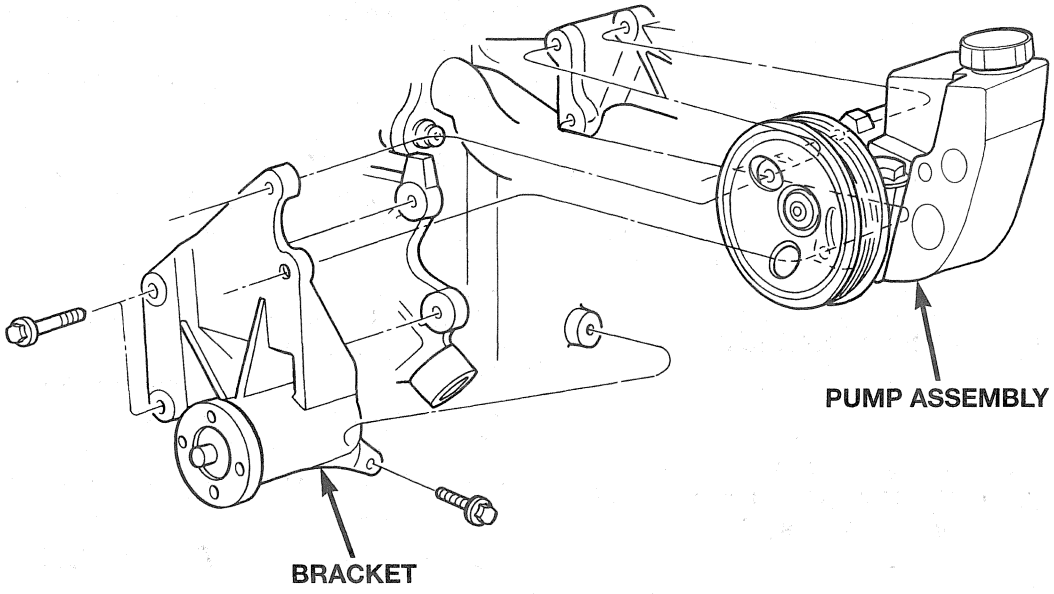


Fig. 4 Pump Mounting 4.0L RHD

(2) Remove pulley from pump with Puller C-4333 (Fig. 5).

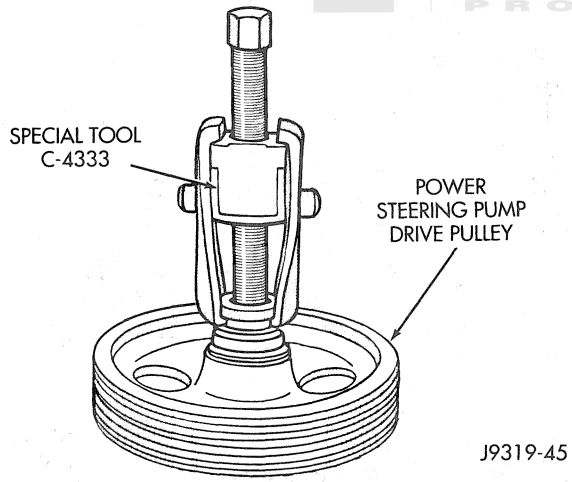


Fig. 5 Pulley Removal

INSTALLATION

(1) Replace pulley if bent, cracked, or loose.

(2) Install pulley on pump with Installer C-4063-B (Fig. 6) flush with the end of the shaft. Ensure the tool and pulley remain aligned with the pump shaft.

(3) Install pump assembly.

(4) With Serpentine Belts; Run engine until warm (5 min.) and note any belt chirp. If chirp exists, move pulley outward approximately 0.5 mm (0.020 in.). If noise increases, press on 1.0 mm (0.040 in.). **Be careful that pulley does not contact mounting bolts.**

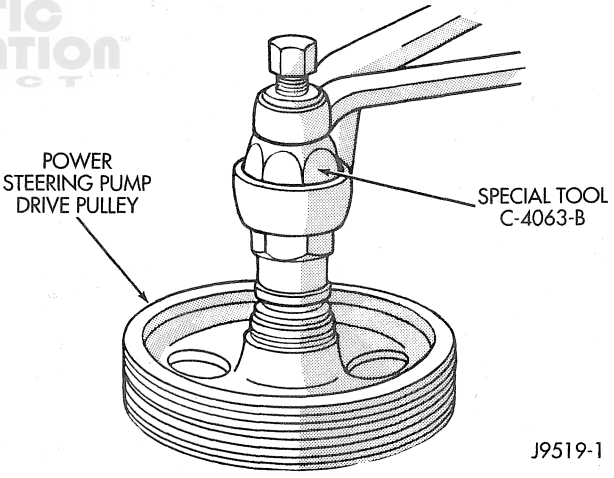


Fig. 6 Pulley Installation

TC-SERIES PUMP RESERVOIR

REMOVAL

(1) Remove power steering pump.

(2) Clean exterior of pump with solvent.

(3) Clamp the pump body in a soft jaw vice.

(4) Pry up tab and slide the retaining clips off (Fig. 7).

(5) Remove fluid reservoir from pump body. Remove and discard O-ring seal.

INSTALLATION

(1) Lubricate new O-ring Seal with Mopar Power Steering Fluid or equivalent.

(2) Install O-ring seal in housing.

(3) Install reservoir onto housing.

DISASSEMBLY AND ASSEMBLY (Continued)

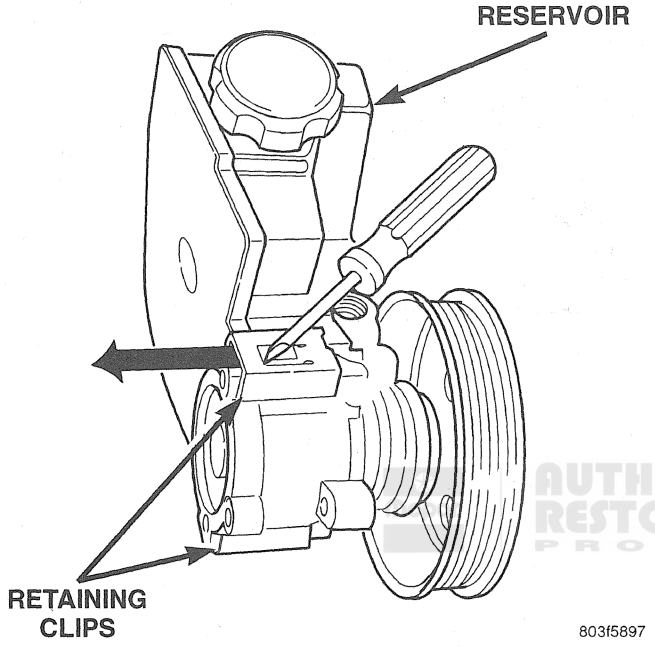


Fig. 7 Pump Reservoir Clips

(4) Slide and tap in reservoir retainer clips until tab locks to housing.

(5) Install power steering pump. Refer to Pump Replacement in this section.

FLOW CONTROL VALVE

REMOVAL

(1) Clean area around fitting to prevent dirt from entering pump. Remove pressure hose from pump fitting.

(2) Remove fitting from pump housing (Fig. 8). **Prevent flow control valve and spring from sliding out of housing bore.**

(3) Remove and discard O-ring seal.

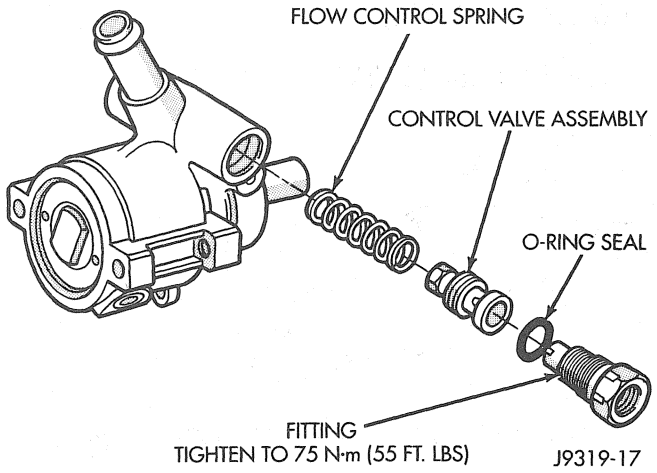


Fig. 8 Flow Control Valve

INSTALLATION

(1) Install spring and flow control valve into pump housing bore. **Be sure the hex nut end of the valve is facing in toward pump.**

(2) Install O-ring seal onto fitting.

(3) Install flow control valve in pump housing and tighten to 75 N·m (55 ft. lbs.).

(4) Install pressure hose to valve.

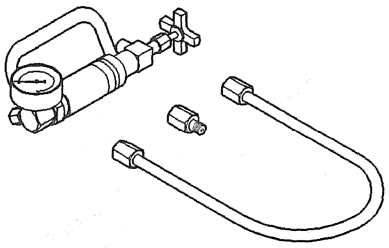
SPECIFICATIONS

TORQUE CHART

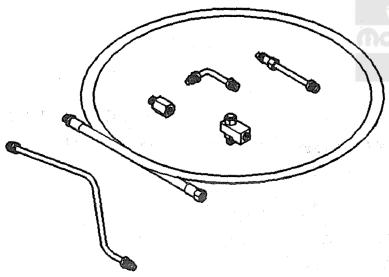
DESCRIPTION	TORQUE
Flow Control Valve	75 N·m (55 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)
Pump Mounting	
Bracket to Pump	28N·m (21 ft. lbs.)
Bracket to Engine	47 N·m (35 ft. lbs.)

SPECIAL TOOLS

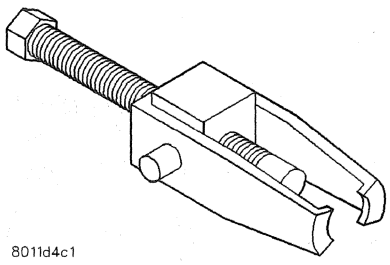
POWER STEERING PUMP



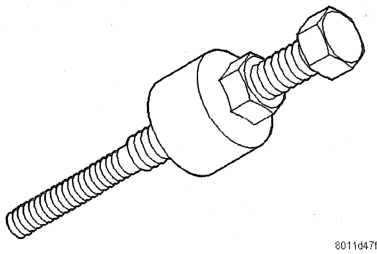
Analyzer Set, Power Steering Flow/Pressure 6815



Adapters, Power Steering Flow/Pressure Tester 6893



Puller C-4333



Installer, Power Steering Pulley C-4063–B

Mopar AUTHENTIC RESTORATION PRODUCT

POWER STEERING GEAR

INDEX

	page
DESCRIPTION AND OPERATION	
POWER STEERING GEAR	11
DIAGNOSIS AND TESTING	
POWER STEERING GEAR LEAKAGE DIAGNOSIS	12
REMOVAL AND INSTALLATION	
PITMAN SHAFT SEALS (IN VEHICLE)	12
STEERING GEAR	13
DISASSEMBLY AND ASSEMBLY	
ADJUSTER PLUG ASSEMBLY	14
HOUSING END PLUG	14
PITMAN SHAFT SEALS AND BEARING	19
PITMAN SHAFT	13
RACK PISTON AND WORM SHAFT	17
SPOOL VALVE	16
ADJUSTMENTS	
STEERING GEAR	20
SPECIFICATIONS	
POWER STEERING GEAR	22
TORQUE CHART	22
SPECIAL TOOLS	
POWER STEERING GEAR	22

DESCRIPTION AND OPERATION

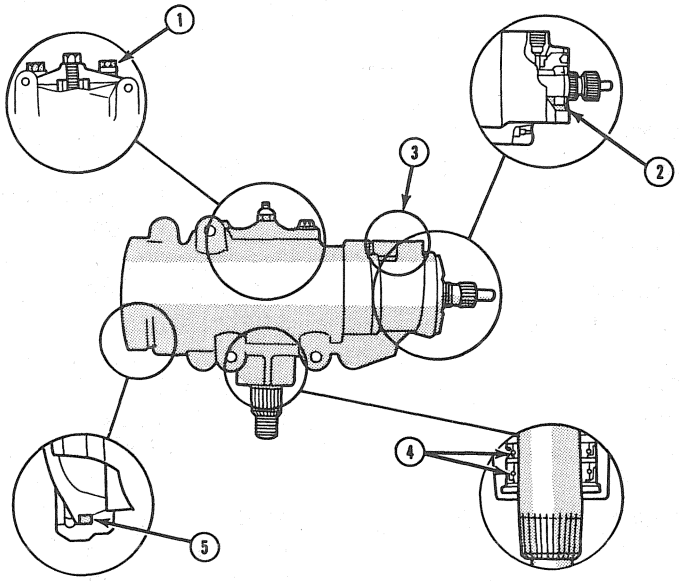
POWER STEERING GEAR

The power steering gear is a recirculating ball type gear. The gear acts as a rolling thread between the worm shaft and rack piston. The worm shaft is supported by a thrust bearing at the lower end and a bearing assembly at the upper end. When the worm shaft is turned the rack piston moves. The rack piston teeth mesh with the pitman shaft. Turning the worm shaft turns the pitman shaft, which turns the steering linkage.

The steering gear can be adjusted and internally serviced.

DIAGNOSIS AND TESTING

POWER STEERING GEAR LEAKAGE DIAGNOSIS



1. SIDE COVER LEAK - TORQUE SIDE COVER BOLTS TO 60 N•m (45 FT. LBS.). REPLACE THE SIDE COVER SEAL IF THE LEAKAGE PERSISTS.
2. ADJUSTER PLUG SEAL - REPLACE THE ADJUSTER PLUG SEALS.
3. PRESSURE LINE FITTING - TORQUE THE HOSE FITTING NUT TO 27 N•m (20 FT. LBS.). IF LEAKAGE PERSISTS, REPLACE THE SEAL.
4. PITMAN SHAFT SEALS - REPLACE THE SEALS.
5. TOP COVER SEAL - REPLACE THE SEAL.

J9219-29

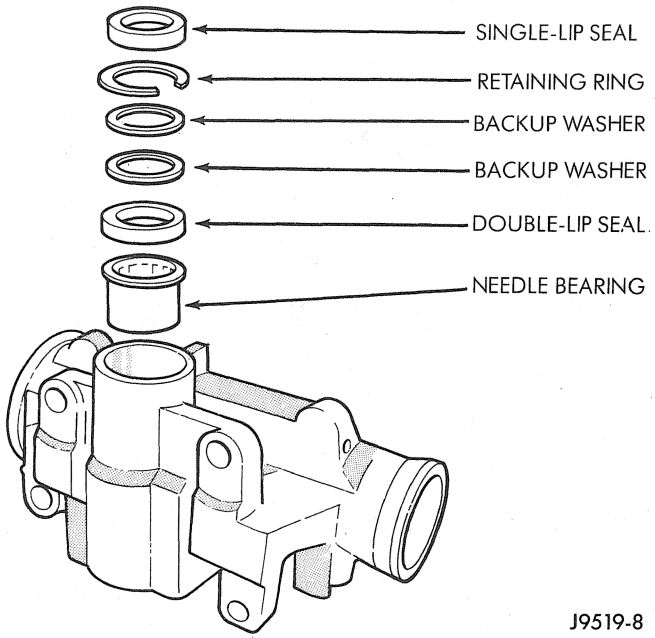
REMOVAL AND INSTALLATION

PITMAN SHAFT SEALS (IN VEHICLE)

REMOVAL

CAUTION: Use care not to score the housing bore when prying out seals and washers.

(1) Remove pitman arm from gear.
(2) Clean exposed end of pitman shaft and housing. Use a wire brush to clean the shaft splines.
(3) Remove single lip dust seal.
(4) Remove retaining ring with snap ring pliers (Fig. 1).
(5) Remove backup washers with screwdriver.
(6) Start the engine and turn steering wheel fully to the LEFT. Hydraulic pressure will force the double lip oil seal out.
(7) Turn off engine and remove double lip seal with screwdriver.
(8) Inspect the housing for burrs and remove if necessary. Inspect the pitman shaft seal surface for roughness and pitting. If shaft is damaged it will have to be replaced.



J9519-8

Fig. 1 Pitman Shaft Seal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Coat the seals and washers with grease.
(2) Install double lip oil seal with a suitable size deep socket.
(3) Install nylon backup washer.
(4) Install steel backup washer.
(5) Install the retainer ring with snap ring pliers.
(6) Install single lip dust seal with a suitable size deep socket.
(7) Center the steering gear and install pitman arm.
(8) Add power steering fluid, refer to Power Steering Initial Operation.

STEERING GEAR

REMOVAL

(1) Place the front wheels in the straight ahead position with the steering wheel centered.
(2) Disconnect and cap the fluid hoses from steering gear.
(3) Remove the column coupler shaft from the gear.
(4) Remove pitman arm from gear.
(5) Remove the steering gear retaining bolts and remove the gear (Fig. 2).

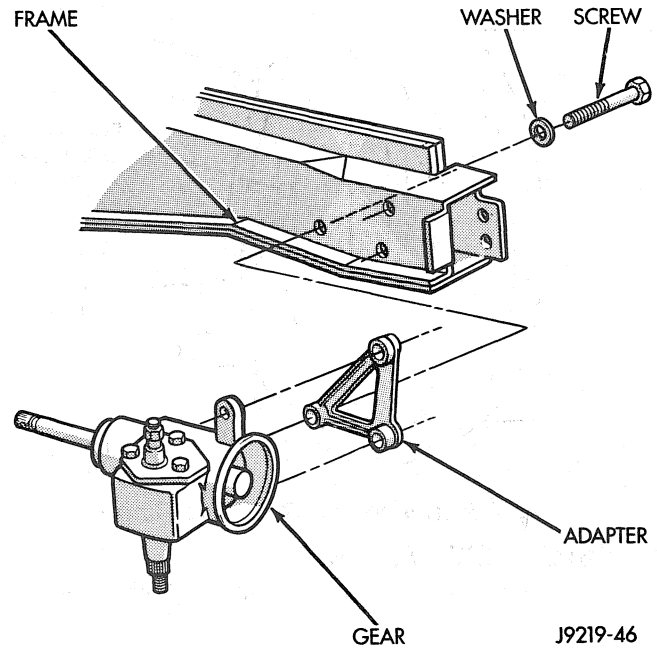


Fig. 2 Steering Gear Mounting (LHD)

INSTALLATION

(1) Align the column coupler shaft to steering gear.
(2) Install steering gear (and bracket) on the frame rail and tighten bolts to 95 N·m (70 ft. lbs.)
(3) Align and install the pitman arm and tighten nut to 251 N·m (185 ft. lbs.).
(4) Connect fluid hoses to steering gear and tighten to 28 N·m (21 ft. lbs.).
(5) Fill power steering system to proper level.

DISASSEMBLY AND ASSEMBLY

PITMAN SHAFT

Steering gear must be removed from the vehicle for this procedure.

REMOVAL

(1) Clean exposed end of pitman shaft and housing with a wire brush.
(2) Remove preload adjuster nut.
(3) Rotate stub shaft with socket to center gear.
(4) Remove side cover bolts and remove side cover, gasket and pitman shaft as an assembly.
(5) Remove pitman shaft from the side cover (Fig. 3).

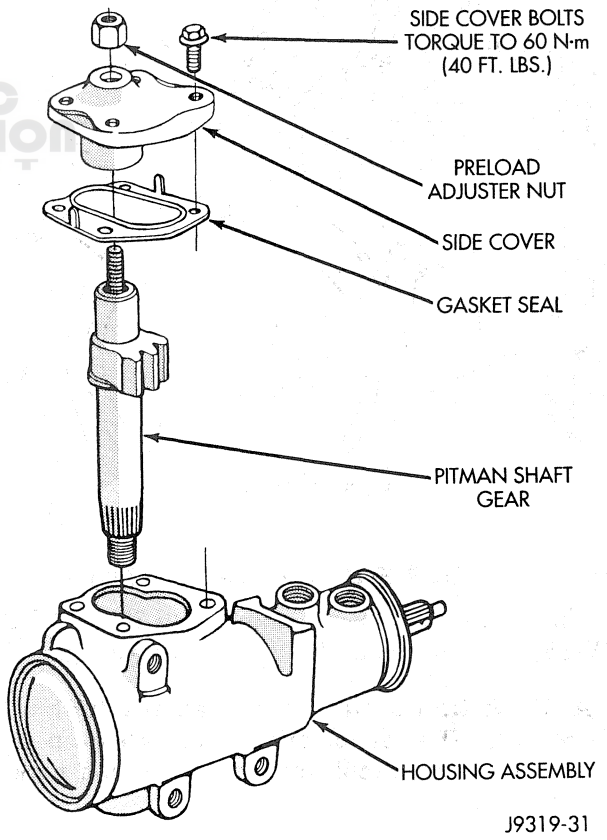


Fig. 3 Side Cover and Pitman Shaft

INSTALLATION

(1) Install pitman shaft to side cover by screwing shaft in until it fully seats to side cover.
(2) Install preload adjuster nut. **Do not tighten nut until after pitman shaft adjustment has been made.**

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Install gasket to side cover and bend tabs around edges of side cover.

(4) Install pitman shaft assembly and side cover to housing.

(5) Install side cover bolts and tighten to 60 N·m (44 ft. lbs.).

(6) Adjust pitman shaft, refer to Over-Center Adjustment.

HOUSING END PLUG

Steering gear must be removed from the vehicle for this procedure.

REMOVAL

(1) Rotate retaining ring until one end is under the hole in the housing. Unseat and force ring from groove (Fig. 4).

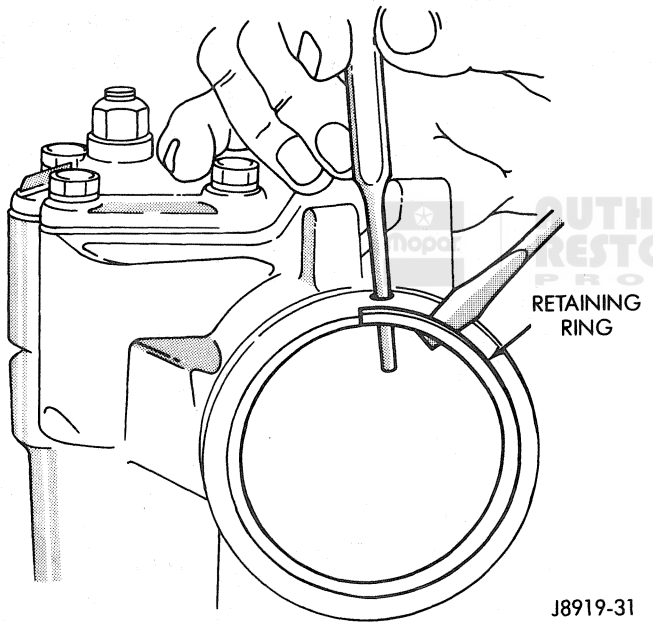


Fig. 4 End Plug Retaining Ring

(2) Rotate stub shaft slowly COUNTER-CLOCKWISE to remove end plug out from housing.

CAUTION: Do not turn stub shaft any further than necessary. The recirculating balls will drop out of the rack piston circuit and fall inside the rack piston chamber.

(3) Remove O-ring seal (Fig. 5).

INSTALLATION

(1) Lubricate O-ring seal with power steering fluid.

(2) Install O-ring into housing.

(3) Install plug, tap lightly with a plastic mallet to seat it.

(4) Install retaining ring with open end 25 mm (1 inch) from access hole (Fig. 6).

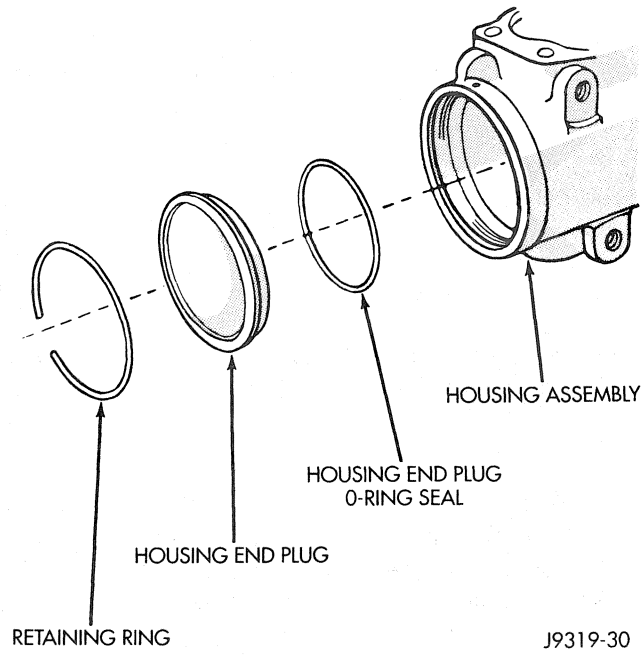


Fig. 5 End Plug Components

(5) Adjust pitman arm shaft, refer to Over-Center Adjustment.

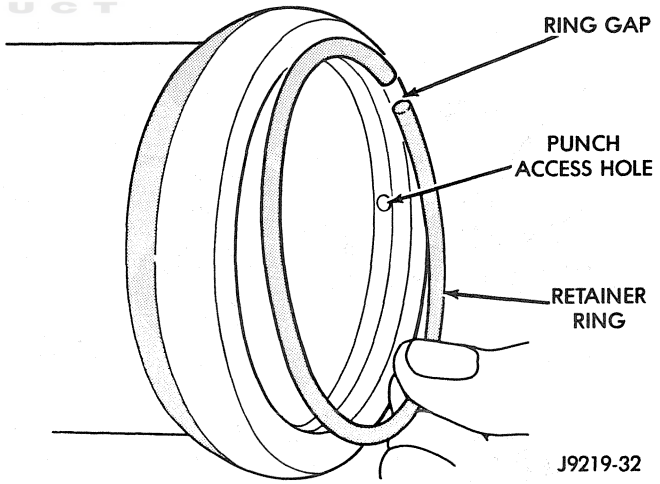


Fig. 6 Installing The Retaining Ring

ADJUSTER PLUG ASSEMBLY

Steering gear must be removed from the vehicle for this procedure.

REMOVAL

(1) Remove adjuster plug lock nut from housing.

(2) Remove adjuster plug from housing with Spanner Wrench C-4381 (Fig. 7).

(3) Remove thrust washer bearing retainer from adjuster plug with screwdriver (Fig. 8).

(4) Remove bearing spacer, races and thrust bearing (Fig. 9).

(5) Remove O-ring seal and retaining snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)

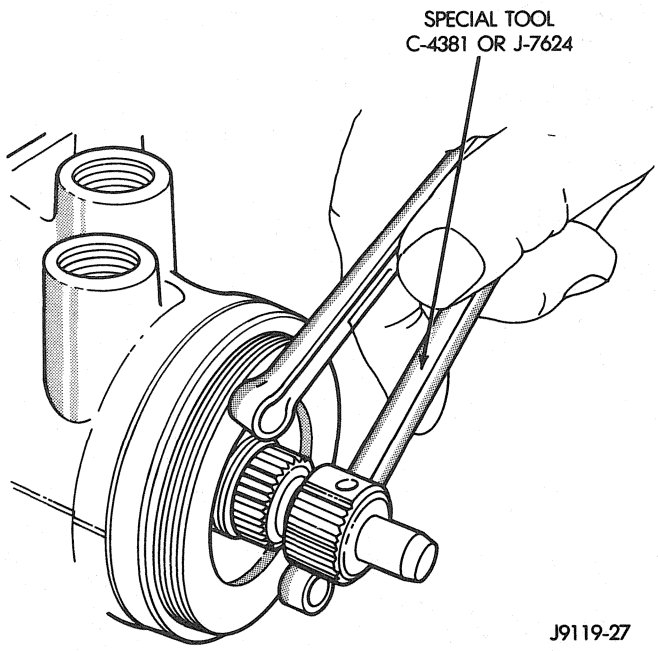


Fig. 7 Adjustment Plug

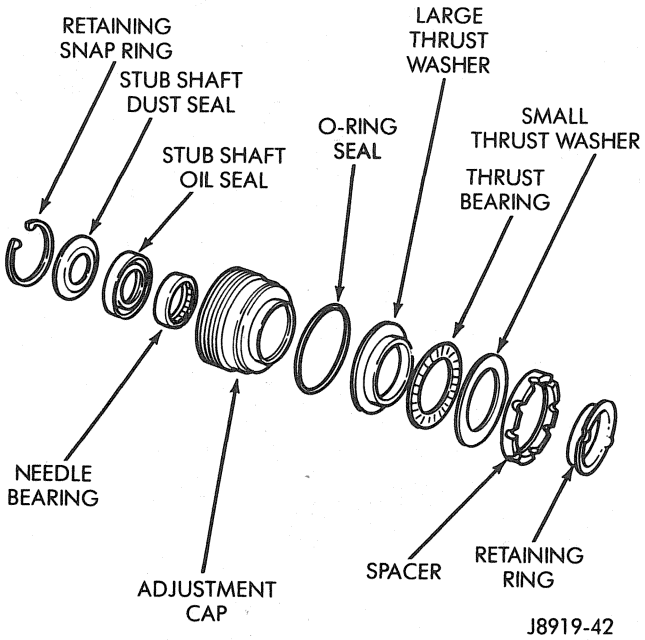


Fig. 9 Adjustment Plug Components

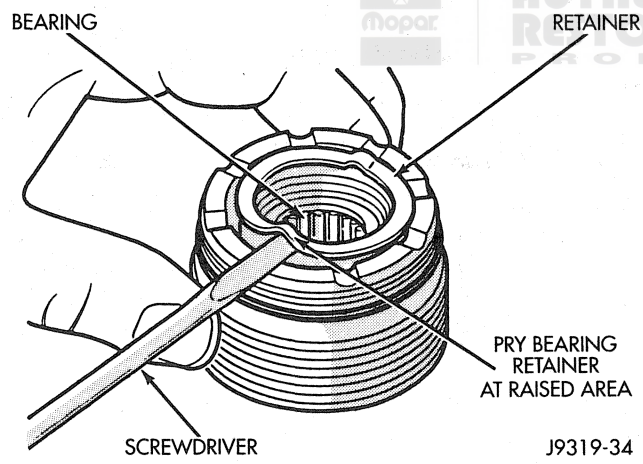


Fig. 8 Bearing Retainer

(6) Remove needle bearing, dust seal and oil seal with remover/installer C-4177 and handle C-4171 (Fig. 10).

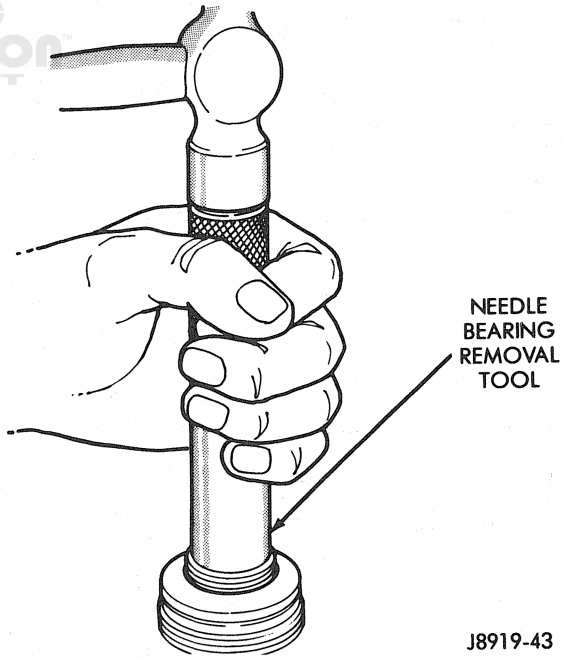


Fig. 10 Needle Bearing Removal

INSTALLATION

CAUTION: Needle bearing must be installed with identification on bearing facing tool to prevent damage to bearing.

(1) Install needle bearing into adjuster plug with remover/install C-4177 and handle C-4171.

(2) Apply white petroleum grease on oil seal. Install oil seal into adjuster plug with remover/installer C-4177 and handle C-4171.

(3) Apply white petroleum grease to dust seal cavity and install dust seal into adjuster plug with remover/installer C-4177 and handle C-4171.

(4) Install retainer snap ring.

(5) Install O-ring seal to adjuster plug.

(6) Install large bearing race, thrust bearing, small bearing race and bearing spacer to adjuster plug.

(7) Install thrust washer bearing retainer to adjuster plug (Fig. 11).

DISASSEMBLY AND ASSEMBLY (Continued)

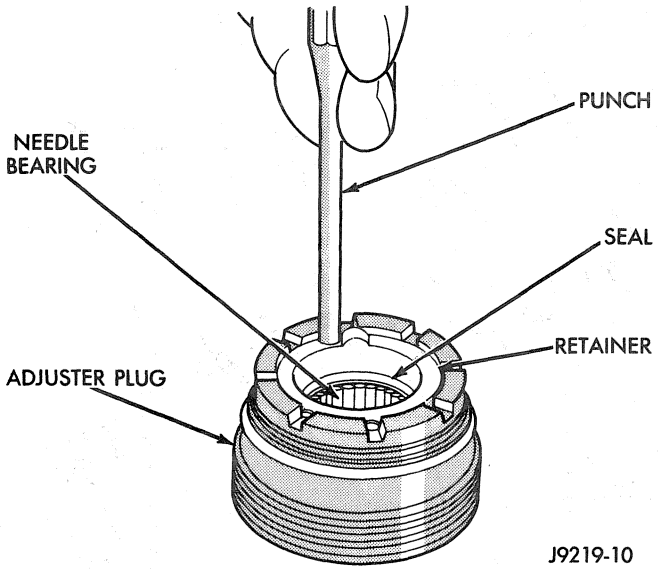


Fig. 11 Install Retainer

CAUTION: When installing adjuster plug, care should be taken not to cut the seals.

(8) Install adjuster plug into housing with Spanner Wrench C-4381.

(9) Adjust bearing preload, refer to Thrust Bearing Preload Adjustment.

(10) Install adjuster plug lock nut, and using a punch (drift) in a notch, tighten securely (Fig. 12). **Hold adjuster plug to maintain alignment of the marks.**

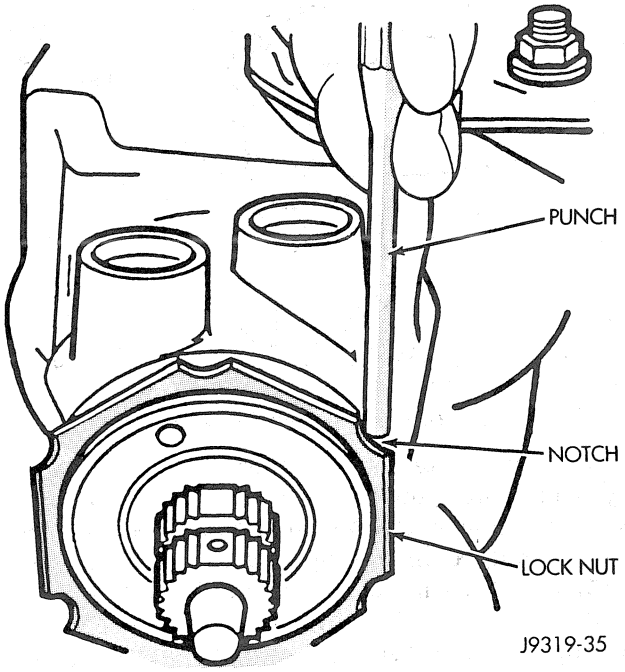


Fig. 12 Tighten Lock Nut

(11) Adjust pitman shaft, refer to Over-Center Adjustment.

SPOOL VALVE

Steering gear must be removed from the vehicle for this procedure.

REMOVAL

(1) Remove adjuster plug, refer to Adjuster Plug Assembly Replacement.

(2) Remove stub shaft and valve assembly (Fig. 13).

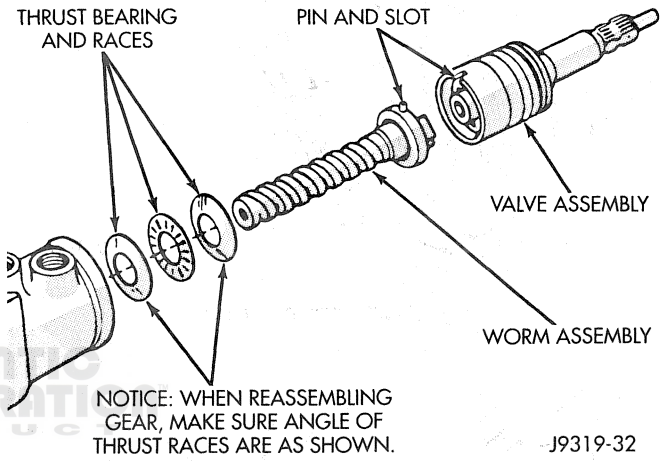


Fig. 13 Bearing, Worm and Valve Assembly

(3) Remove stub shaft from valve assembly by lightly tapping on a block of wood to loosen shaft cap. Then pull cap and valve body and disengage stub shaft pin from hole in valve body (Fig. 14).

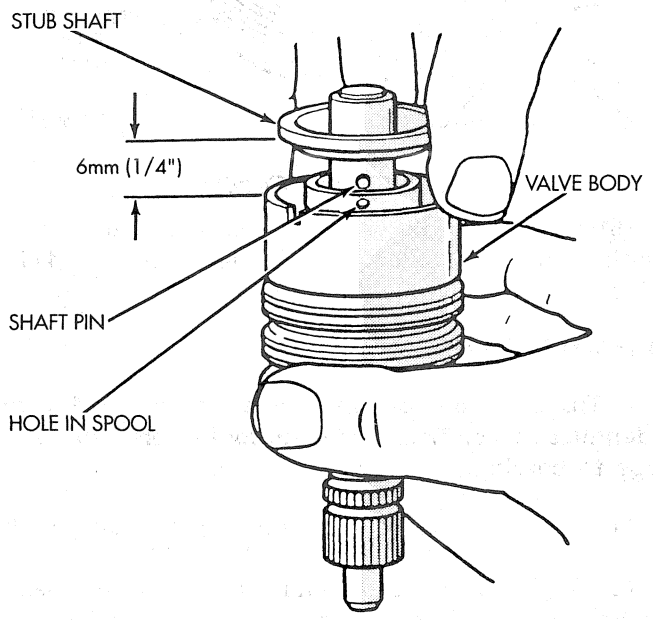


Fig. 14 Stub Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Remove valve spool by pulling and rotating from valve body (Fig. 15).

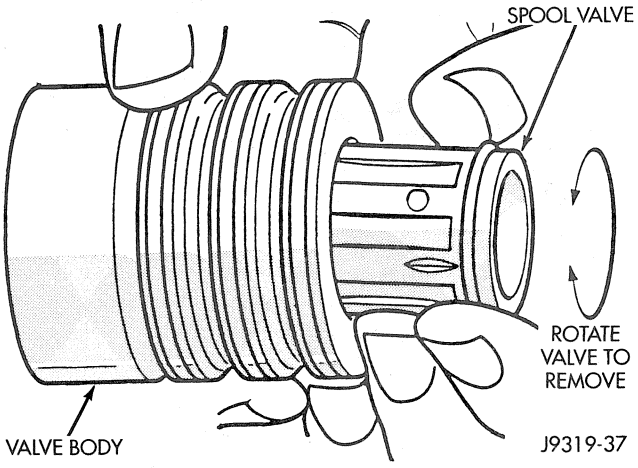


Fig. 15 Spool Valve

(5) Remove valve spool O-ring seal and valve body teflon rings and O-ring seals (Fig. 16).

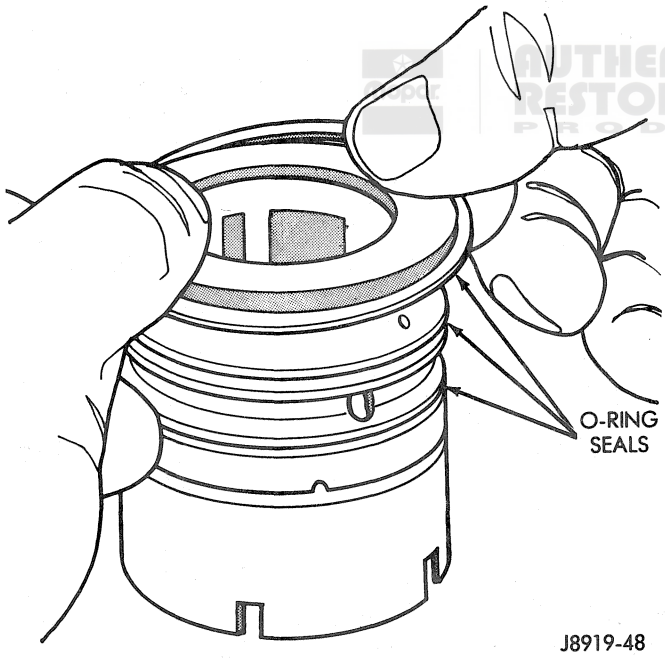


Fig. 16 Valve Seals

INSTALLATION

(1) Install valve spool O-ring seal to valve spool.

(2) Lubricate valve spool and O-ring seal with power steering fluid.

(3) Install valve spool to valve body by pushing and rotating. Hole in valve spool for stub pin must be accessible from opposite end of valve body.

(4) Assemble stub shaft to valve spool, if necessary and insert pin (Fig. 17).

NOTE: Notch in stub shaft cap must fully engage valve body pin and seat against valve body shoulder.

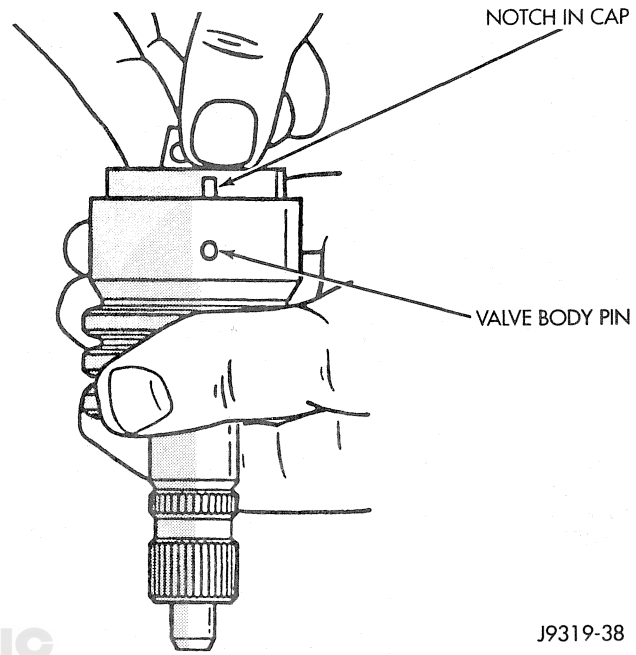


Fig. 17 Stub Shaft Installation

(5) Install O-ring seals and teflon rings to valve body.

(6) Lubricate O-ring seals and teflon rings with power steering fluid.

(7) Install stub shaft and valve assembly to worm shaft. Line up worm shaft to slot in the valve assembly.

(8) Install adjuster plug.

(9) Adjust Thrust Bearing Preload Adjustment and Over-Center Adjustment.

RACK PISTON AND WORM SHAFT

Steering gear must be removed from the vehicle for this procedure.

REMOVAL

(1) Remove pitman shaft and side cover.

(2) Remove housing end plug.

(3) Turn stub shaft COUNTERCLOCKWISE until the rack piston begins to come out of the housing.

(4) Remove rack piston plug (Fig. 18).

(5) Insert Arbor C-4175 into bore of rack piston (Fig. 19). Hold tool tightly against worm shaft while turning the stub shaft COUNTERCLOCKWISE.

(6) The rack piston will be forced onto the tool and hold the rack piston balls in place.

(7) Remove the rack piston, rack balls, and tool together from housing.

(8) Remove valve, worm shaft and thrust bearing and races.

DISASSEMBLY AND ASSEMBLY (Continued)

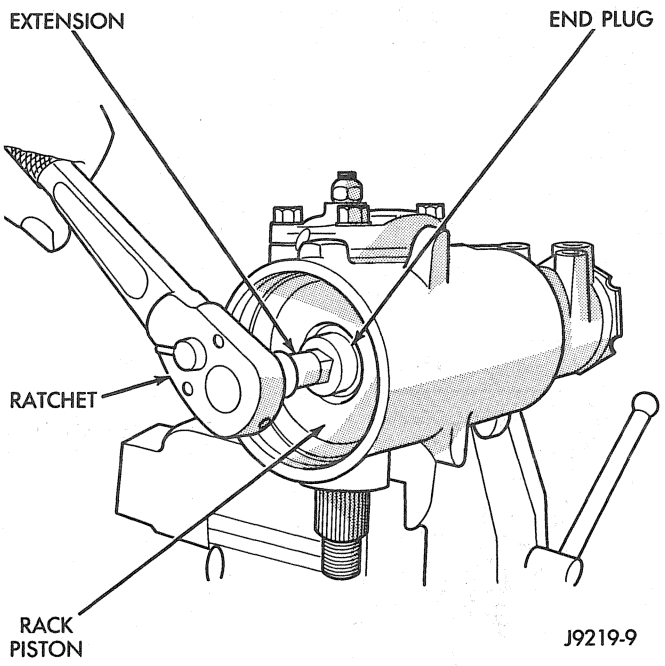


Fig. 18 Rack Piston End Plug

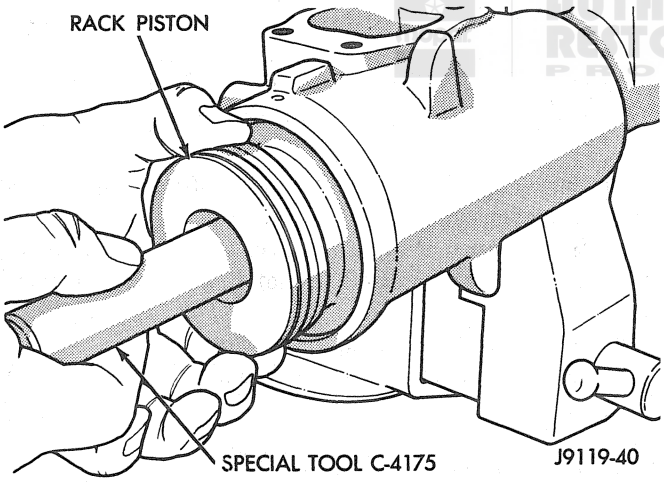


Fig. 19 Rack Piston

(9) Remove tool from rack piston.
(10) Remove rack piston balls.
(11) Remove screws, clamp and ball guide.
(12) Remove teflon ring and O-ring seal (Fig. 20).

INSTALLATION

(1) Clean all components in solvent and dry with compressed air.
(2) Check for scores, nicks or burrs on the rack piston finished surface. Slight wear is normal on the worm gear surfaces.
(3) Install O-ring seal and teflon ring and lubricate with power steering fluid.
(4) Install worm shaft to rack piston outside of housing. Fully seat worm shaft to rack piston. Align

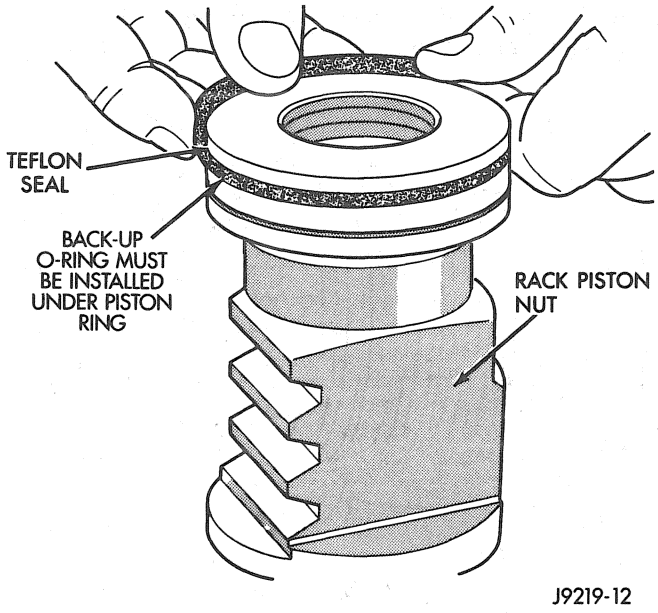


Fig. 20 Rack Piston Teflon Ring and O-Ring

worm shaft spiral groove with rack piston ball guide hole (Fig. 21).

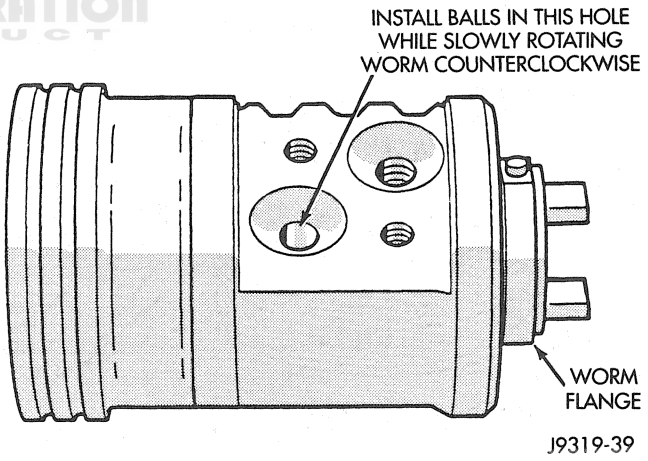


Fig. 21 Installing Balls in Rack Piston

NOTE: There are 12 black and 12 silver (Chrome) balls in the rack piston circuit. The black balls are smaller than the silver balls. The balls must be installed alternately into the rack piston and ball guide. This procedure will maintain worm shaft preload.

(5) Lubricate and install rack piston balls through return guide hole while turning worm shaft COUNTERCLOCKWISE.

WARNING: MAKE SURE ALL RACK PISTON BALLS ARE INSTALLED PROPERLY. IMPROPER INSTALLATION MAY RESULT IN PERSONAL INJURY.

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install remaining balls to guide using grease or petroleum jelly at each end to hold in place (Fig. 22).

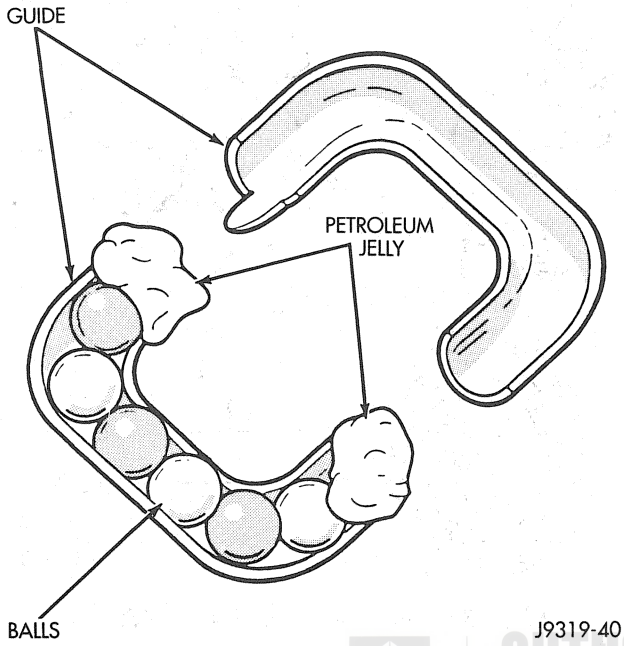


Fig. 22 Balls in the Return Guide

(7) Install guide onto rack piston and return with clamp and screws. Tighten screws to 58 N·m (43 ft. lbs.).

(8) Insert Arbor C-4175 into bore of rack piston. Hold tool tightly against worm shaft while turning the stub shaft COUNTERCLOCKWISE.

(9) The rack piston will be forced onto the tool and hold the rack piston balls in place.

(10) Install the races and thrust bearing to worm shaft (Fig. 23).

(11) Install worm shaft to housing.

(12) Install valve

(13) Install rack piston to worm shaft from tool, compress seals.

(14) Hold Arbor tightly against worm shaft and turn stub shaft CLOCKWISE until rack piston is seated on worm shaft.

(15) Install rack piston plug and tighten to 150 N·m (111 ft. lbs.).

(16) Install housing end plug.

(17) Install pitman shaft and side cover.

(18) Adjust steering gear.

PITMAN SHAFT SEALS AND BEARING

REMOVAL

(1) Remove pitman arm from gear.

(2) Clean exposed end of pitman shaft and housing with a wire brush.

(3) Remove single lip dust seal.

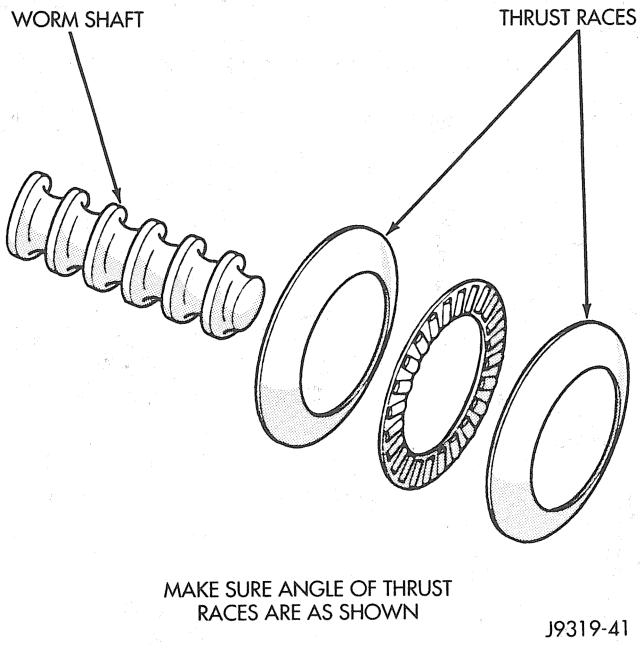


Fig. 23 Worm Shaft and Bearing

(4) Remove retaining ring with snap ring pliers (Fig. 24).

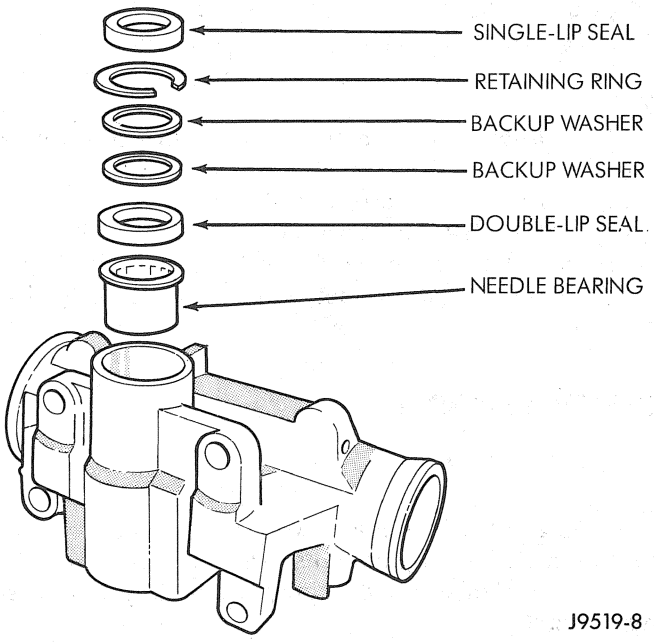


Fig. 24 Pitman Shaft Seals & Bearing

(5) Remove backup washers with screwdriver.

CAUTION: Use care not to score the housing bore when prying out seals and washers.

(6) Remove double lip oil seal with screwdriver.

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Inspect the housing for burrs and remove if necessary.

(8) Remove needle bearing from housing (Fig. 25).

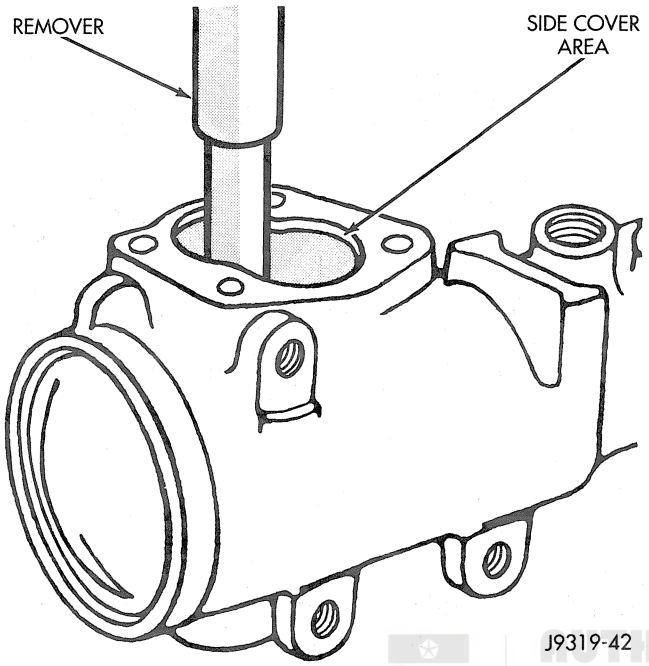


Fig. 25 Needle Bearing Removal

INSTALLATION

(1) Install needle bearing into housing (Fig. 24).

(2) Coat the double lip seal and washers with grease.

(3) Install the double lip oil seal with a suitable size deep socket.

(4) Install nylon backup washer.

(5) Install steel backup washer.

(6) Install the retainer ring with snap ring pliers.

(7) Install single lip dust seal with a suitable size deep socket.

ADJUSTMENTS

STEERING GEAR

CAUTION: Steering gear must be adjusted in the proper order. If adjustments are not performed in order, gear damage and improper steering response may result.

NOTE: Adjusting the steering gear in the vehicle is not recommended. Remove gear from the vehicle and drain the fluid. Then mount gear in a vise to perform adjustments.

WORM THRUST BEARING PRELOAD

(1) Remove adjuster plug locknut (Fig. 26).

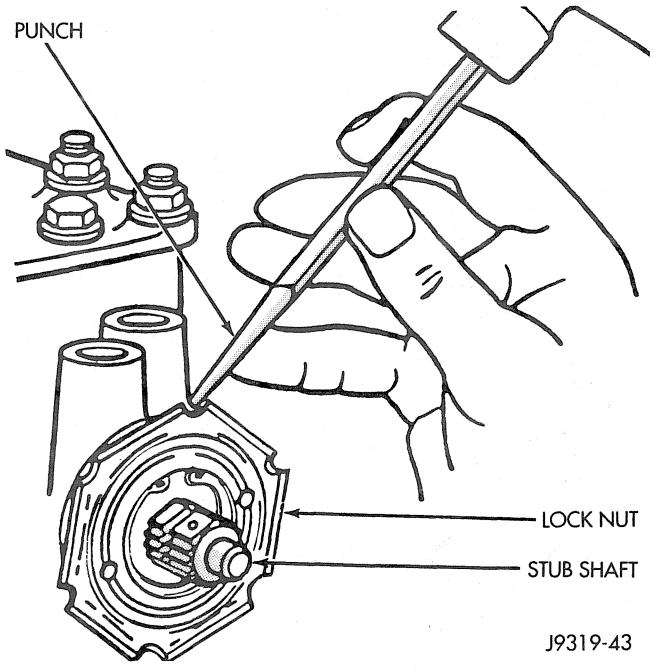


Fig. 26 Loosening the Adjuster Plug

(2) Turn the adjuster in with Spanner Wrench C-4381. Tighten the plug and thrust bearing in the housing until firmly bottomed in housing.

(3) Place an index mark on the housing even with one of the holes in adjuster plug (Fig. 27).

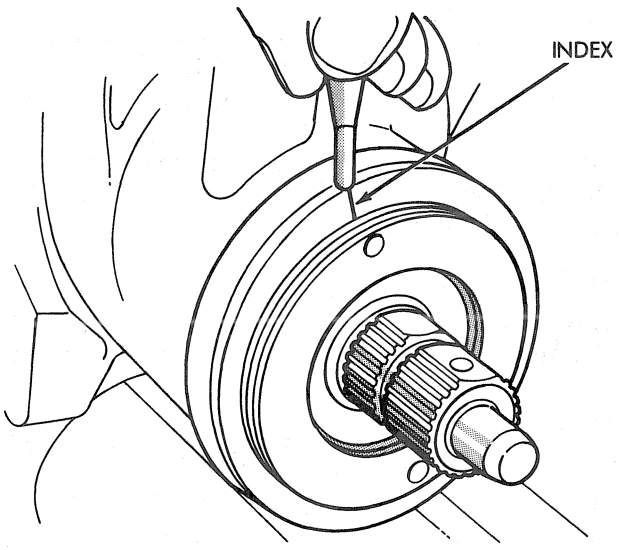


Fig. 27 Alignment Marking On Housing

(4) Measure back (counterclockwise) 13 mm (0.50 in) and mark housing (Fig. 28).

(5) Rotate adjustment cap back (counterclockwise) with spanner wrench until hole is aligned with the second mark (Fig. 29).

ADJUSTMENTS (Continued)

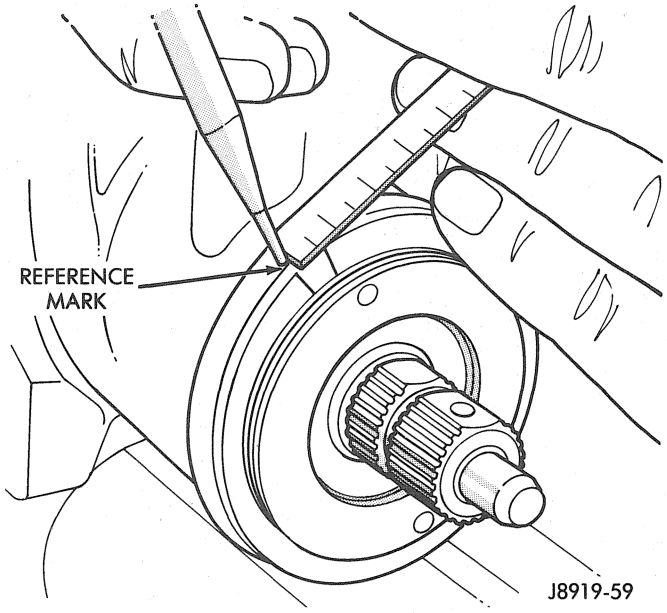


Fig. 28 Remarking The Housing

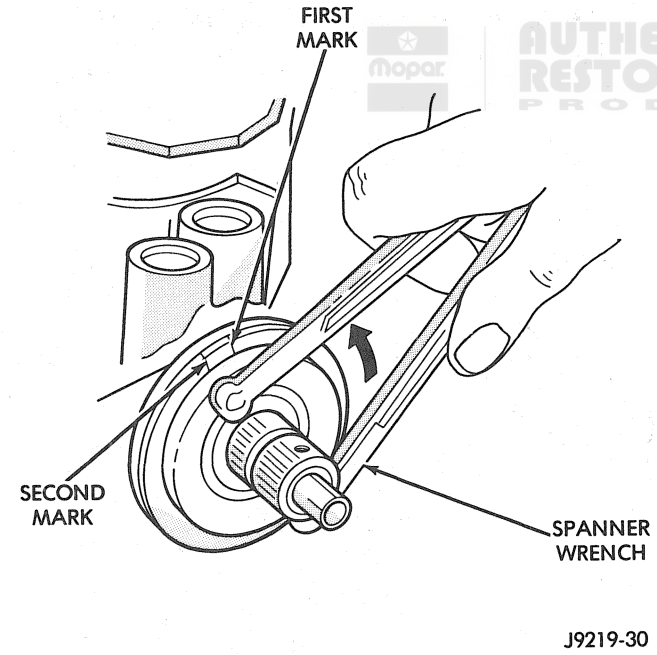


Fig. 29 Aligning To The Second Mark

(6) Install and tighten locknut to 108 N·m (80 ft. lbs.). Be sure adjustment cap does not turn while tightening the locknut.

OVER-CENTER

(1) Rotate the stub shaft from stop to stop and count the number of turns.

(2) Starting at either stop turn the stub shaft back 1/2 the total number of turns. This is the center of the gear travel (Fig. 30).

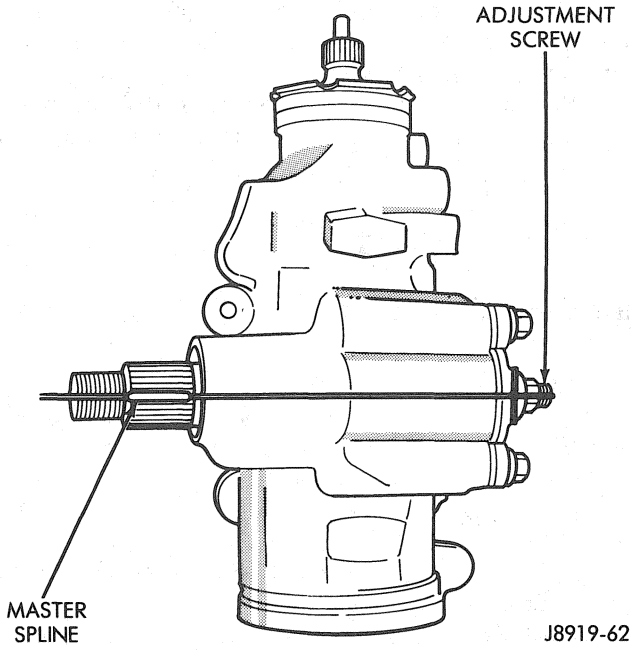


Fig. 30 Steering Gear Centered

(3) Turn the pitman shaft adjuster screw back (COUNTERCLOCKWISE) until extended, then turn back in (CLOCKWISE) one full turn.

(4) Place the torque wrench in the vertical position on the stub shaft. Rotate the wrench 45 degrees each side of the center and record the highest rotational torque on center (Fig. 31).

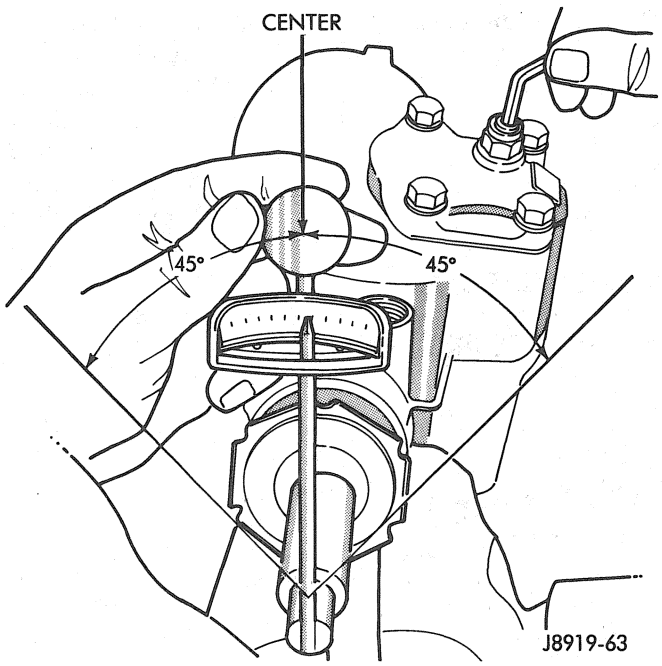


Fig. 31 Checking Over-center Rotation Torque

ADJUSTMENTS (Continued)

(5) Turn the adjuster in until torque to turn stub shaft is 0.6 to 1.2 N·m (6.0 to 10.0 in. lbs.) more than previous reading recorded.

(6) Prevent the adjuster screw from turning while tightening adjuster lock nut. Tighten the adjuster lock nut to 27 N·m (20 ft. lbs.).

SPECIFICATIONS

POWER STEERING GEAR

Steering Gear
- Type . . . . . .Recirculating Ball

Gear Ratio
- RHD 14:1
- LHD 17.5:1

Worm Shaft Bearing
- Preload. . . . . .0.45–1.13 N·m (4–10 in. lbs.)

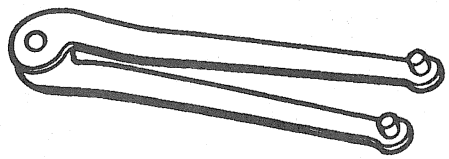
Pitman Shaft Overcenter Drag
- New Gear (under 400 miles). . . . . .0.45–0.90 N·m (4–8 in. lbs.) + Worm Shaft Preload
- Used Gear (over 400 miles) . . . . . .0.5–0.6 N·m (4–5 in. lbs.) + Worm Shaft Preload

TORQUE CHART

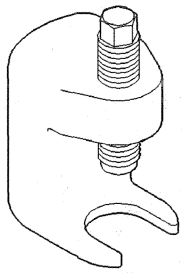
DESCRIPTION	TORQUE
Adjustment Cap Locknut	108 N·m (80 ft. lbs.)
Adjustment Screw Locknut	49 N·m (36 ft. lbs.)
Gear to Frame Bolts	95 N·m (70 ft. lbs.)
Pitman Shaft Nut	251 N·m (185 ft. lbs.)
Rack Piston Plug	102 N·m (75 ft. lbs.)
Side Cover Bolts	60 N·m (44 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)
Return Line	28 N·m (21 ft. lbs.)
Return Guide Clamp Bolt	58 N·m (43 ft. lbs.)

SPECIAL TOOLS

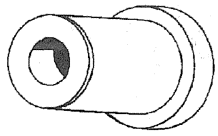
POWER STEERING GEAR



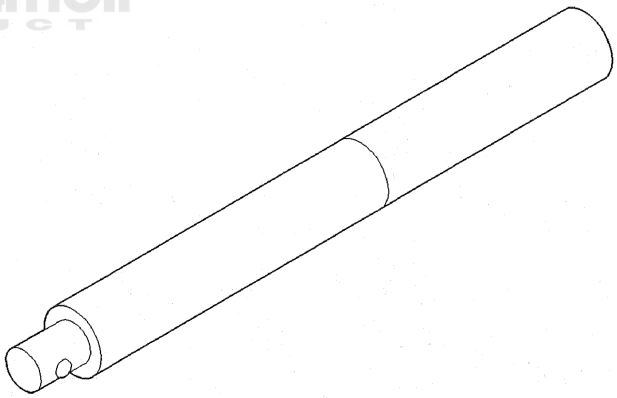
Remover/Installer, Steering Plug C-4381



Remover, Pitman Arm C-4150A



Remover, Pitman Shaft Bearing C-4177



Handle C-4171



Remover/Installer Steering Rack Piston C-4175

STEERING COLUMN

INDEX

	page		page
GENERAL INFORMATION		REMOVAL AND INSTALLATION	
STEERING COLUMN	23	STEERING COLUMN	24
DIAGNOSIS AND TESTING		SPECIFICATIONS	
IGNITION SWITCH	24	TORQUE CHART	26

GENERAL INFORMATION

STEERING COLUMN

The tilt and standard column (Fig. 1) has been designed to be serviced as an assembly; less wiring, switches, shrouds, steering wheel, etc. Most steering column components can be serviced without removing the steering column from the vehicle.

SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

To service the steering wheel, switches or airbag, refer to Group 8 M and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISARM THE AIRBAG FIRING MECHANISM. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.

WARNING: THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

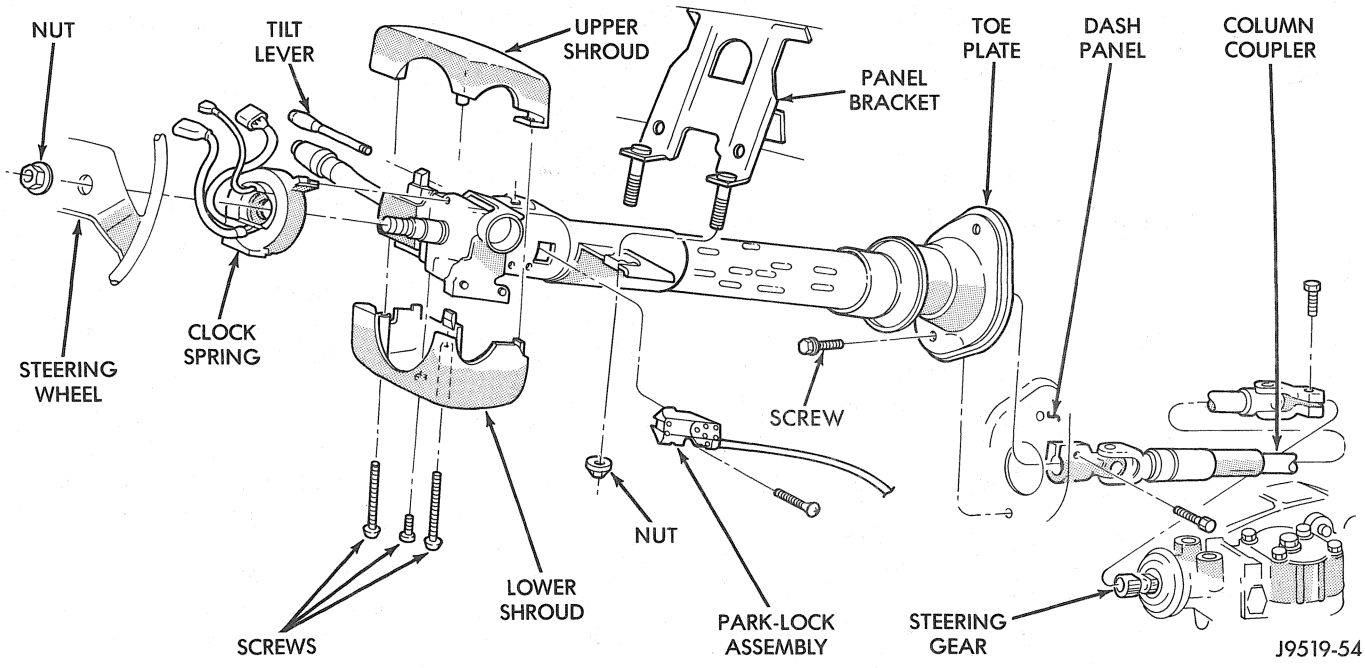


Fig. 1 Steering Column

GENERAL INFORMATION (Continued)

CAUTION: Do not attempt to remove the pivot pins to disassemble the tilting mechanism. Do not remove ignition locking link, shaft lock plate or plate retainer. This will damage the column (Fig. 2) and (Fig. 3).

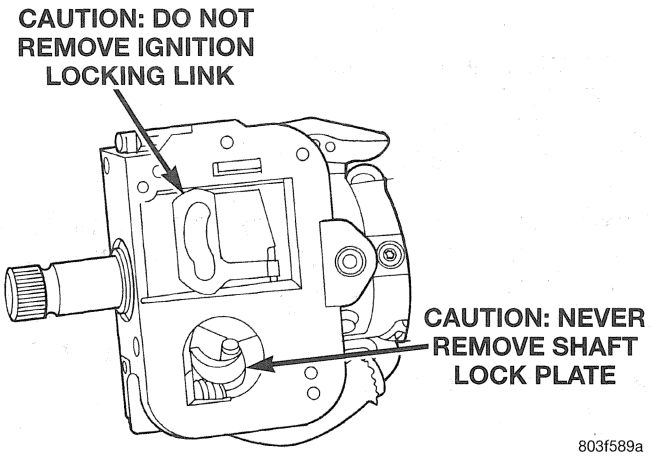


Fig. 2 Observe Cautions

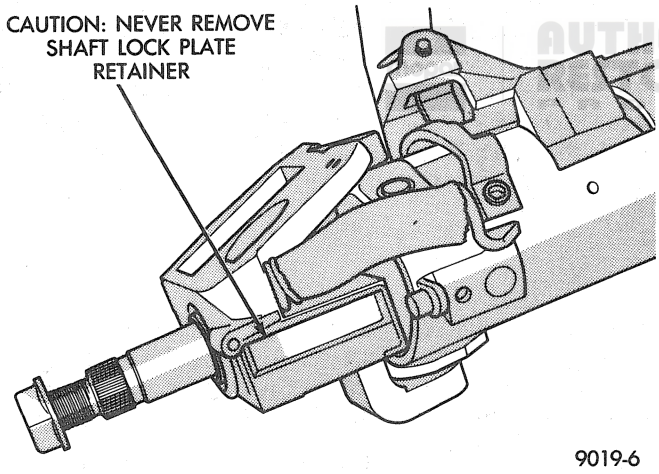


Fig. 3 Observe Cautions

DIAGNOSIS AND TESTING

IGNITION SWITCH

TEST AND REPAIR

If the ignition switch effort is excessive, remove the ignition switch from the steering column. Refer to Group 8D Ignition System. Using a key cylinder, check the turning effort of the switch. If the ignition switch binds look for the following conditions.

(1) Look for rough areas or flash in the casting and if found remove with a file (Fig. 4).

(2) Remove the link and slider and check the link to see if it is bent. If so replace with a new part.

(3) Put the slider in its slot in the sleeve and verify a loose fit over the length of the slot. If the slider

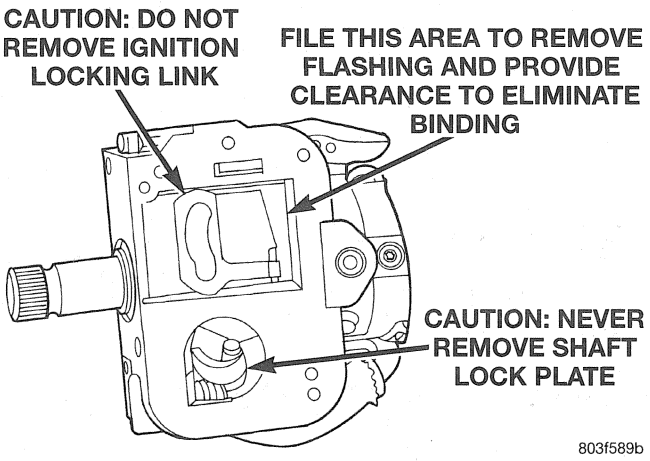


Fig. 4 Steering Column Flash Removal And Non-Serviceable Components

binds in the slot at any point lightly file the slider until clearance is achieved.

(4) If no binding is found, lightly file the ramp on the ignition switch, (The ramp fits into the casting) until binding no longer occurs.

REMOVAL AND INSTALLATION

STEERING COLUMN

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED, REFER TO GROUP 8M RESTRAINT SYSTEMS FOR SERVICE PROCEDURES. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Make sure the front wheels are in the **straight ahead** position.

(2) Remove the negative (ground) cable from the battery.

(3) Disarm and remove airbag, refer to group 8M Restraint Systems for service procedures.

(4) Remove steering wheel.

(5) Remove lower instrument panel/knee blocker.

(6) Remove column coupler upper pinch bolt (Fig. 5).

(7) Remove relay box.

(8) Remove tilt lever (if equipped) from column.

(9) Remove upper and lower steering column shrouds (Fig. 6).

(10) Remove lower fixed column shroud.

(11) Remove column braces (Fig. 7).

(12) Remove column bracket mounting nuts and lower column.

(13) Remove upper fixed column shroud.

REMOVAL AND INSTALLATION (Continued)

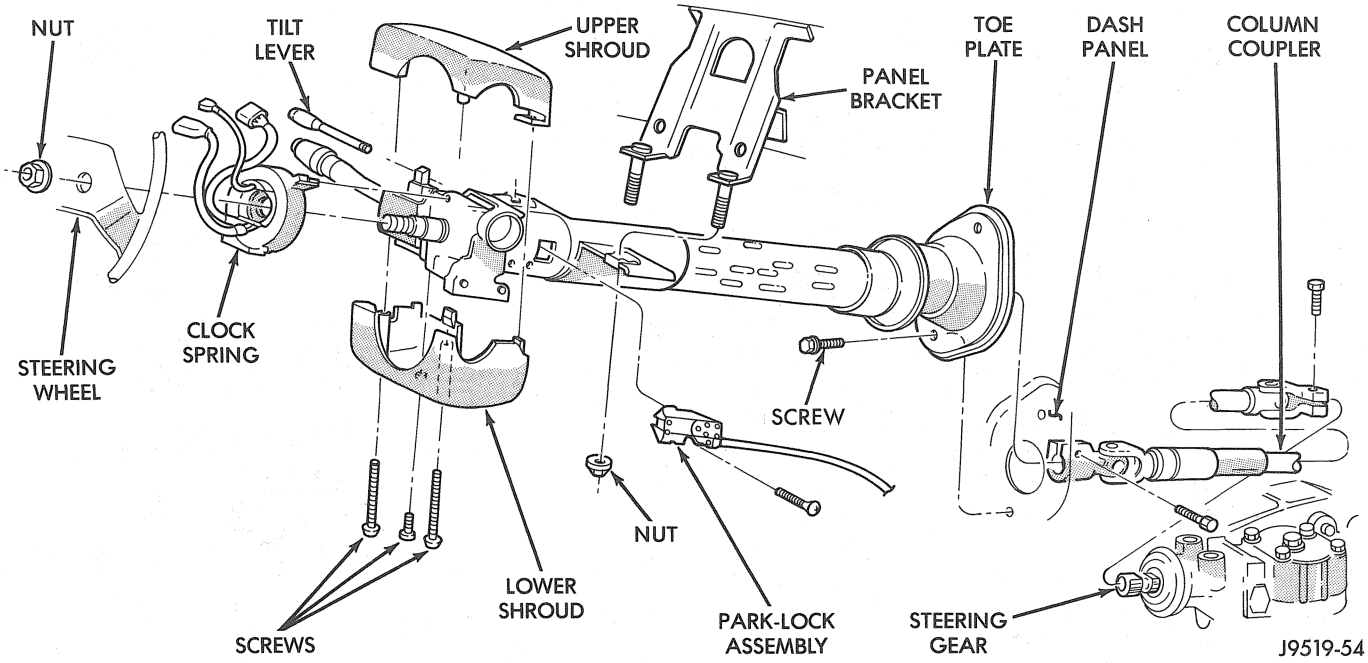


Fig. 5 Steering Column

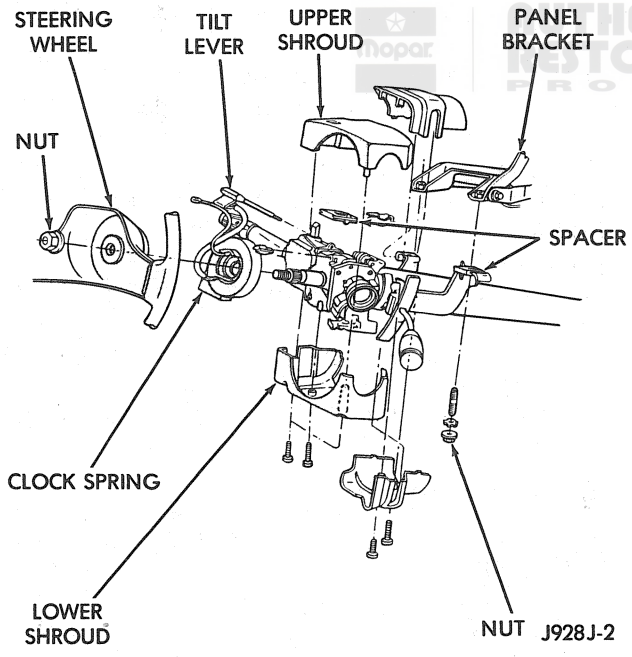


Fig. 6 Column Shrouds

(14) Remove multi-function switch tamper proof mounting screws and connector screw. Connector screw will stay in the connector.

(15) Unplug wiring harness from the column switches (Fig. 8).

(16) Remove the wiring harness from steering column.

(17) Remove interlock cable from the steering column, refer to Group 21 Automatic Transmission Shifter/Ignition Interlock.

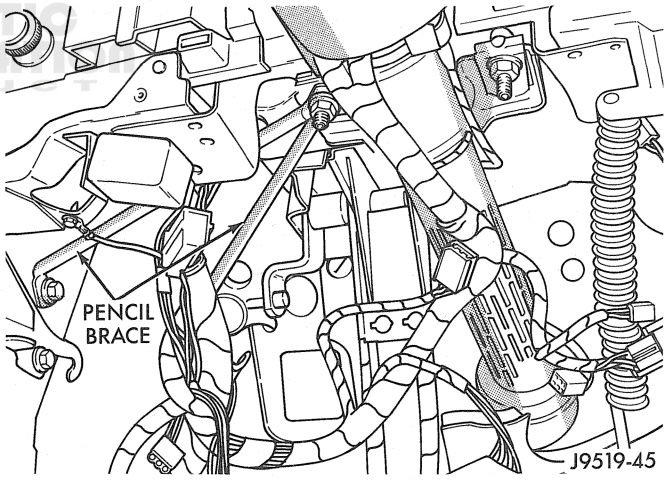


Fig. 7 Steering Column Braces

(18) Remove the column.

INSTALLATION

(1) Align and install the column to the coupler. **Do not apply force at the top of the steering column shaft.**

(2) Ensure the ground clip is on the left spacer slot (Fig. 9).

(3) Install interlock cable from the steering column, refer to Group 21 Automatic Transmission Shifter/Ignition Interlock.

(4) Install wiring harness connections to steering column.**Ensure the wiring is not pinched and all connections are correctly locked in place.**

REMOVAL AND INSTALLATION (Continued)

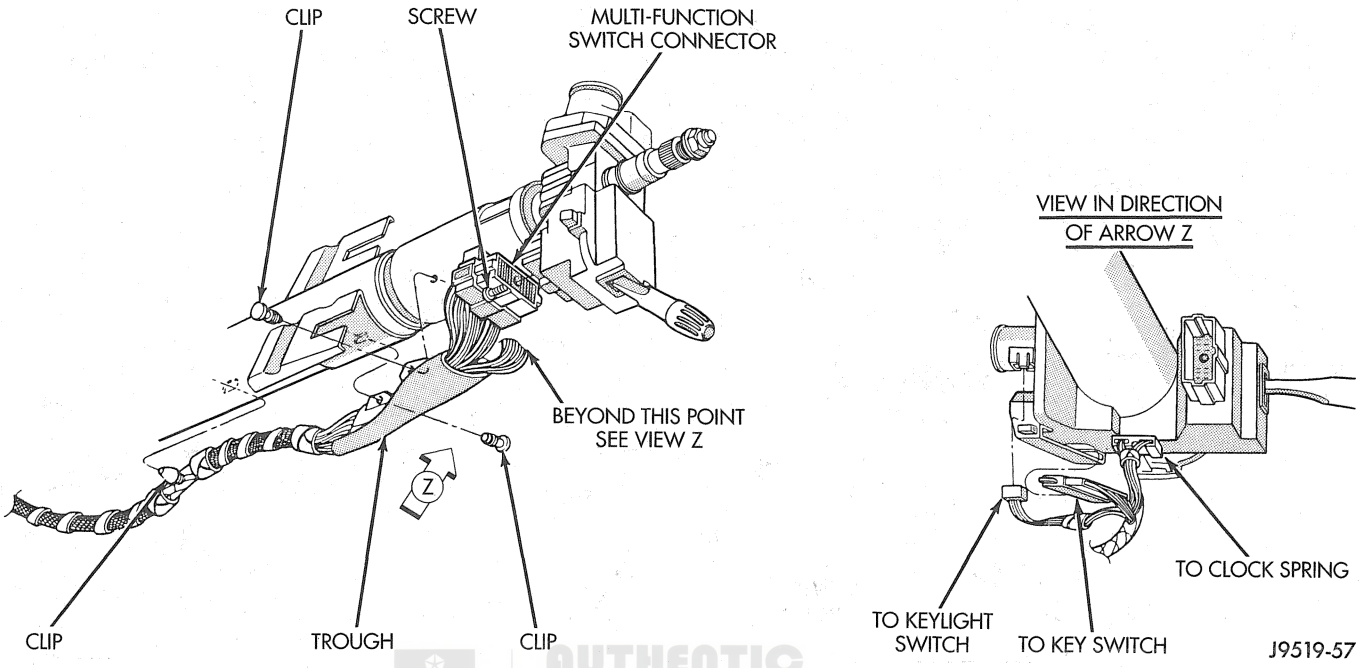


Fig. 8 Steering Column Wiring Harness

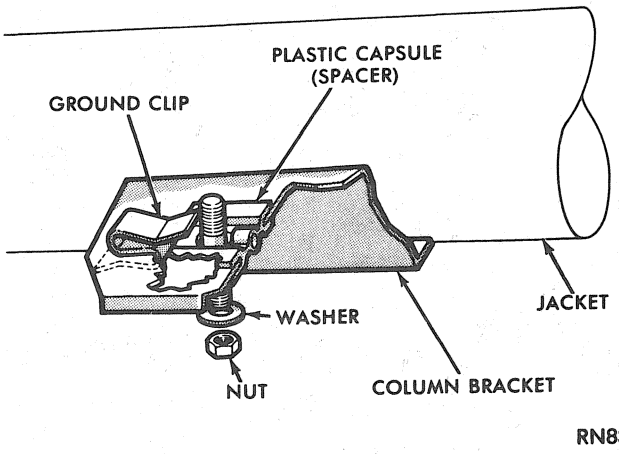


Fig. 9 Ground Clip & Spacer

(5) Install wiring harness connector onto multi function switch. Tighten function switch wiring harness connector retaining bolt to 2 N·m (17 in. lbs.).

(6) Plug in wiring harness connector to remaining switches.

(7) Install upper fixed column shroud cover.

(8) Install shaft coupler pinch bolt loose, load column up to panel bracket.

(9) Be sure both spacers are fully seated in the column support bracket. Tighten the column panel bracket support nuts to 12 N·m (105 in. lbs.).

(10) Tighten the coupler pinch bolt to 47 N·m (35 ft. lbs.).

(11) Install lower fixed shroud.

(12) Install upper and lower shrouds. Install the tilt lever (if equipped).

(13) Install rely box.

(14) Install lower instrument panel/knee blocker.

(15) Install clockspring.

(16) Install steering wheel.

(17) Remove the column shaft shipping lock pin (installed in service column).

(18) Install and arm airbag, refer to Group 8M Restraint Systems for service procedures.

(19) Connect the battery ground (negative) cable.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Steering Column	
Steering Wheel Nut	61 N·m (45 ft. lbs.)
Column Bracket Nuts	12 N·m (105 in. lbs.)
Shaft Coupler Bolts	41 N·m (35ft. lbs.)
Toe Plate Bolts	23 N·m (200 in. lbs.)

STEERING LINKAGE

INDEX

	page
GENERAL INFORMATION	
STEERING LINKAGE	27
SERVICE PROCEDURES	
STEERING LINKAGE	27
REMOVAL AND INSTALLATION	
DRAG LINK	29
PITMAN ARM	28
STEERING DAMPER	29
TIE ROD	27
SPECIFICATIONS	
TORQUE CHART	29
SPECIAL TOOLS	
STEERING LINKAGE	30

GENERAL INFORMATION

STEERING LINKAGE

The steering linkage consist of a pitman arm, drag link, tie rod, tie rod ends and a steering damper (Fig. 1) and (Fig. 2). The service procedures and torque specifications are the same for LHD and RHD vehicles.

SERVICE PROCEDURES

STEERING LINKAGE

Before removing any steering component, the boot seals should be closely inspected for damage. If a seal is damaged, it should be replaced. Before installing a new seal, inspect ball stud. Replace ball stud if worn and lubricate the ball studs with MOPAR Multi-Mileage Lubricant, or an equivalent.

REMOVAL AND INSTALLATION

TIE ROD

NOTE: Use a Puller tool C-3894-A for tie rod removal. Failure to use this tool could damage the ball stud and seal (Fig. 3).

REMOVAL

(1) Remove the cotter pins and nuts at the tie rod ball studs and drag link.

(2) Loosen the ball studs with a puller tool to remove the tie rod.

(3) Loosen clamp bolts and unthread the tie rod end from the tube.

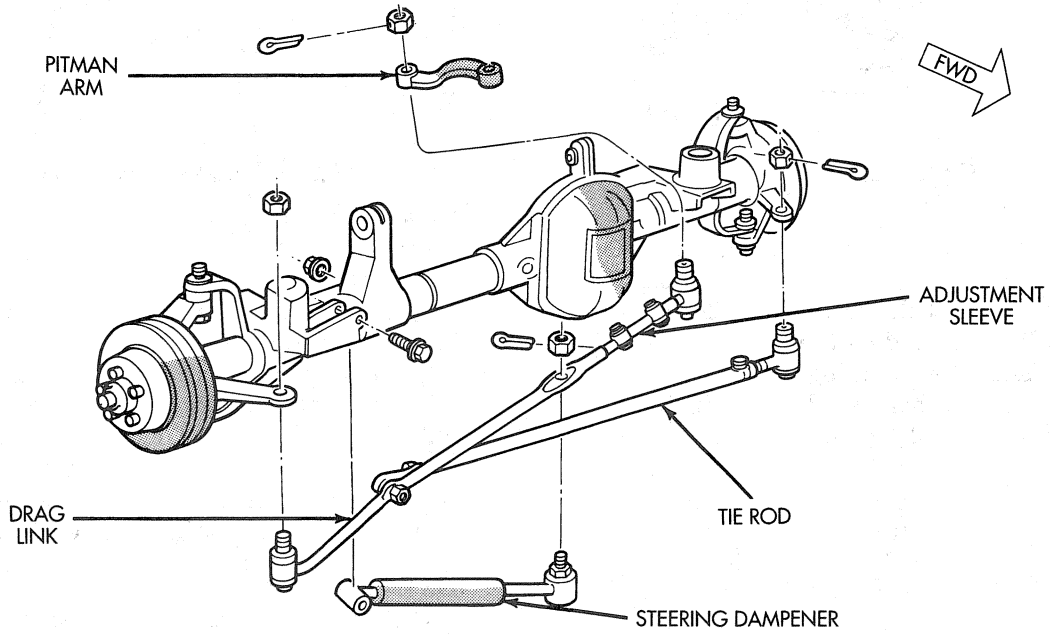


Fig. 1 Steering Linkage—LHD

REMOVAL AND INSTALLATION (Continued)

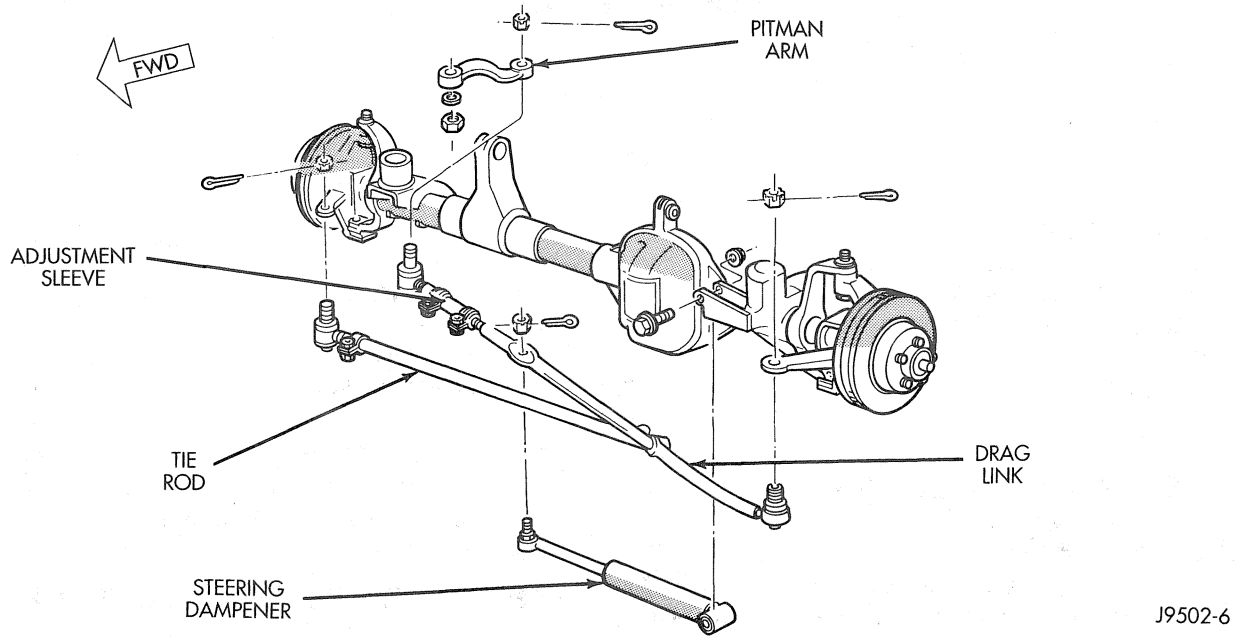


Fig. 2 Steering Linkage—RHD

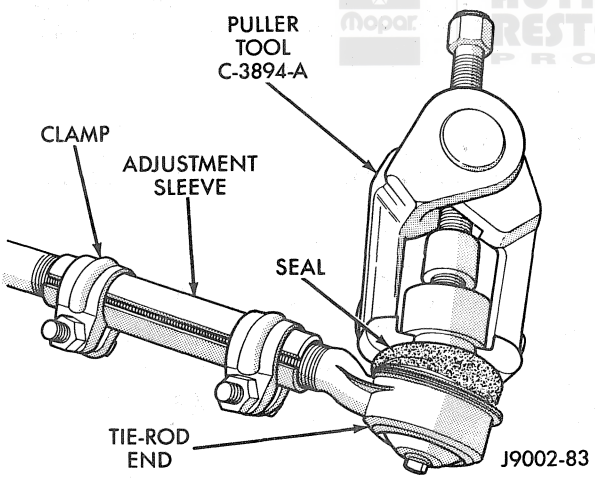


Fig. 3 Ball Stud Puller

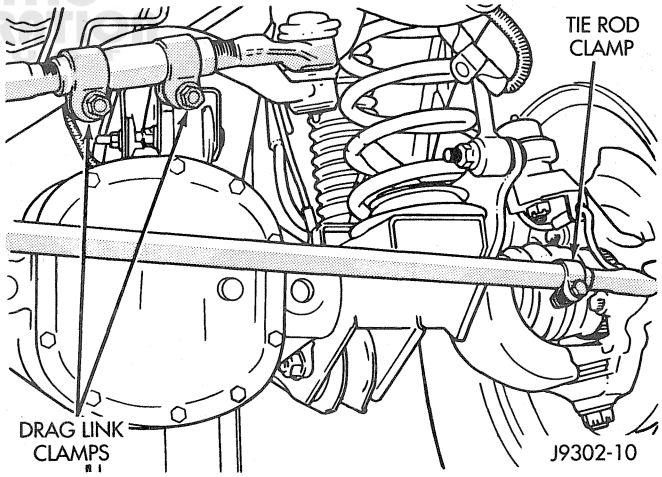


Fig. 4 Tie Rod/Drag Link Clamps

INSTALLATION

(1) Thread the tie rod end into the tube and position the clamp to it's original position (Fig. 4). Tighten the clamp bolts to 27 N·m (20 ft. lbs.).

(2) Install the tie rod on the drag link and steering knuckle. Install the retaining nuts.

(3) Tighten the ball stud nut on the steering knuckle to 47 N·m (35 ft. lbs.). Tighten the ball stud nut to drag link to 88 N·m (65 ft. lbs.). Install new cotter pins.

PITMAN ARM

REMOVAL

(1) Remove the cotter pin and nut from the drag link at the pitman arm.

(2) Remove the drag link ball stud from the pitman arm with a puller.

(3) Remove the nut and washer from the steering gear shaft. Mark the pitman shaft and pitman arm for installation reference. Remove the pitman arm from steering gear with Puller C-4150-A (Fig. 5).

INSTALLATION

(1) Align and install the pitman arm on steering gear shaft.

REMOVAL AND INSTALLATION (Continued)

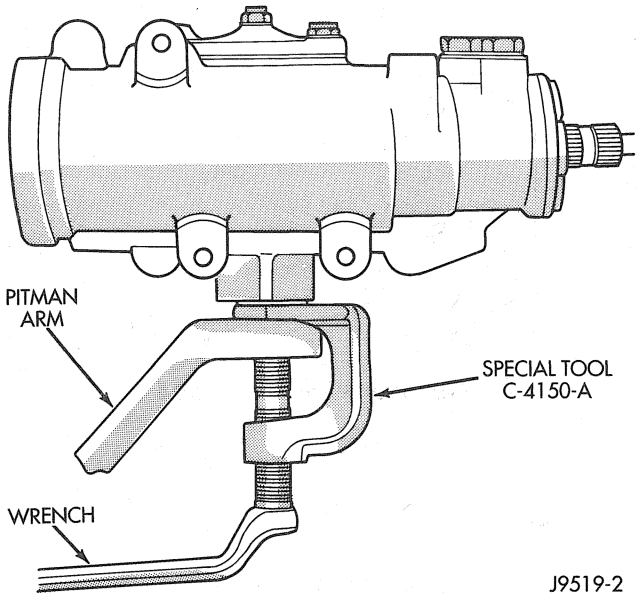


Fig. 5 Pitman Arm Puller

(2) Install the washer and nut on the shaft and tighten nut to 251 N·m (185 ft. lbs.).

(3) Install drag link ball stud to pitman arm install nut and tighten to 74 N·m (55 ft. lbs.). Install a new cotter pin.

DRAG LINK

REMOVAL

(1) Remove cotter pins and nuts from drag link

(2) Remove the steering damper ball stud from the drag link.

(3) Remove tie rod from drag link

(4) Remove drag link from the steering knuckle and pitman arm.

INSTALLATION

(1) Install the drag link onto steering knuckle and pitman arm.

(2) Install nut at steering knuckle and tighten to 47 N·m (35 ft. lbs.). Install new cotter pins.

(3) Install nut at pitman arm and tighten to 75 N·m (55 ft. lbs.). Install new cotter pins.

(4) Install tie rod onto drag link and install nut. Tighten nut to 75 N·m (55 ft. lbs.) and install new cotter pins.

(5) Install steering damper onto drag link and install nut. Tighten nut to 75 N·m (55 ft. lbs.) and install a new cotter pin.

STEERING DAMPER

REMOVAL

(1) Remove the steering damper retaining bolt from the axle bracket.

(2) Remove the cotter pin and nut from the ball stud at the drag link.

(3) Remove the steering damper ball stud from the drag link with a puller.

INSTALLATION

(1) Install steering damper onto the axle bracket and drag link.

(2) Install steering damper bolt in axle bracket and tighten nut to 75 N·m (55 ft. lbs.).

(3) Install ball stud nut at the drag link and tighten nut to 75 N·m (55 ft. lbs.). Install a new cotter pin.

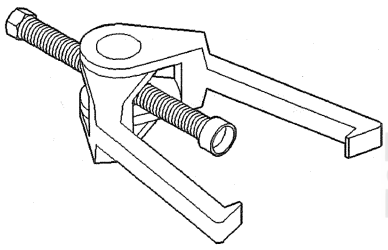
SPECIFICATIONS

TORQUE CHART

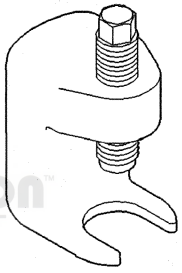
DESCRIPTION	TORQUE
Pitman Arm	
Shaft	251 N·m (185 ft. lbs.)
Drag Link	
Ball Studs	74 N·m (55 ft. lbs.)
Clamp	49 N·m (36 ft. lbs.)
Tie Rod Ends	
Ball Studs	74 N·m (55 ft. lbs.)
Clamp	27 N·m (20 ft. lbs.)
Tie Rod	
Ball Stud	88 N·m (65 ft. lbs.)
Steering Damper	
Frame	74 N·m (55 ft. lbs.)
Drag Link	74 N·m (55 ft. lbs.)

SPECIAL TOOLS

STEERING LINKAGE



Puller C-3894–A



Remover Pitman C-4150A

Mopar AUTHENTIC RESTORATION PRODUCT

TRANSMISSION AND TRANSFER CASE

CONTENTS

	page		page
AUTOMATIC TRANSMISSION—30RH	72	AX4/5 MANUAL TRANSMISSION	1
AUTOMATIC TRANSMISSION—AW4	169	NV231 TRANSFER CASE	289
AX15 MANUAL TRANSMISSION	36	NV242 TRANSFER CASE	312

AX4/5 MANUAL TRANSMISSION

INDEX

	page		page
GENERAL INFORMATION		**DISASSEMBLY AND ASSEMBLY**	
GEAR RATIOS	1	ADAPTER HOUSING AND FRONT BEARING RETAINER	6
GENERAL INFORMATION	1	MAINSHAFT	20
RECOMMENDED LUBRICANT	1	SHIFT MECHANISM	10
SHIFT PATTERN	1	**CLEANING AND INSPECTION**	
TRAMSMISSION IDENTIFICATION	1	AX 4/5 MANUAL TRANSMISSION COMPONENTS	33
TRANSMISSION ASSEMBLY INFORMATION	2	**SPECIFICATIONS**	
DIAGNOSIS AND TESTING		AX4/5 MANUAL TRANSMISSION TORQUE	35
HARD SHIFTING	4	**SPECIAL TOOLS**	
LOW LUBRICANT LEVEL	3	AX4/5	35
TRANSMISSION NOISE	4		
REMOVAL AND INSTALLATION			
TRANSMISSION	4		

GENERAL INFORMATION

GENERAL INFORMATION

The AX 4 is a four speed manual transmission. The AX 5 is a five speed manual transmission. Fifth gear in the AX 5 is an overdrive range. The shift mechanism in both models is integral and mounted in the shift tower portion of the adapter housing (Fig. 1). The AX 4/5 is used for 2.5L engine applications.

TRAMSMISSION IDENTIFICATION

The AX 4/5 identification code is on the bottom surface of the transmission case near the fill plug (Fig. 2). The first number is year of manufacture. The second and third numbers indicate month of manufacture. The next series of numbers is the transmission serial number.

GEAR RATIOS

Gear ratios for the AX 4 and AX 5 are as follows:

- First gear: 3.93:1
- Second gear: 2.33:1
- Third gear: 1.45:1
- Fourth gear: 1.00:1
- Fifth gear (AX 5): 0.85:1
- Reverse gear: 4.74:1

SHIFT PATTERN

The AX 4/5 first through fourth gear shift pattern is in a conventional H configuration. On the AX 5, fifth gear is up and to the right and reverse gear is down and to the right (Fig. 3).

RECOMMENDED LUBRICANT

Recommended lubricant for AX 4/5 transmissions is Mopar 75W–90, API Grade GL–5 gear lubricant, or equivalent.

Correct lubricant level is from the bottom edge, to no more than 6 mm (1/4 in.) below the bottom edge of the fill plug hole.

GENERAL INFORMATION (Continued)

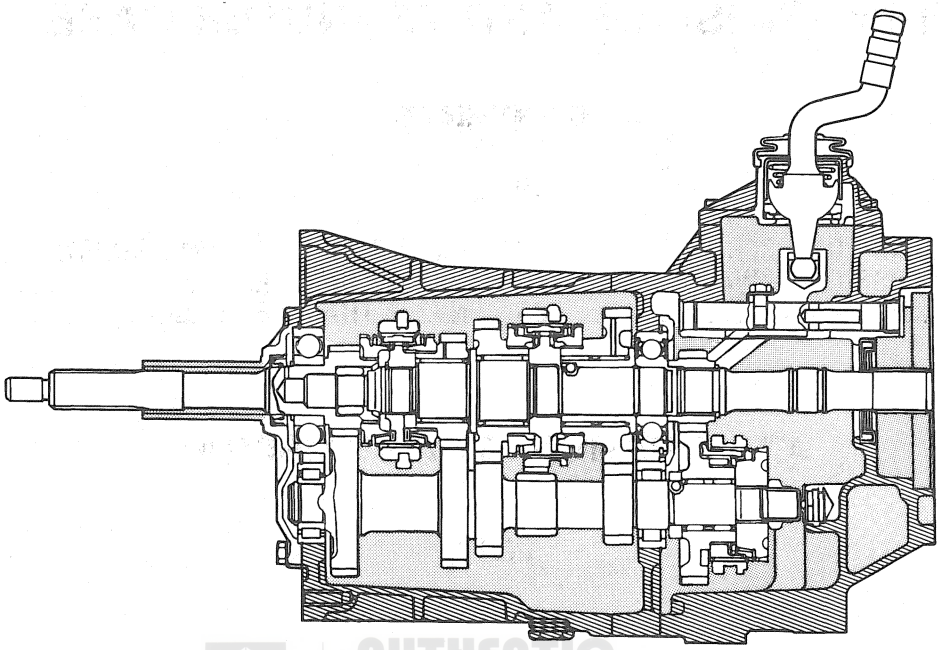


Fig. 1 AX 4/5 Manual Transmission

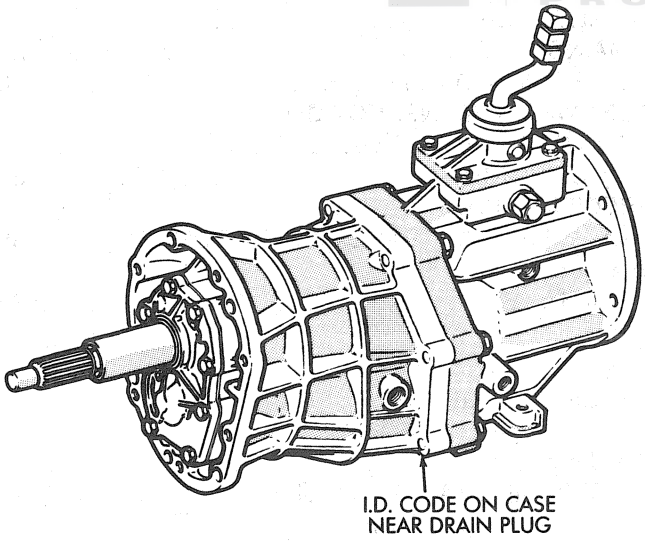


Fig. 2 Transmission Identification

The fill plug is at the passenger side of the adapter housing (Fig. 4). The drain plug is at the bottom of the case.

Approximate dry fill lubricant capacity is 3.3 liters (3.5 qts.).

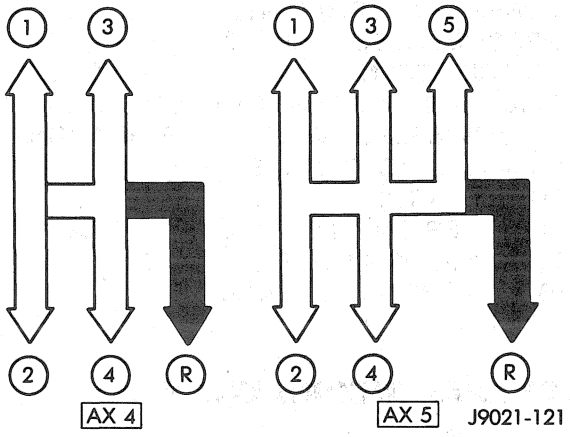


Fig. 3 AX 4/5 Shift Pattern

TRANSMISSION ASSEMBLY INFORMATION

Lubricate the transmission components with Mopar 75W–90, GL 5 gear lubricant during assembly. Use petroleum jelly to lubricate seal lips and/or hold parts in place during installation.

Refer to (Fig. 5) during assembly for AX 4/5 gear differences.

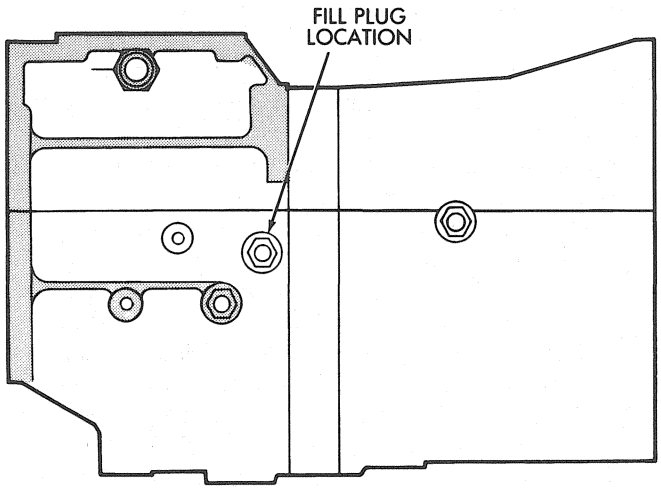


Fig. 4 Fill Plug Location

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adaptor or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non–recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing slip, grab and chatter.

Transmissions filled from air or electrically powered lubricant containers can be under filled. This generally happens when the container delivery mechanism is improperly calibrated. Always check the lubricant level after filling to avoid an under fill condition.

A correct lubricant level check can only be made when the vehicle is level; use a drive–on hoist to ensure this. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an under–or–overfill condition.

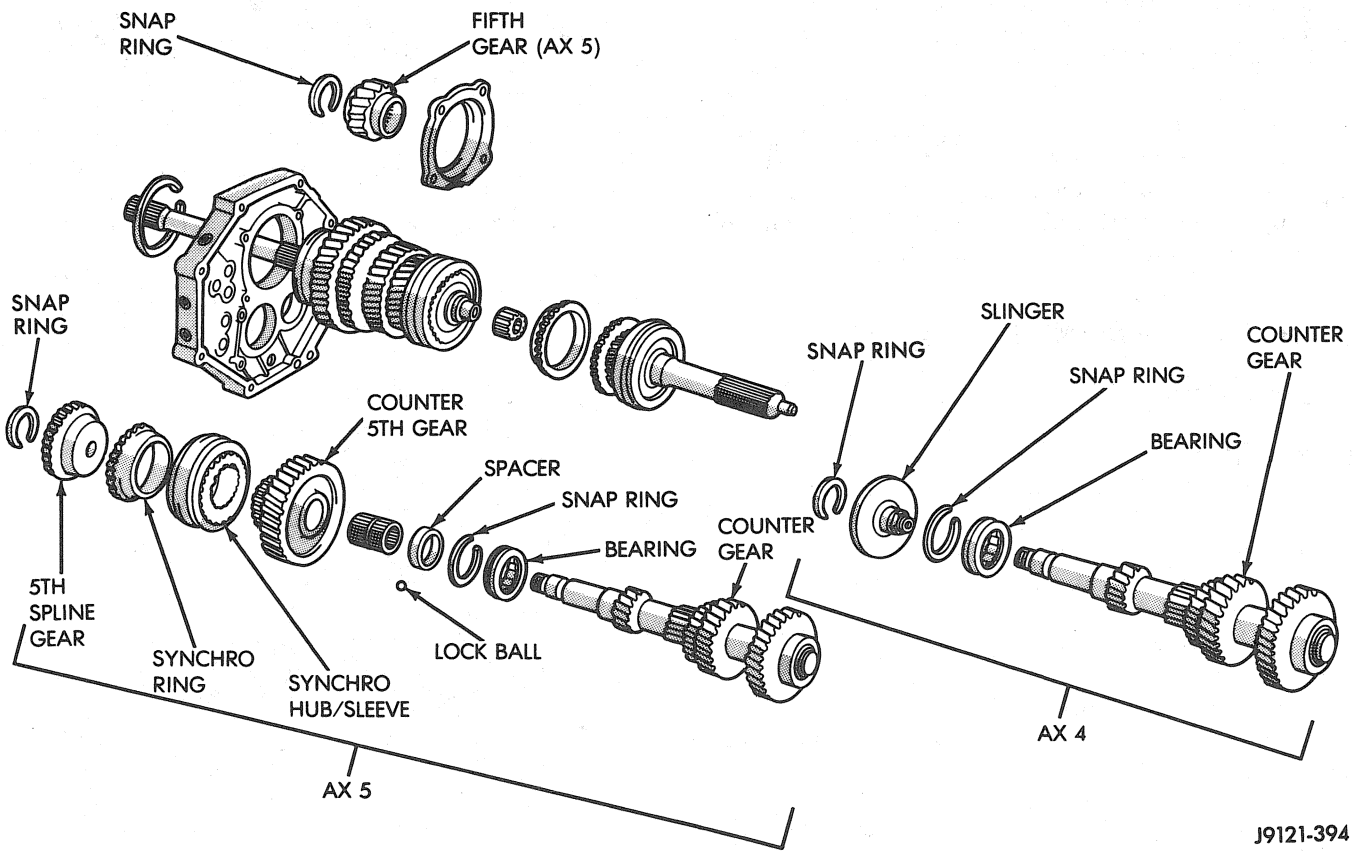


Fig. 5 Counter Gear Components

DIAGNOSIS AND TESTING (Continued)

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants, component damage, incorrect clutch adjustment, or by a damaged clutch pressure plate or disc.

Substantial lubricant leaks can result in gear, shift rail, synchro and bearing damage. If a leak goes undetected for an extended period, the first indications of a problem are usually hard shifting and noise.

Incorrect or contaminated lubricants can also contribute to hard shifting. The consequence of using non–recommended lubricants is noise, excessive wear, internal bind and hard shifting.

Improper clutch release is a frequent cause of hard shifting. Incorrect adjustment or a worn, damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result.

Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear–in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible but only at extreme speeds.

Severe, highly audible transmission noise is generally the result of a lubricant problem. Insufficient, improper, or contaminated lubricant will promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL AND INSTALLATION

TRANSMISSION

REMOVAL

(1) Shift transmission into first or third gear. Then raise vehicle on hoist.

(2) Support engine with adjustable jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(3) Disconnect necessary exhaust system components.

(4) Remove skid plate.

(5) Disconnect rear cushion and bracket from transmission.

(6) Remove rear crossmember.

(7) Disconnect transfer case shift linkage at transfer case.

(8) Disconnect vehicle speed sensor wires and transfer case vent hose.

(9) Remove slave cylinder from clutch housing.

(10) Disconnect transmission shift lever as follows:

(a) Lower transmission–transfer case assembly approximately 7–8 cm (3 in.) for access to shift lever.

(b) Reach up and around transmission case and unseat shift lever dust boot from transmission shift tower (Fig. 6). Move boot upward on shift lever for access to retainer that secures lever in shift tower.

(c) Reach up and around transmission case and press shift lever retainer downward with your fingers. Turn retainer counterclockwise to release it.

(d) Lift lever and retainer out of shift tower (Fig. 6). **Do not remove the shift lever from the floorpan boots. Leave the lever in place for later transmission installation.**

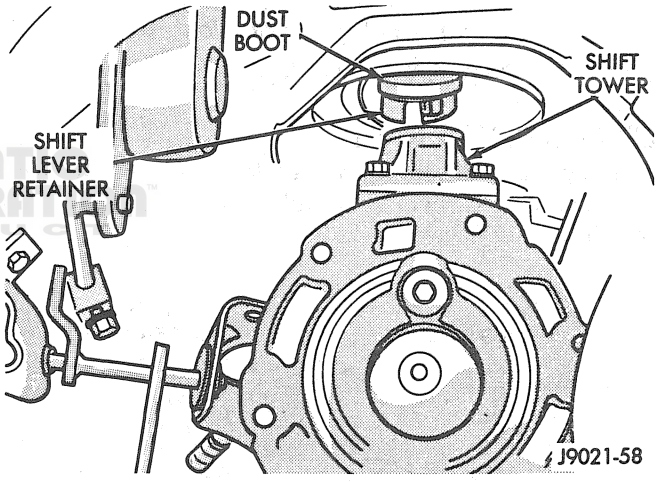


Fig. 6 Removing/Installing Shift Lever

(11) Mark front and rear propeller shafts for installation alignment (Fig. 7). Then remove both shafts.

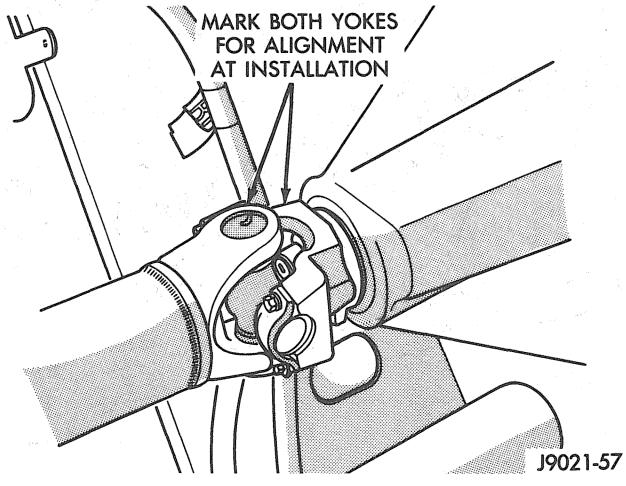


Fig. 7 Marking Propeller Shaft And Axle Yokes

REMOVAL AND INSTALLATION (Continued)

(12) Remove crankshaft position sensor (Fig. 8), (Fig. 9).

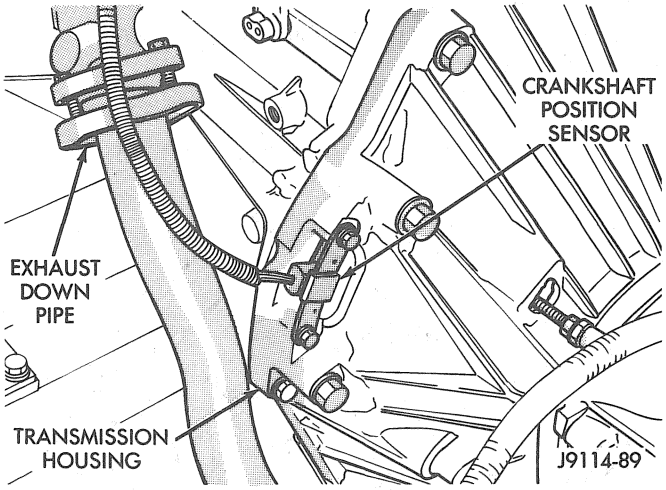


Fig. 8 Crankshaft Position Sensor—2.5L Engine

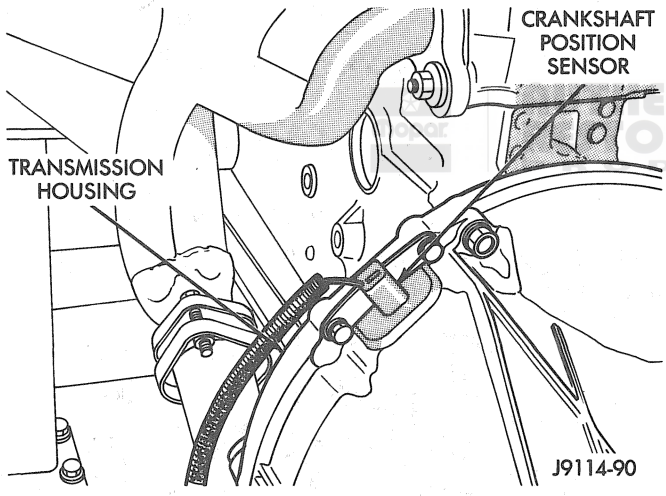


Fig. 9 Crankshaft Position Sensor —4.0L Engine

CAUTION: It is important that the crankshaft position sensor be removed prior to transmission removal. The sensor can easily be damaged if left in place during removal operations.

(13) Unclip wire harnesses from transmission and transfer case.

(14) Remove slave cylinder from clutch housing.

(15) Support transmission with transmission jack.

(16) Remove nuts attaching transfer case to transmission and remove transfer case.

(17) Secure transmission to jack with safety chains.

(18) Remove clutch housing brace rod.

(19) Remove clutch housing–to–engine bolts.

(20) Pull transmission jack rearward until input shaft clears clutch. Then slide transmission out from under vehicle.

(21) Remove clutch release bearing, release fork and retainer clip.

(22) Remove clutch housing from transmission.

TRANSMISSION INSTALLATION

(1) Install clutch housing on transmission. Tighten housing bolts to 37 N·m (27 ft. lbs.) torque.

(2) Lubricate contact surfaces of release fork pivot ball stud and release fork with high temp grease. Then install release bearing, fork and retainer clip.

(3) Mount transmission on transmission jack.

(4) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar high temp grease.

(5) Align transmission input shaft, release bearing, and clutch disc splines. Then slide transmission into place.

(6) Install and tighten clutch housing–to–engine bolts to 38 N·m (28 ft. lbs.) torque. **Be sure the housing is properly seated on engine block before tightening bolts.**

(7) Lower transmission approximately 7–8 cm (3 in.) for access to shift tower. Be sure transmission is in first or third gear.

(8) Reach up and around transmission and insert shift lever in shift tower. Press lever retainer downward and turn it clockwise to lock it in place. Then install lever dust boot on shift tower.

(9) Install slave cylinder in clutch housing.

(10) Align and install transfer case on and transmission. Tighten transfer case–to–transmission nuts to 35 N·m (26 ft. lbs.) torque.

(11) Connect transfer case vent hose and shift linkage. Check and adjust linkage if necessary.

(12) Connect transfer case vent hose.

(13) Secure wire harnesses in clips/tie straps on transmission and transfer case.

(14) Connect backup light switch wires.

(15) Connect vehicle speed sensor wires.

(16) Install and connect crankshaft position sensor.

(17) Install rear crossmember. Tighten crossmember–to–frame bolts to 41 N·m (31 ft. lbs.) torque. Then tighten transmission–to–rear support bolts/nuts to 45 N·m (33 ft. lbs.) torque.

(18) Remove jack stand.

(19) Align and install front/rear propeller shafts. Tighten shaft U–joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(20) Install skid plate, if equipped. Tighten bolts to 42 N·m (31 ft. lbs.) torque. Tighten stud nuts to 17 N·m (150 in. lbs.) torque.

(21) Top off transmission and transfer case lubricant levels.

(22) Lower vehicle.

DISASSEMBLY AND ASSEMBLY

ADAPTER HOUSING AND FRONT BEARING RETAINER

REMOVAL

(1) Drain transmission lubricant.
(2) Remove release bearing and lever.
(3) Remove clutch housing bolts and remove housing.
(4) On rear wheel drive models, remove vehicle speed sensor, speedometer adapter and speedometer driven gear. Then remove extension housing seal (Fig. 10).

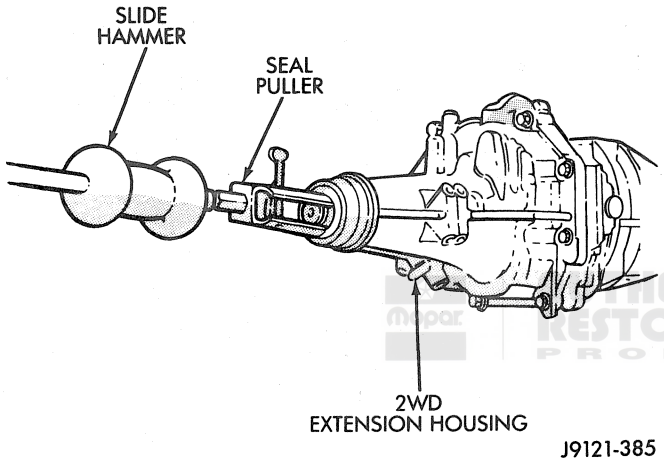


Fig. 10 Removing Rear Wheel Drive Extension Housing Seal

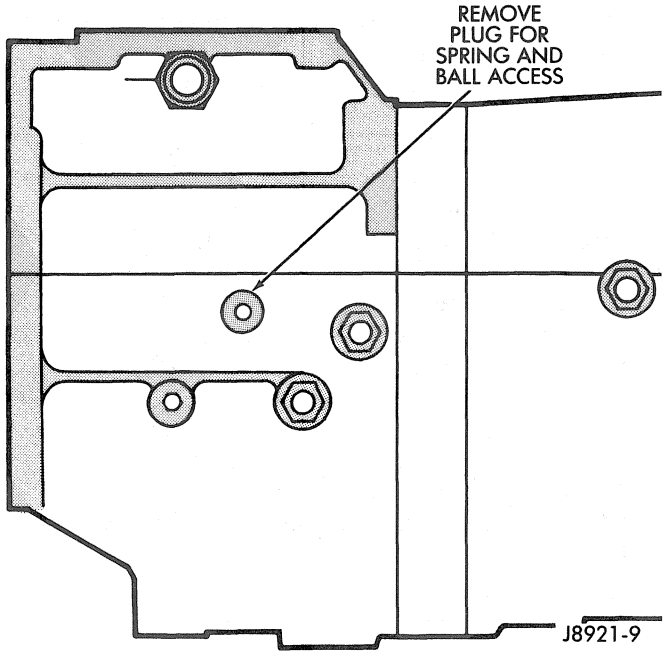


Fig. 11 Detent Ball Plug Location

(5) Remove detent spring and ball. Remove detent plug (Fig. 11) and remove detent spring and ball with pencil magnet.
(6) Remove shift arm set bolt (Fig. 12) and remove bolt and lockplate.

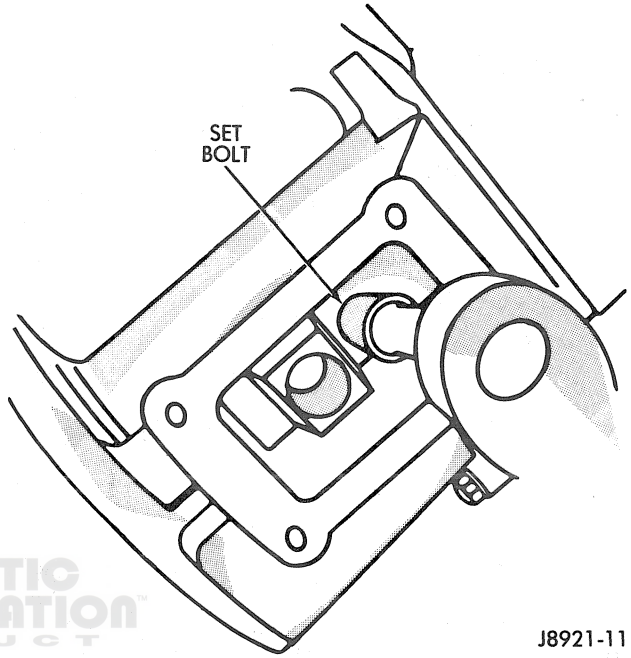


Fig. 12 Set Bolt Removal

(7) Remove shift lever shaft plug (Fig. 13). Then pull shaft out with large magnet.

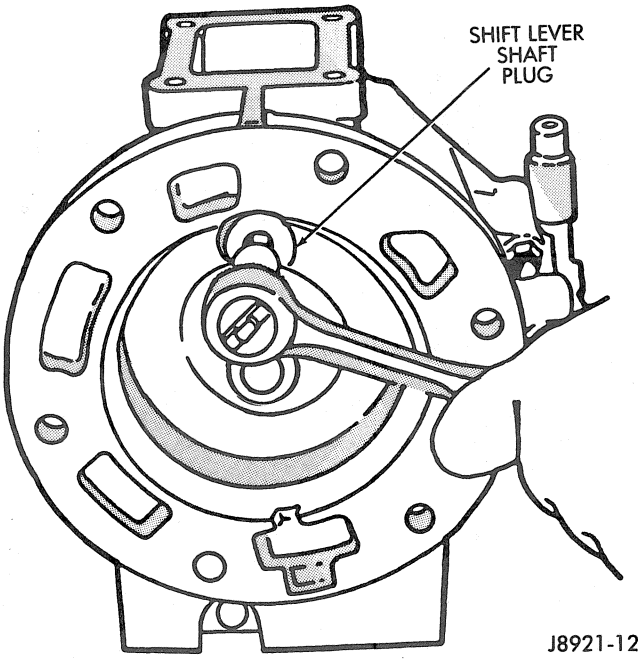


Fig. 13 Removing Shift Lever Shaft Plug

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Remove adapter housing bolts.
(9) Remove adapter housing by tapping it loose with plastic mallet.
(10) Remove front bearing snap rings (Fig. 14).

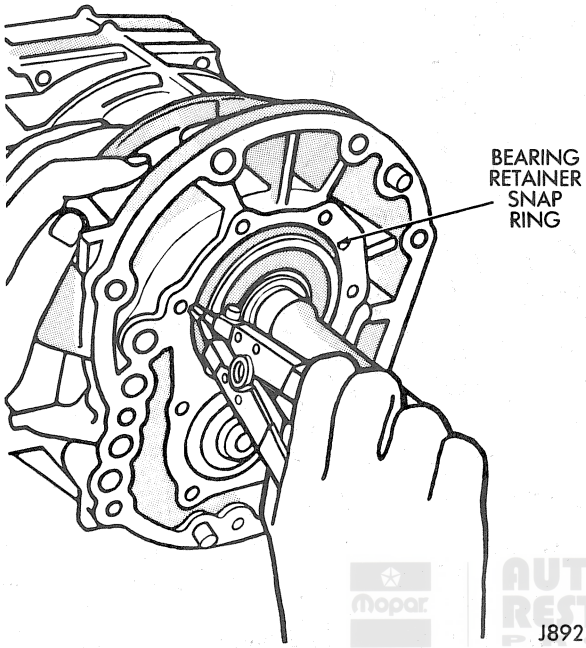


Fig. 14 Removing Bearing Retainer Snap Ring

(11) Remove front bearing retainer and intermediate plate by tapping them loose with plastic mallet (Fig. 15).

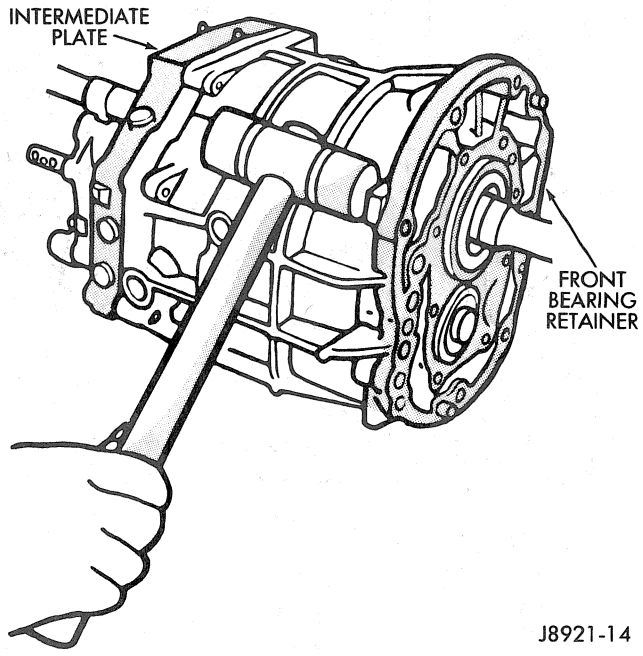


Fig. 15 Front Bearing Retainer And Intermediate Plate Removal

ASSEMBLING GEARTRAIN AND TRANSMISSION CASE

(1) Remove intermediate plate from vise.
(2) Install new gaskets on intermediate plate.
(3) Install transmission case on intermediate plate (Fig. 16).

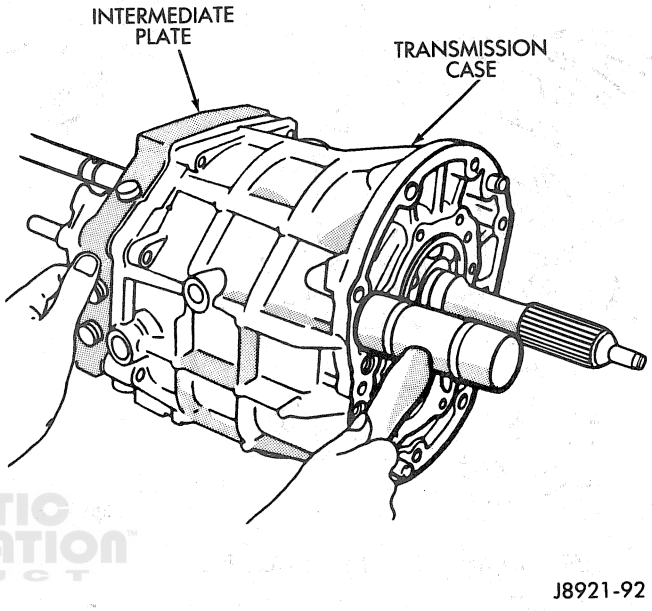


Fig. 16 Installing Transmission Case

(4) Install new front bearing snap ring (Fig. 17).

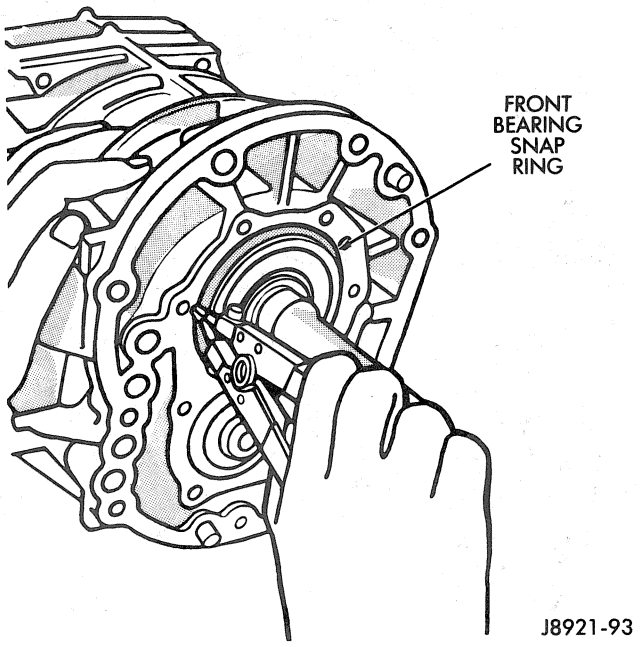


Fig. 17 Installing Front Bearing Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Install new gasket on front bearing retainer and install retainer on case (Fig. 18).

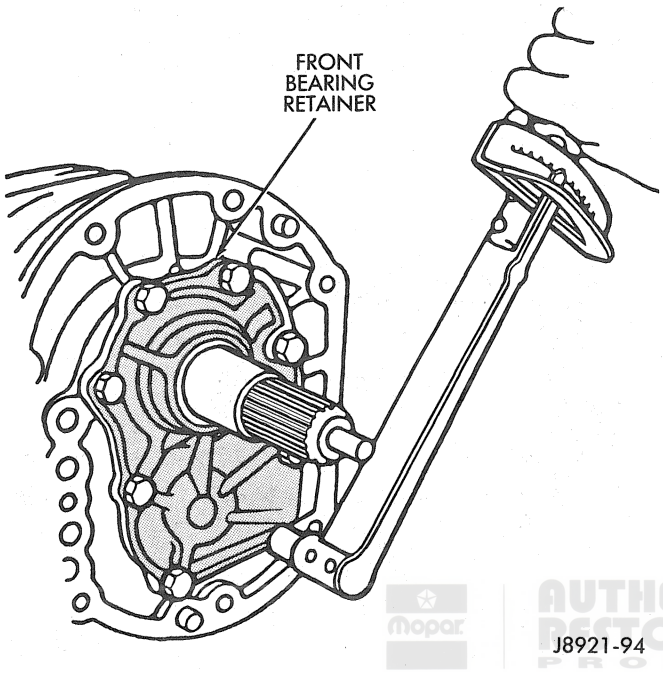


Fig. 18 Installing Front Bearing Retainer

(6) Install adapter or extension housing on intermediate plate (Fig. 19). Tighten housing bolts to 37 N·m (27 ft. lbs.) torque.

(7) Install shift arm (Fig. 19).

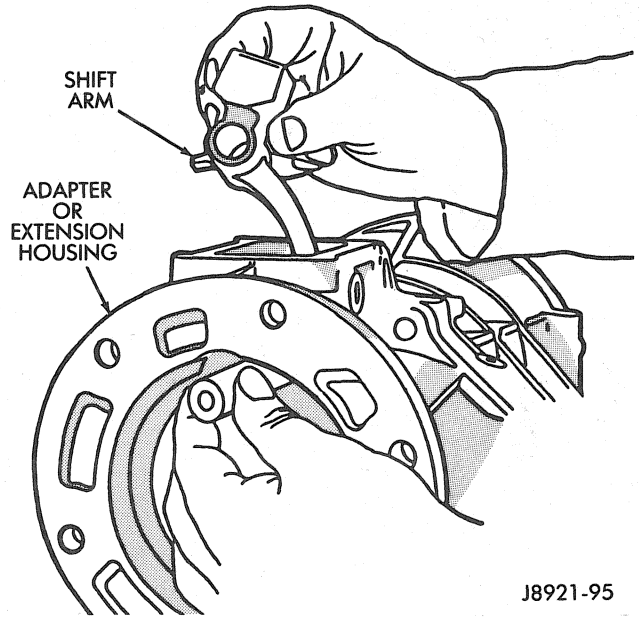


Fig. 19 Installing Adapter Housing And Shift Arm

(8) Install shift arm lock plate with pliers (Fig. 20). Then install and tighten lock plate set bolt to 38 N·m (28 ft. lbs.) torque.

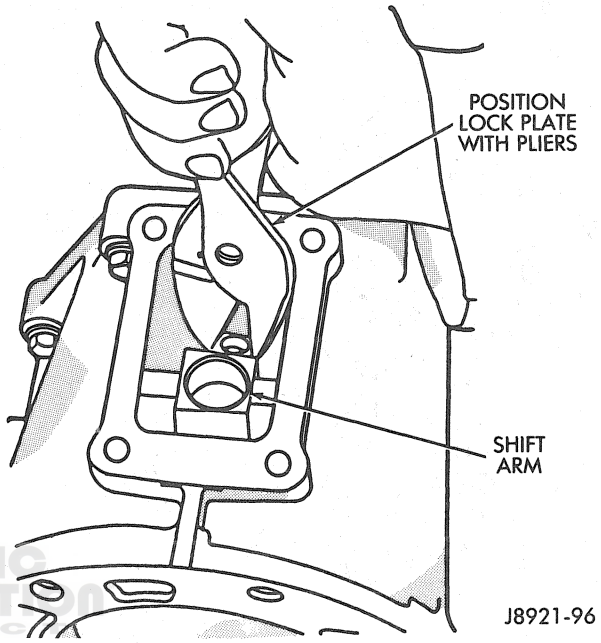


Fig. 20 Shift Arm Lock Plate Installation

(9) Install and tighten shaft plug to 18 N·m (13 ft. lbs.) torque (Fig. 21).

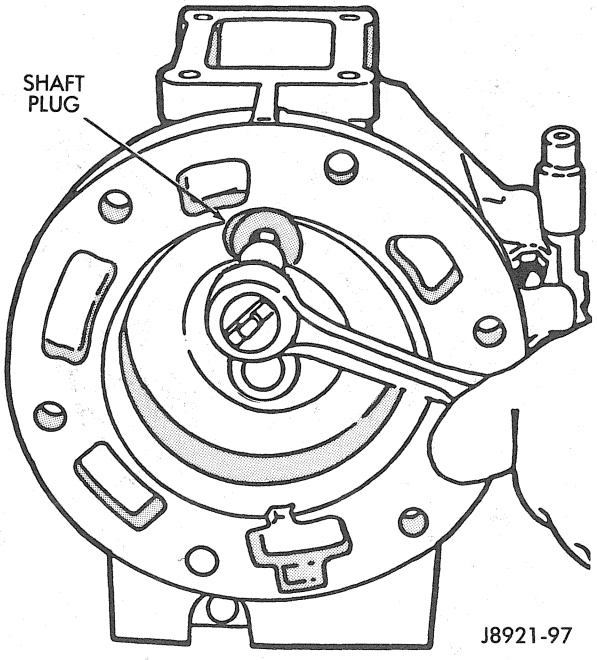


Fig. 21 Shaft Plug Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Install lock ball and spring in housing. Then apply sealer to ball plug and install plug (Fig. 22). Tighten plug to 19 N·m (14 ft. lbs.) torque.

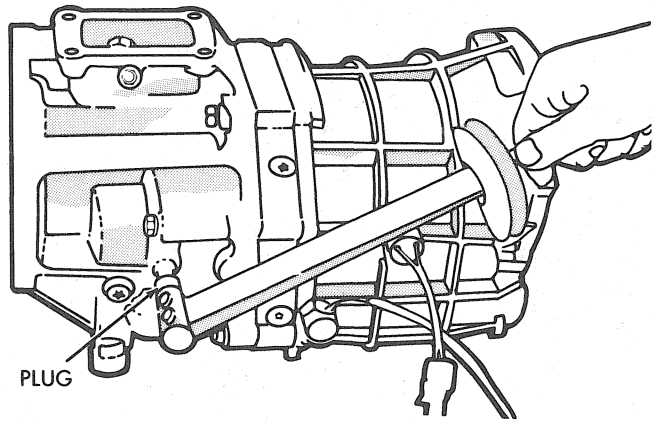


Fig. 22 Installing Ball Plug

(11) Install reverse pins in housing (Fig. 23). Tighten pins to 27 N·m (20 ft. lbs.) torque.

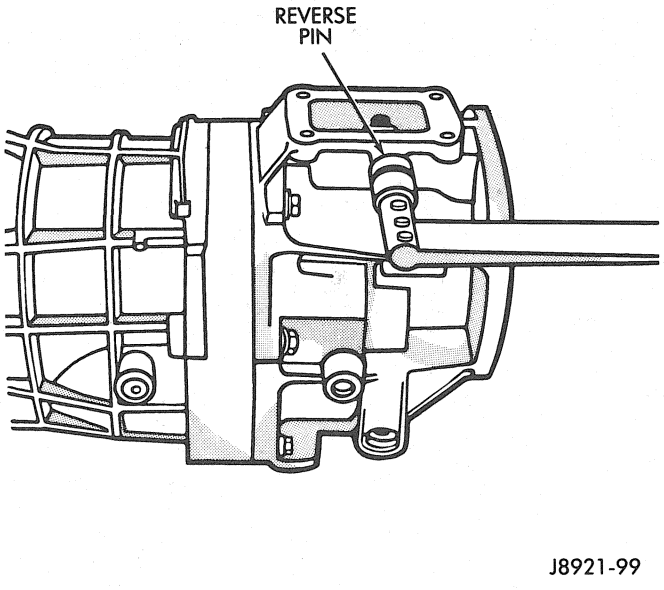


Fig. 23 Install Reverse Pins

(12) Install shift tower and new gasket on housing (Fig. 24). Tighten tower bolts to 18 N·m (13 ft. lbs.) torque.

(13) Install backup lamp switch (Fig. 24). Tighten switch to 37 N·m (27 ft. lbs.) torque.

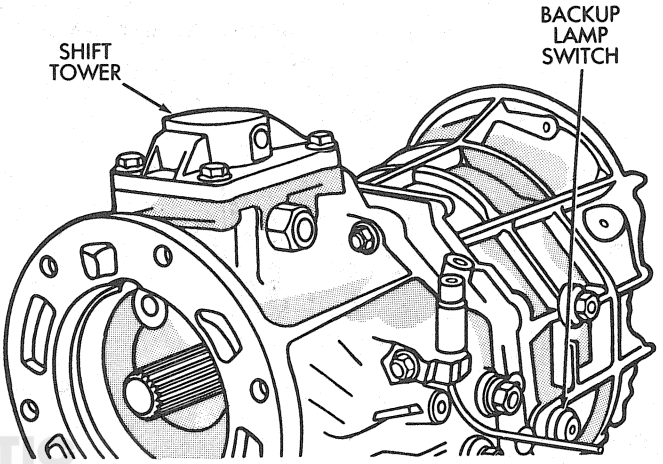


Fig. 24 Installing Shift Tower And Backup Lamp Switch

(14) On rear wheel drive models, install new seal in extension housing (Fig. 25).

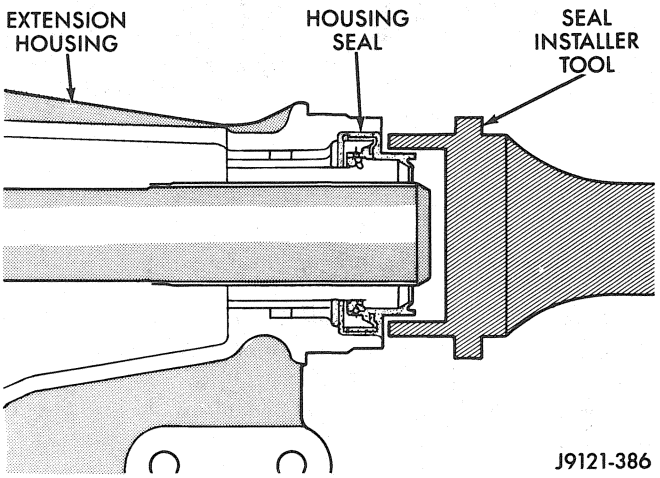


Fig. 25 Extension Housing Seal Installation—Rear Wheel Drive

(15) Install vehicle speed sensor.

(16) Install clutch housing, release bearing, release fork and retainer clip.

DISASSEMBLY AND ASSEMBLY (Continued)

SHIFT MECHANISM

DISASSEMBLE

(1) Install two clutch housing bolts and spare washers in intermediate plate (Fig. 26). Then clamp plate and gear assembly in vise. **Use enough washers to prevent bolts from touching. Also be sure vise jaws are clamped on bolt heads (Fig. 26).**

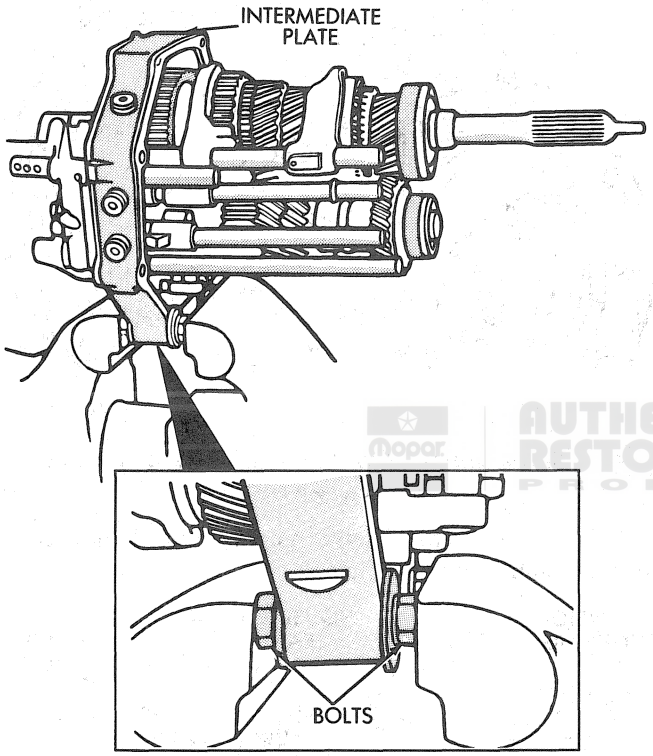


Fig. 26 Positioning Intermediate Plate In Vise

(2) Remove threaded plugs from intermediate plate. Then remove lock ball and spring from plug holes with pencil magnet (Fig. 27).

(3) Remove shift fork pins with punch and hammer (Fig. 28).

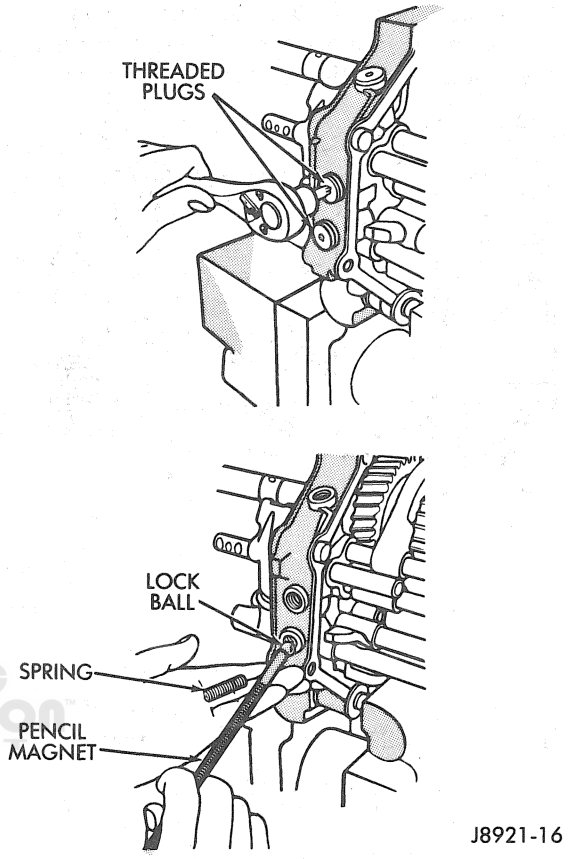


Fig. 27 Lock Ball And Spring Removal

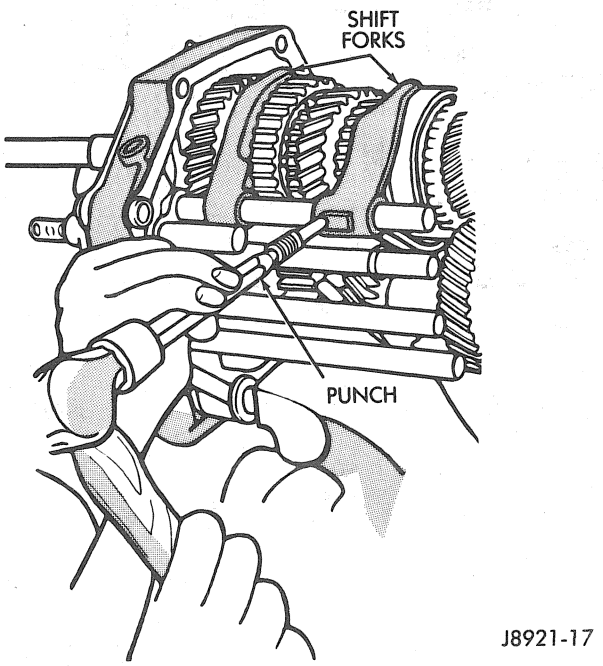


Fig. 28 Removing Shift Fork Pin

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Remove shift rail C–rings (Fig. 29).

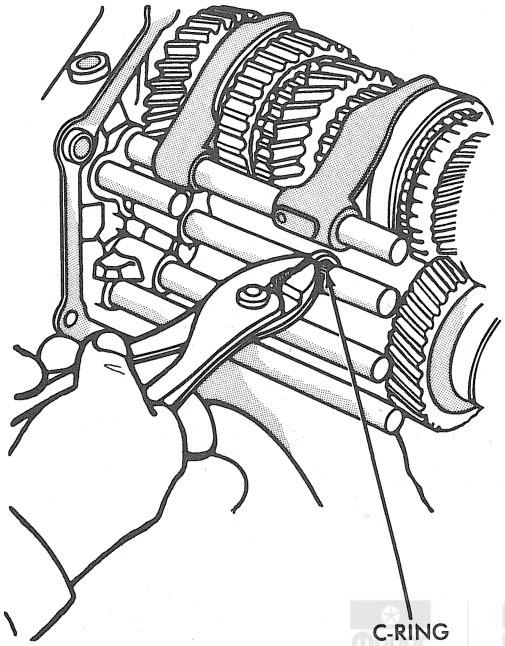


Fig. 29 Shift Rail C–Ring Removal

(5) Pull No. 4 shift rail outward and remove lock balls and pin (Fig. 30).

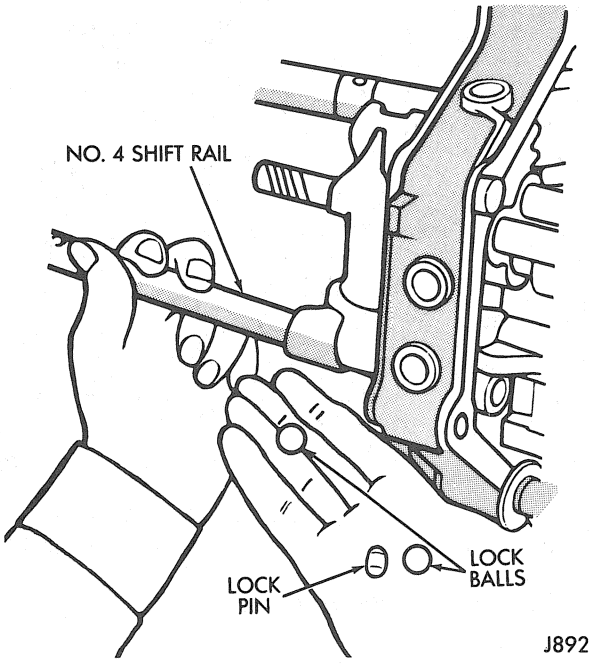


Fig. 30 Removing No. 4 Shift Rail, Lock Balls And Pin

(6) Remove No. 4 shift rail, fifth gear and No. 3 shift fork (Fig. 31).

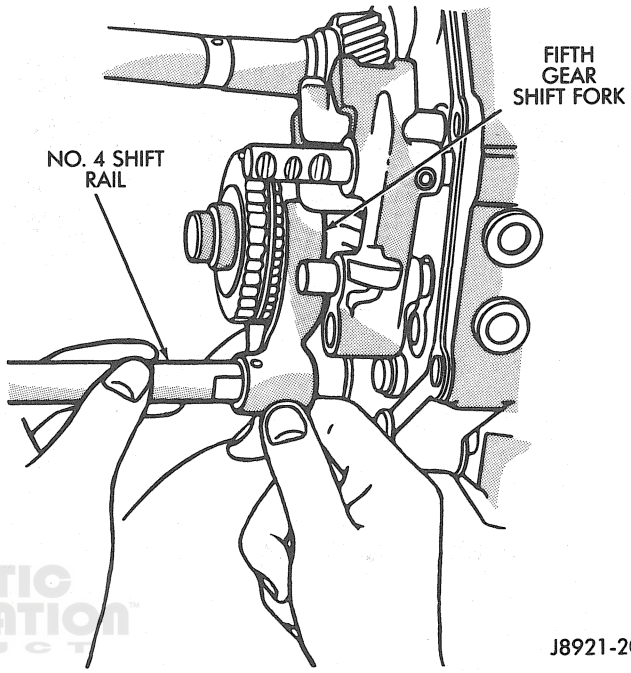


Fig. 31 Removing No. 4 Shift Rail And Fifth Gear Shift Fork

(7) Pull No. 5 shift rail and shift head out of plate (Fig. 32).

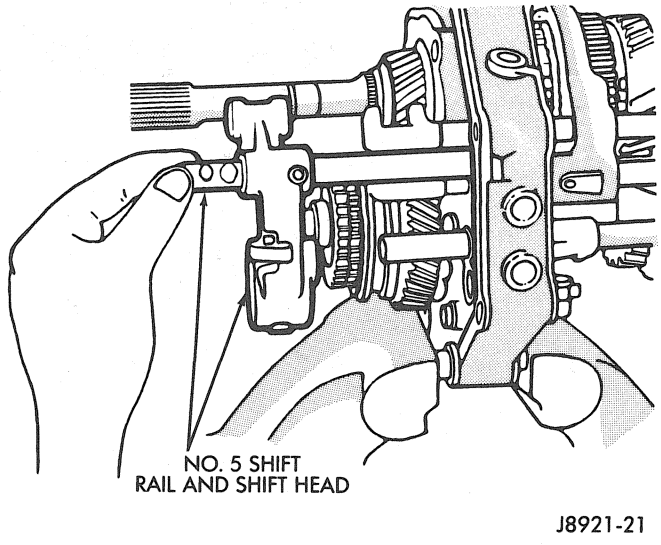


Fig. 32 Removing No. 5 Shift Rail And Shift Head

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Remove shift rail No.3. **Catch interlock pins as rail is removed (Fig. 33).**

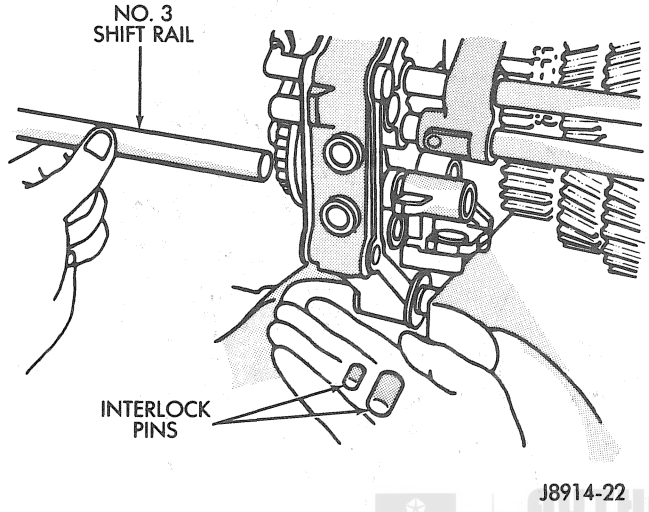


Fig. 33 Removing No. 3 Shift Rail And Interlock Pin

(9) Remove No. 1 shift rail and interlock pin (Fig. 34).

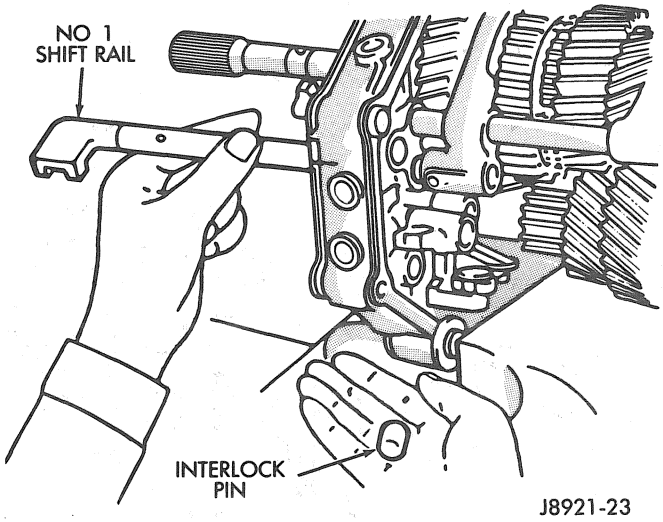


Fig. 34 Removing No. 1 Shift Rail And Interlock Pin

(10) Remove shift rail No. 2 and shift forks 1 and 2 (Fig. 35).

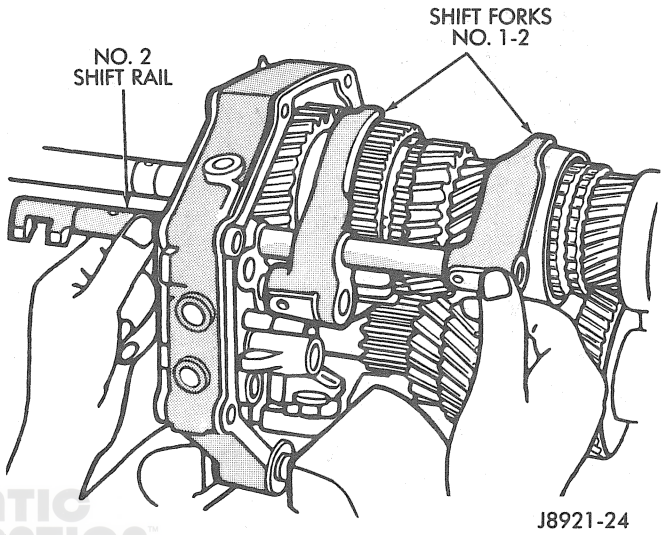


Fig. 35 Removing Shift Forks And No. 2 Shift Rail

(11) Remove reverse idler gear and shaft (Fig. 36).

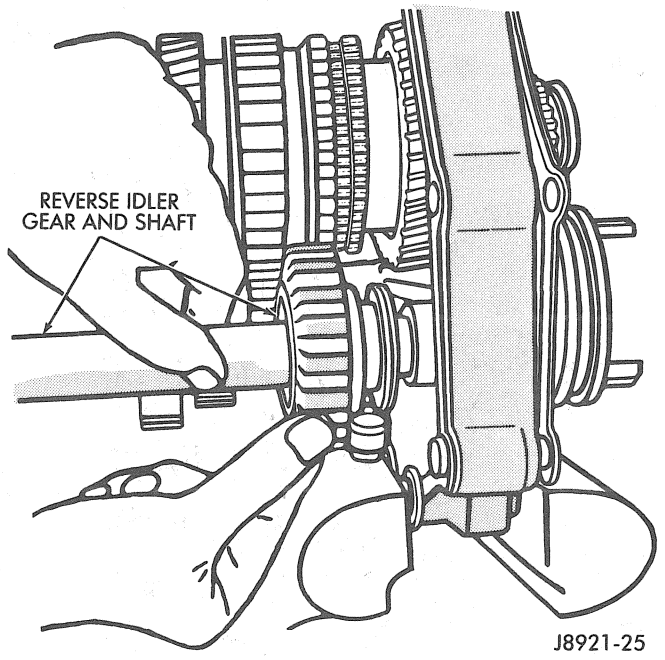


Fig. 36 Removing Reverse Idler Gear And Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Remove reverse shift arm and fork (Fig. 37).

SHIFT MECHANISM ASSEMBLY AND INSTALLATION

When assembling the shift mechanism, refer to (Fig. 38) for component details and location.

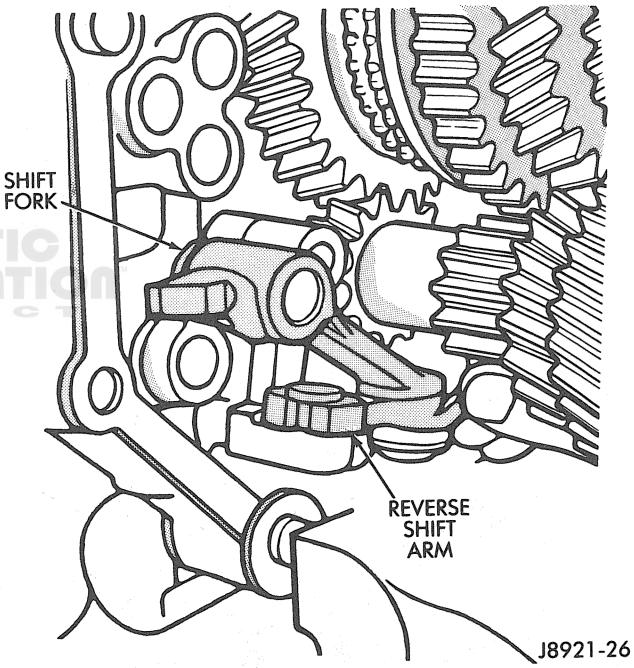
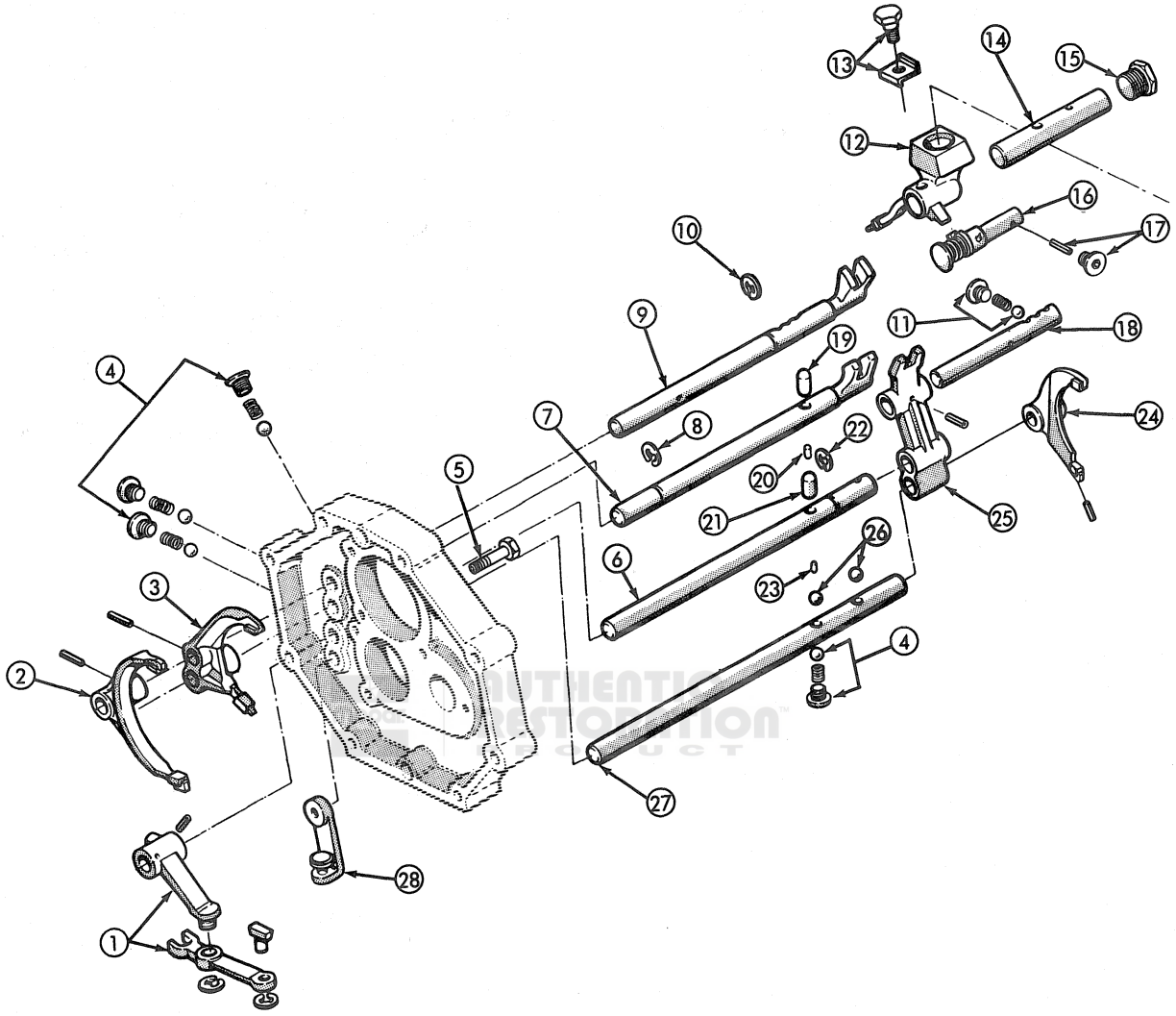


Fig. 37 Reverse Shift Arm Removal

DISASSEMBLY AND ASSEMBLY (Continued)



1. REVERSE FORK AND SHIFT ARM
2. 1-2 SHIFT FORK
3. 3-4 SHIFT FORK
4. LOCK BALL, SPRING AND PLUG (AX 5)
5. BRACKET BOLT
6. NO. 3 SHIFT RAIL
7. NO. 1 SHIFT RAIL
8. C-RING
9. NO. 2 SHIFT RAIL
10. C-RING
11. LOCK BALL, SPRING AND PLUG
12. SHIFT ARM
13. SET BOLT AND LOCK PLATE
14. SHIFT LEVER SHAFT
15. SHAFT PLUG
16. REVERSE PIN
17. RETAINING PIN AND PLUG
18. NO. 5 SHIFT RAIL
19. INTERLOCK PIN
20. INTERLOCK PIN
21. INTERLOCK PIN
22. C-RING
23. INTERLOCK PIN
24. FIFTH-REVERSE FORK (AX 5)
25. REVERSE SHIFT HEAD
26. LOCK BALLS (AX 5)
27. NO. 4 SHIFT RAIL (AX 5)
28. REVERSE ARM BRACKET

J9021-122

Fig. 38 Shift Components

DISASSEMBLY AND ASSEMBLY (Continued)

(1) Install reverse shift arm. Then seat shift fork in bracket (Fig. 39).

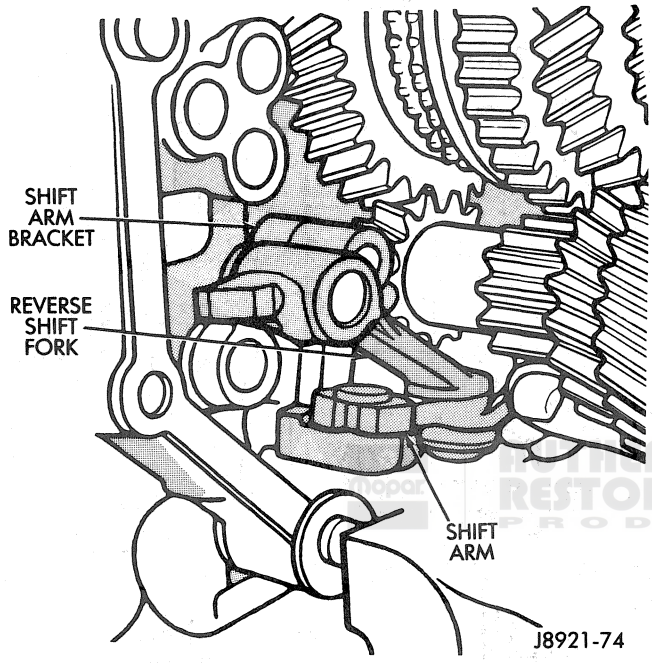


Fig. 39 Installing Reverse Shift Arm

(2) Install reverse idler gear on shaft. Then install shaft and gear in intermediate plate (Fig. 40). Install shaft lock plate and tighten attaching bolt to 18 N·m (13 ft. lbs.) torque.

(3) Install 1–2 and 3–4 shift forks in synchronizer sleeves. Then slide No. 2 shift rail through intermediate plate and into forks (Fig. 41).

(4) Coat shift rail interlock pins and balls with liberal quantity petroleum jelly to hold them in place.

(5) Refer to (Fig. 42) for interlock ball and pin positions during following assembly steps.

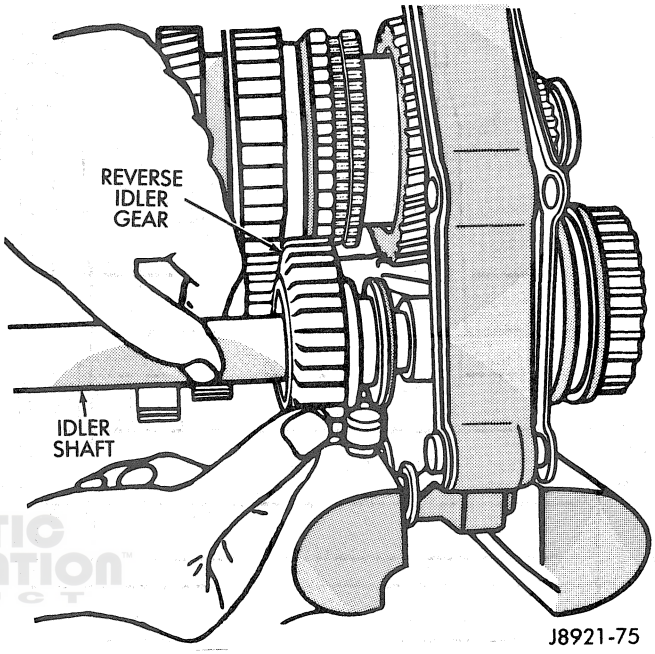


Fig. 40 Installing Reverse Idler Gear And Shaft

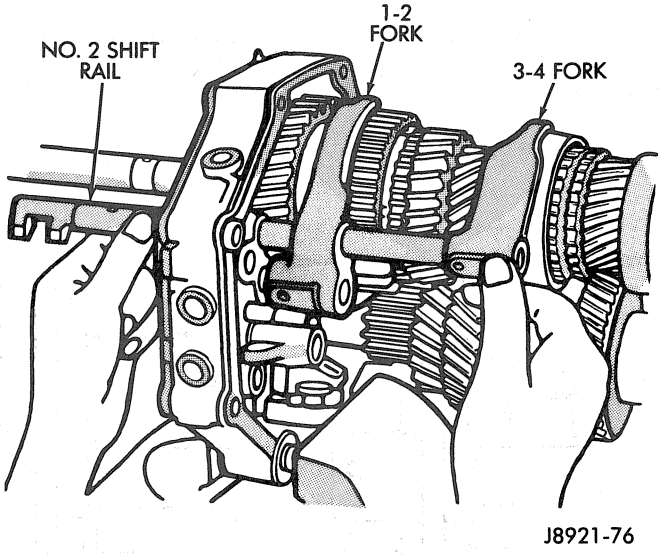


Fig. 41 Installing No. 2 Shift Rail and Shift Forks

DISASSEMBLY AND ASSEMBLY (Continued)

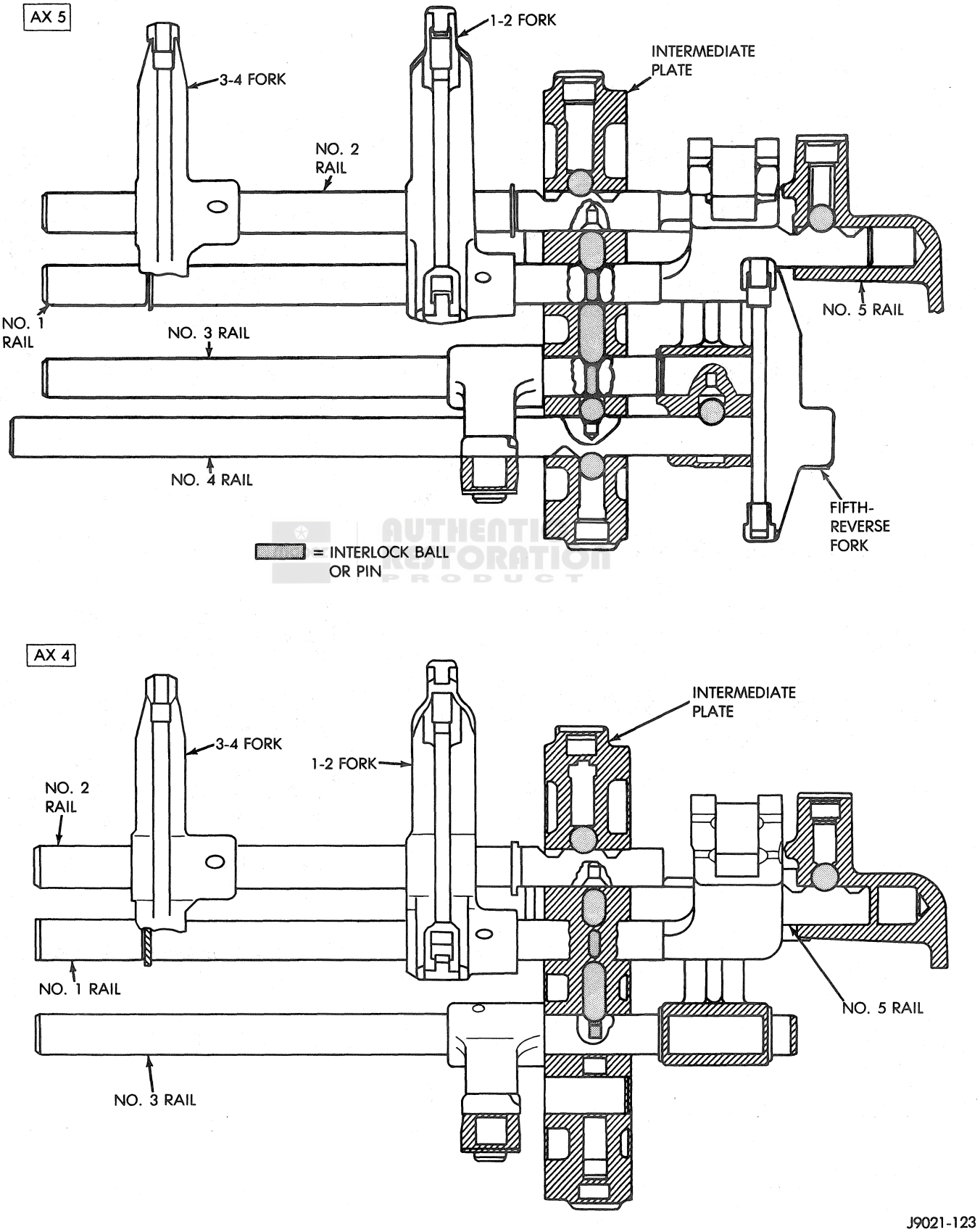


Fig. 42 Interlock Ball And Pin Position

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Insert first interlock pin in intermediate plate (Fig. 43). Use pencil magnet and screwdriver to install pin.

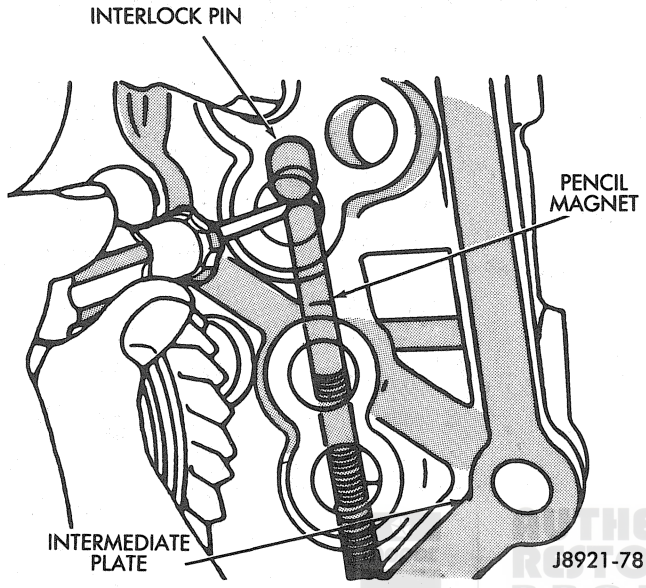


Fig. 43 Installing First Interlock Pin

(7) Install smaller diameter interlock pin in No. 1 rail (Fig. 44).

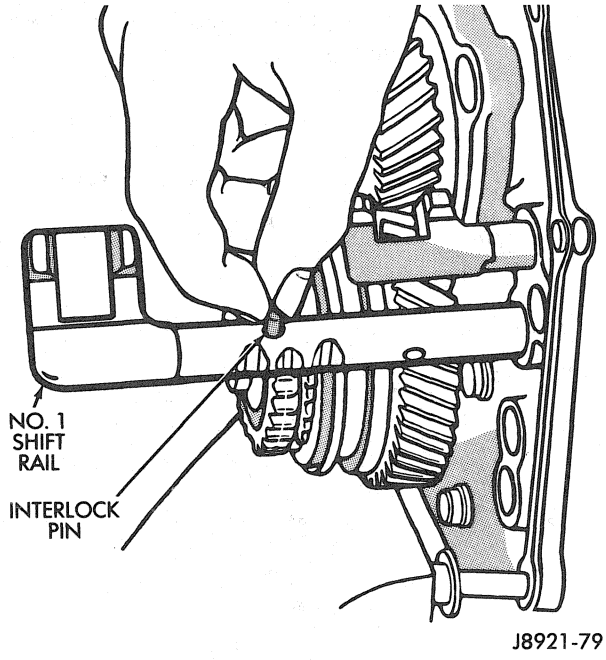


Fig. 44 Installing Interlock Pin In No. 1 Shift Rail

(8) Slide No. 1 rail through 1–2 shift fork (Fig. 45).

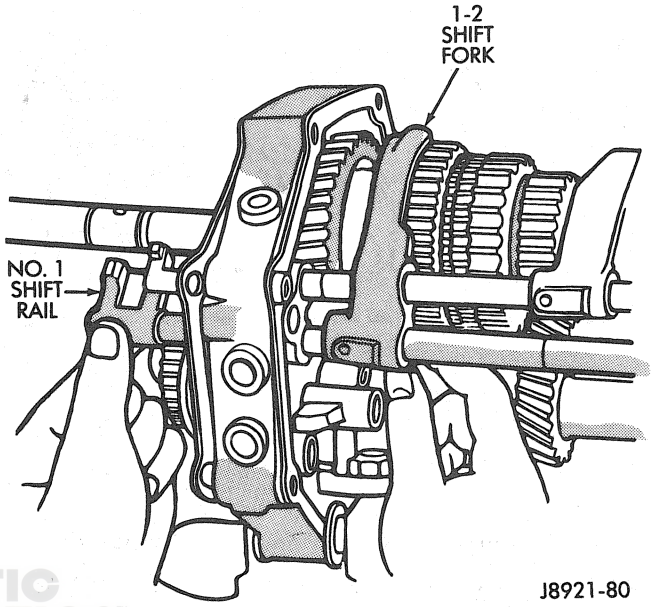


Fig. 45 Installing No. 1 Shift Rail

(9) Install largest interlock pin between Nos. 1 and 3 shift rails (Fig. 46).

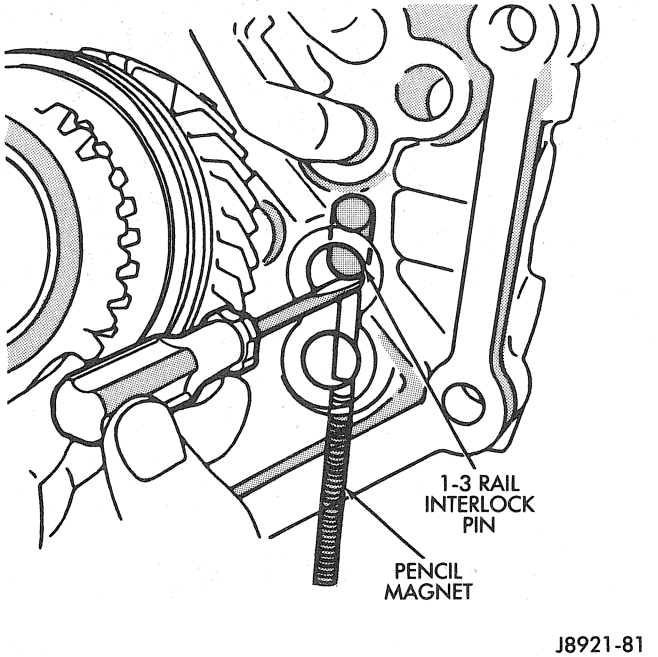


Fig. 46 Installing 1–3 Shift Rail Interlock Pin

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Install interlock pin in No. 3 shift rail (Fig. 47).

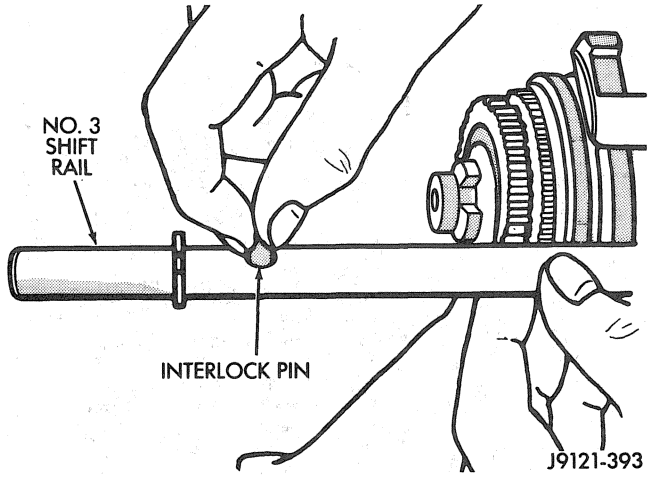


Fig. 47 Installing No. 3 Shift Rail Interlock Pin

(11) Slide No. 3 rail into reverse shift head (Fig. 48).

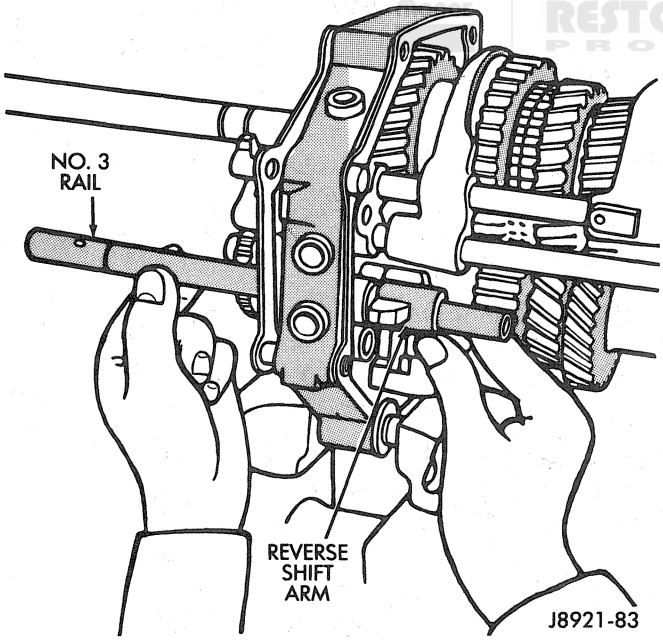


Fig. 48 Installing No. 3 Shift Rail

(12) Assemble reverse shift head and No. 5 shift rail.

(13) Install No. 5 shift rail in intermediate plate and engage shift head on No. 3 shift rail (Fig. 49).

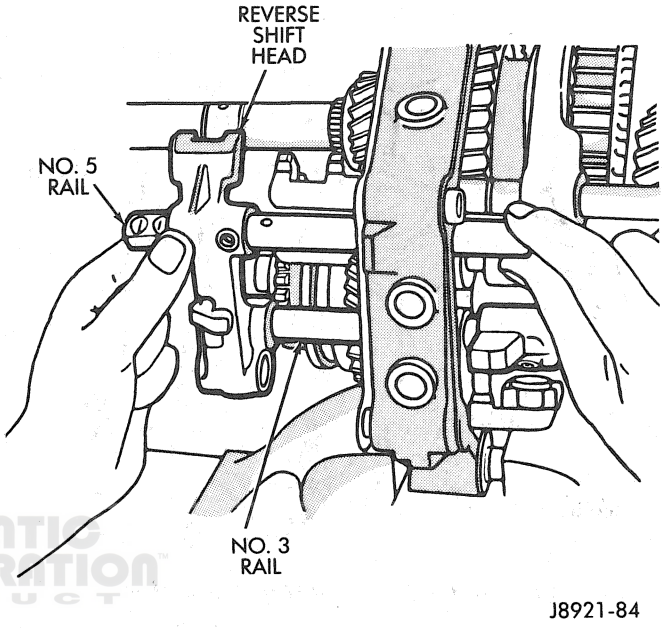


Fig. 49 Installing Reverse Shift Head

(14) Install reverse shift head lock ball with screwdriver and pencil magnet (Fig. 50).

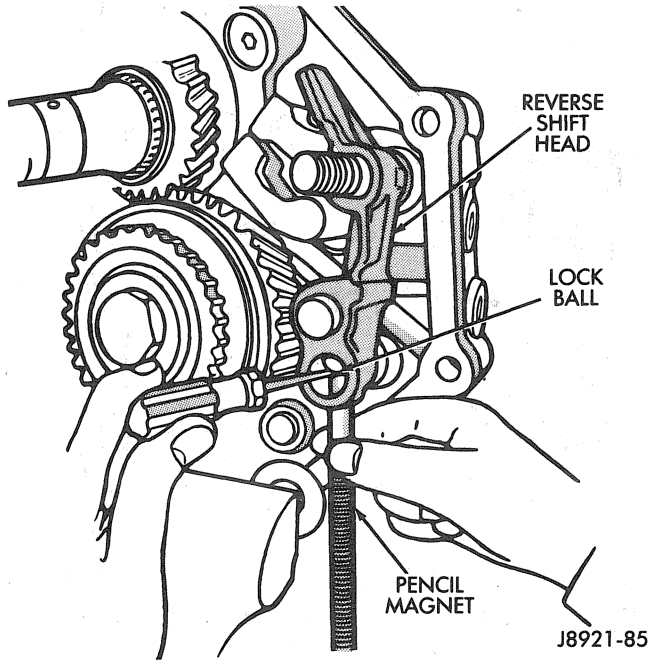


Fig. 50 Installing Reverse Shift Head Lock Ball

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Shift fifth gear synchronizer sleeve rearward to lock it (Fig. 51).

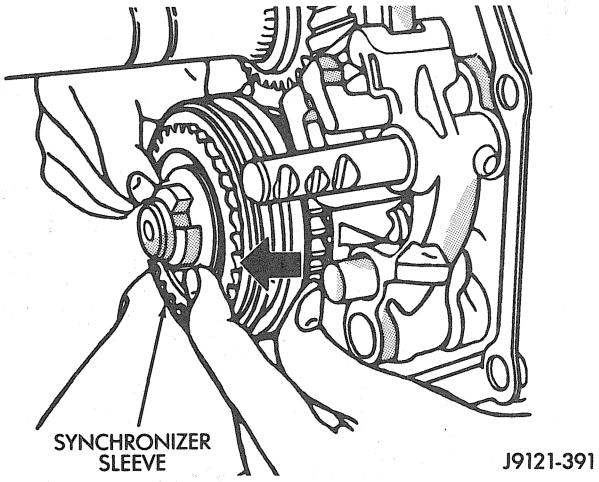


Fig. 51 Locking Fifth Synchronizer

(16) On AX 5, install fifth–reverse shift fork in synchronizer sleeve. Then slide No. 4 shift rail into fork (Fig. 52).

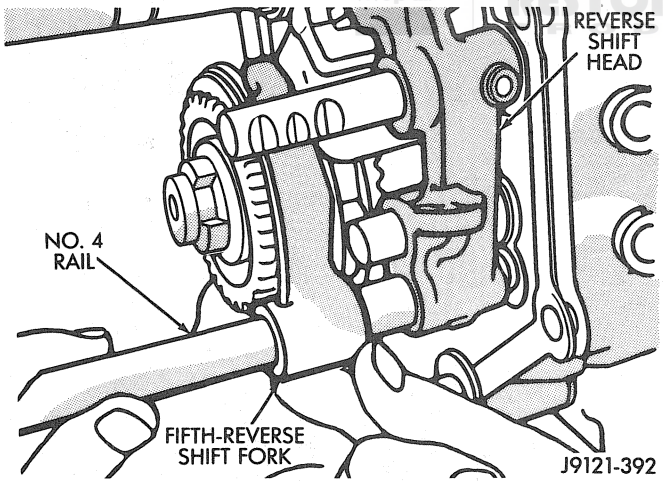


Fig. 52 Fifth–Reverse Shift Fork Installation

(17) Install shift rail lock ball with pencil magnet and screwdriver (Fig. 53).

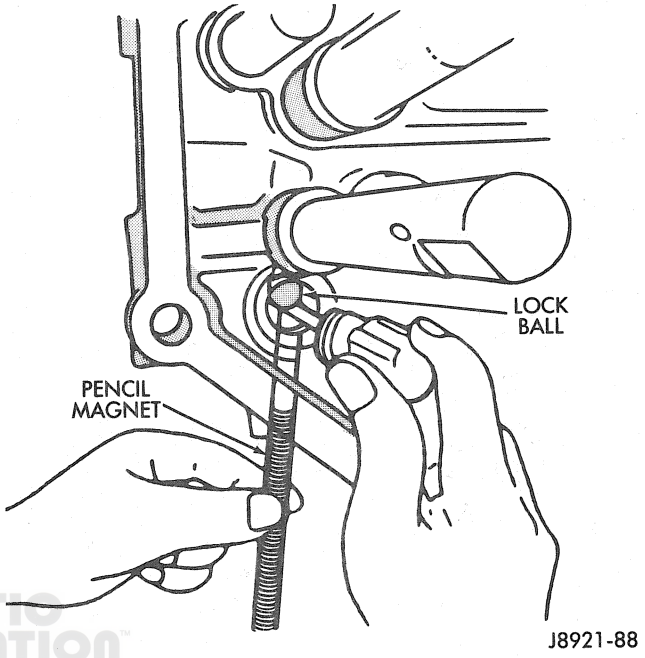


Fig. 53 Lock Ball Installation

(18) Check interlock operation as follows: Move No. 1 shift rail rearward to first gear position. Interlock operation is OK if remaining shift rails did not move.

(19) Install new shift fork pins (Fig. 54).

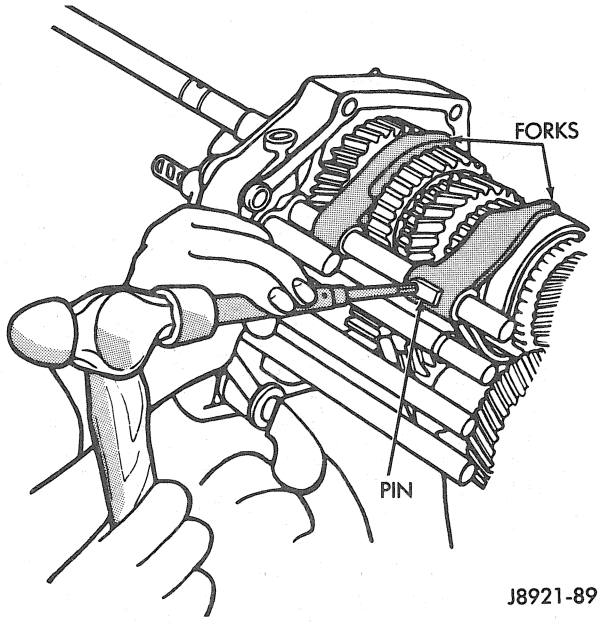


Fig. 54 Installing Shift Fork Pins

DISASSEMBLY AND ASSEMBLY (Continued)

(20) Install new shift rail C–rings (Fig. 55).

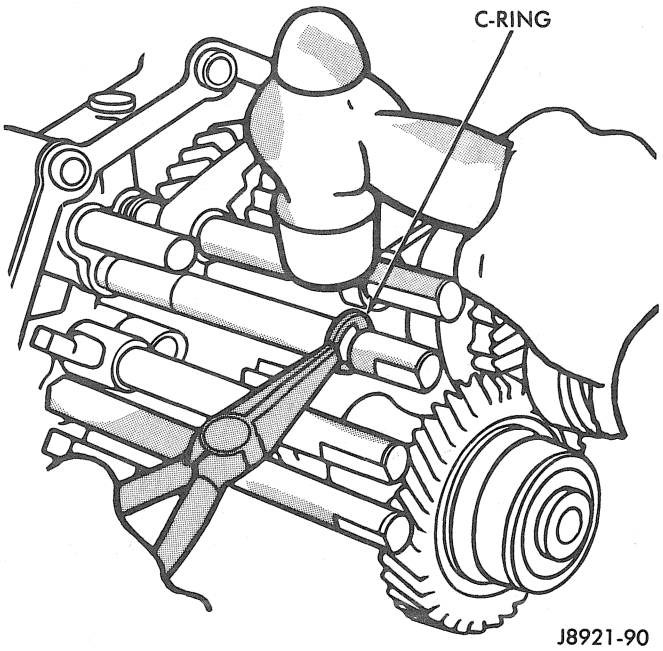


Fig. 55 Installing Shift Rail C–Rings

(21) Apply sealer to threads of lock ball plugs.

(22) Install lock balls and springs in intermediate plate. **Short spring goes in top hole of intermediate plate.**

(23) Install lock ball and spring plugs (Fig. 56). Tighten plugs to 19 N·m (14 ft. lbs.) torque.

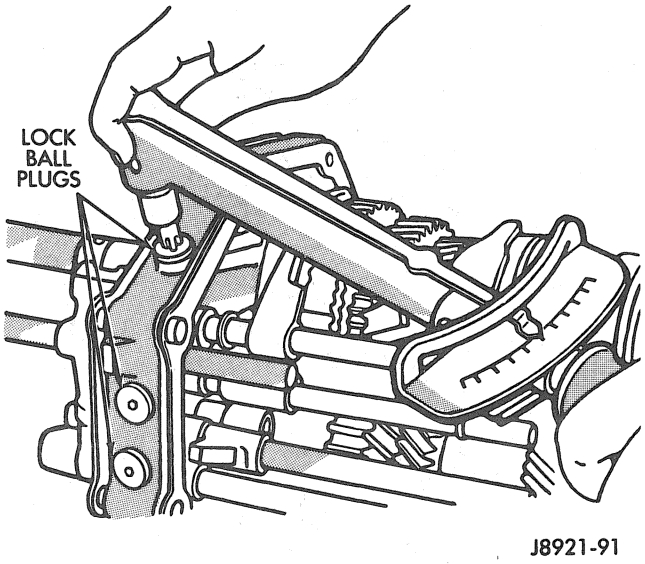


Fig. 56 Installing Lock Ball Plugs

MAINSHAFT

DISASSEMBLE

(1) On AX 5, measure fifth counter gear thrust clearance with feeler gauge (Fig. 57). Clearance should be 0.10–0.30 mm (0.004– 0.012 in.).

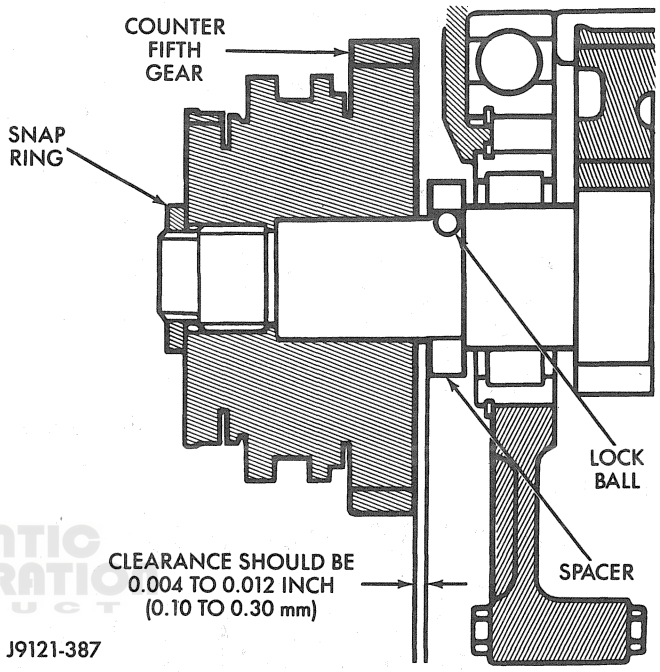


Fig. 57 Measuring Counter Fifth Gear Thrust Clearance

(2) Engage two synchro sleeves to lock mainshaft gears (Fig. 58).

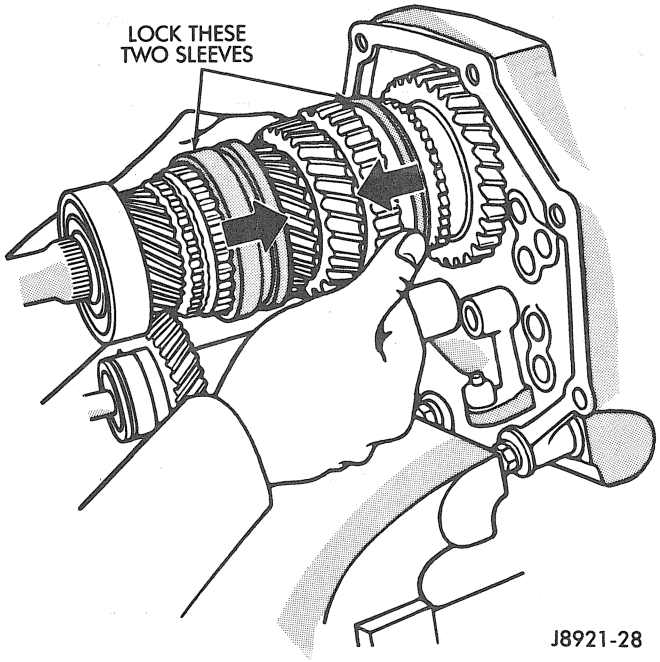


Fig. 58 Locking Mainshaft Gears

DISASSEMBLY AND ASSEMBLY (Continued)

(3) On AX 4, remove counter gear nut and oil slinger. On AX 5, remove select fit snap ring that secures fifth spline gear and counter fifth gear on shaft (Fig. 59).

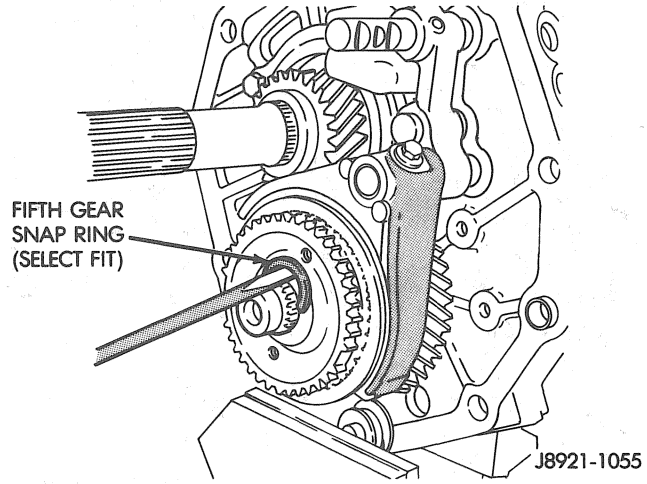


Fig. 59 Removing Fifth Gear Snap Ring

(4) Remove fifth spline gear, synchronizer and counter fifth gear with 2–, or 3–jaw puller (Fig. 60).

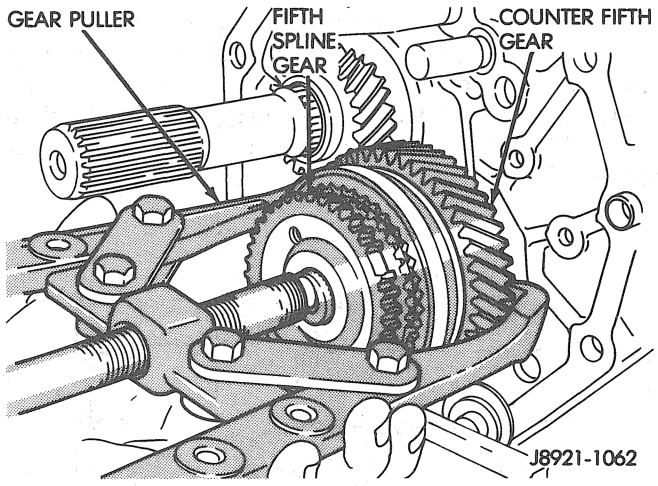


Fig. 60 Removing Fifth Gear Assembly

(5) Remove spacer and remove lock ball with pencil magnet (Fig. 61).

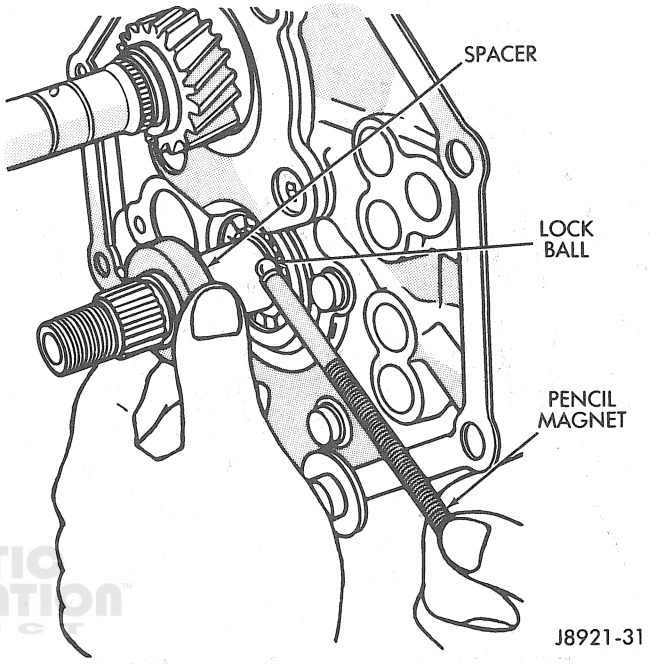


Fig. 61 Spacer And Lock Ball Removal

(6) Remove reverse shift arm bracket (Fig. 62).

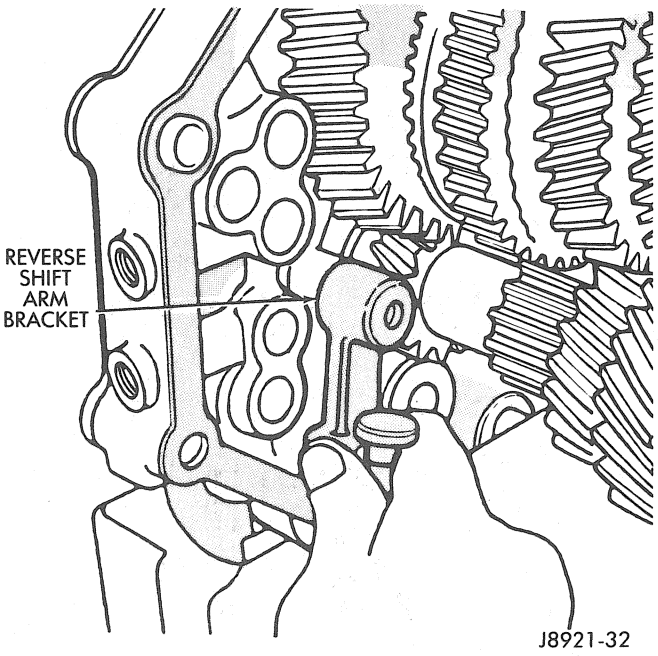


Fig. 62 Removing Reverse Shift Arm Bracket

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Remove rear bearing retainer bolts with appropriate size torx bit and remove retainer (Fig. 63).

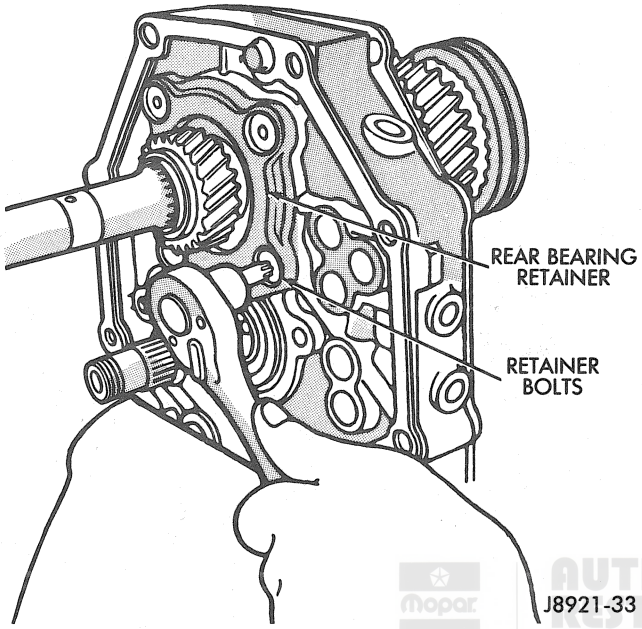


Fig. 63 Removing Rear Bearing Retainer

(8) Remove rear bearing snap ring (Fig. 64).

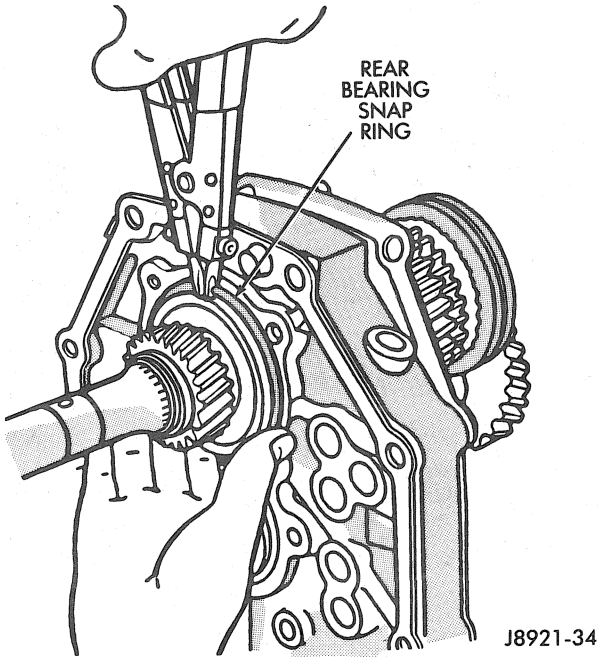


Fig. 64 Removing Rear Bearing Snap Ring

(9) Tap intermediate plate with plastic mallet and pull output shaft–counter gear assemblies out of plate (Fig. 65).

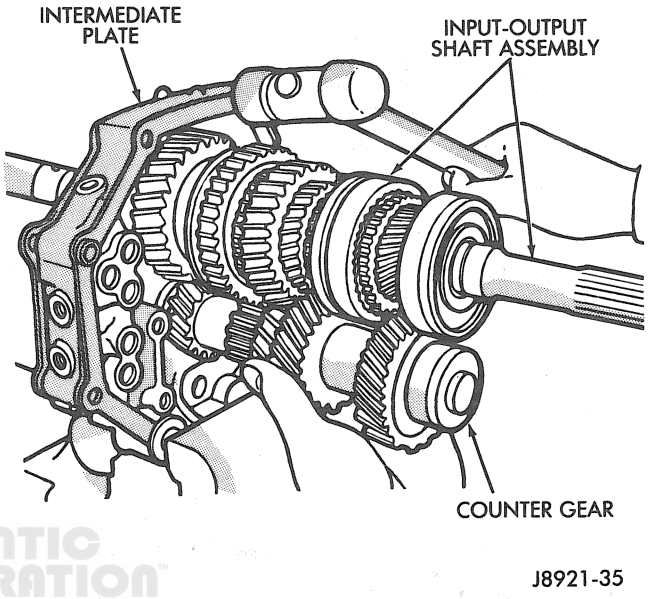


Fig. 65 Removing Counter Gear And Output Shaft

(10) Remove rear bearing from intermediate plate.

(11) Remove input shaft and shaft roller bearings from output shaft.

(12) Measure thrust clearance of output shaft gears (Fig. 66). Clearance should be 0.10 – 0.25 mm (0.004 – 0.010 in.).

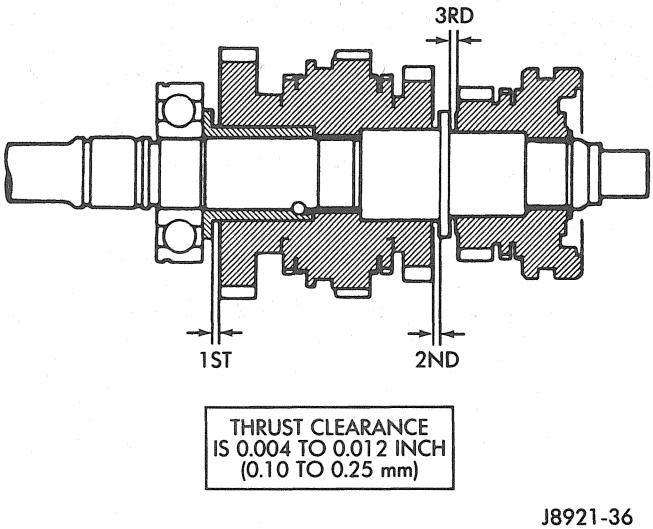


Fig. 66 Checking Output Shaft Gear Thrust Clearance

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Remove output shaft fifth gear snap ring with two screwdrivers (Fig. 67).

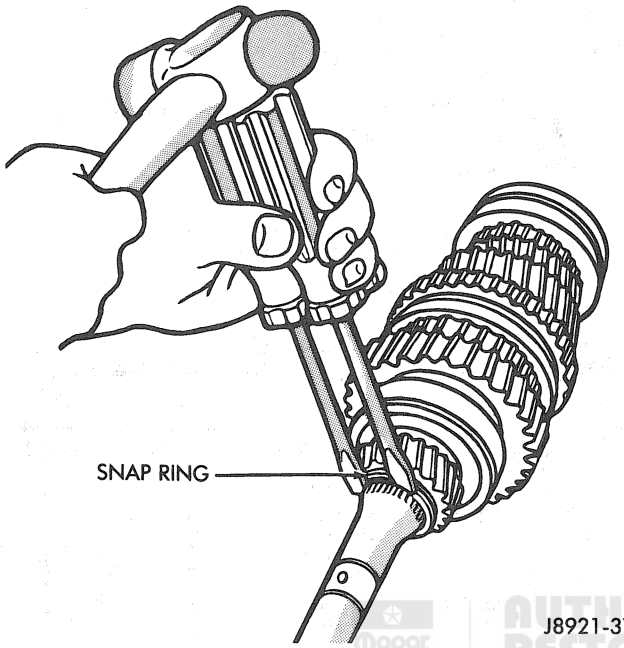


Fig. 67 Removing Fifth Gear Snap Ring

(14) Press fifth gear, rear bearing, first gear and inner race off output shaft (Fig. 68).

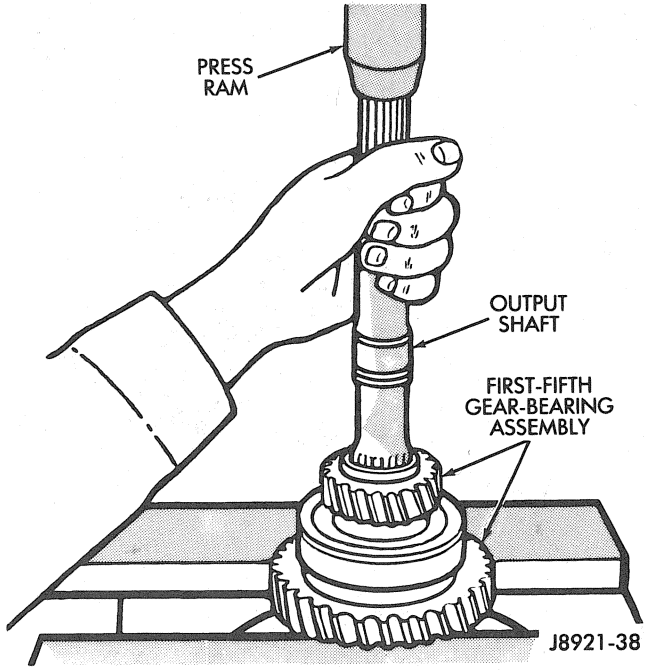


Fig. 68 Removing Fifth Gear And First Gear Bearing And Race

(15) Remove needle roller bearing.

(16) Remove synchronizer ring.

(17) Remove synchronizer lock ball with pencil magnet (Fig. 69).

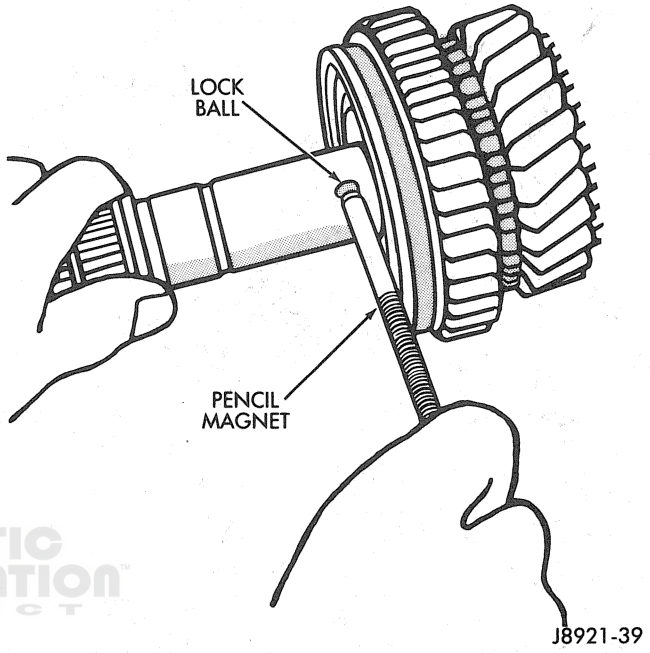


Fig. 69 Synchronizer Lock Ball Removal

(18) Press 1–2 synchronizer and second gear off output shaft (Fig. 70).

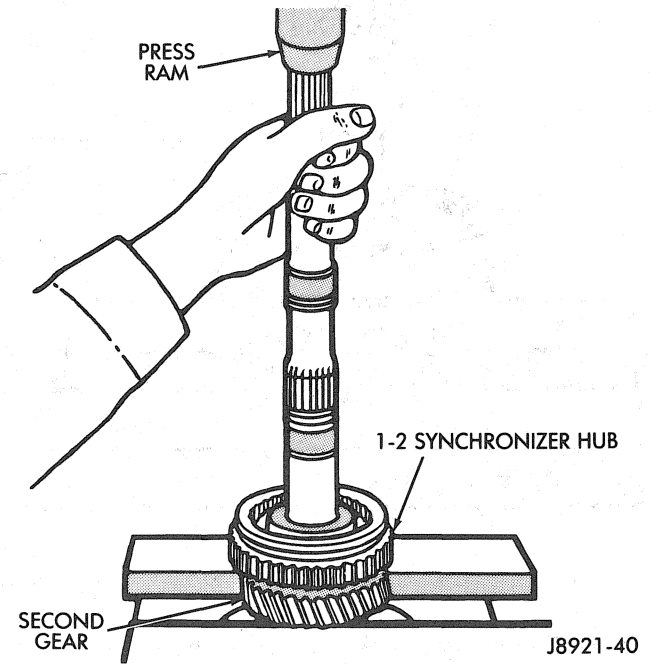


Fig. 70 Second Gear And 1–2 Synchronizer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(19) Remove needle roller bearing from the shaft or second gear.

(20) Remove 3–4 synchronizer snap ring (Fig. 71).

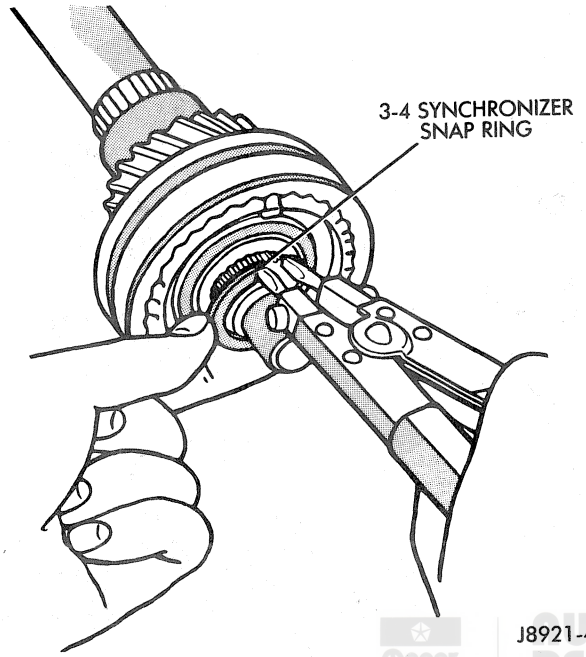


Fig. 71 Removing 3–4 Synchronizer Snap Ring

(21) Press 3–4 synchronizer and third gear off shaft (Fig. 72).

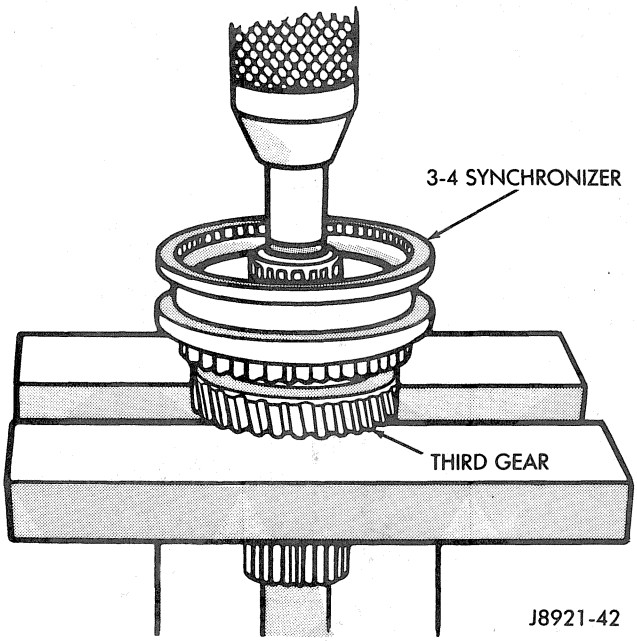


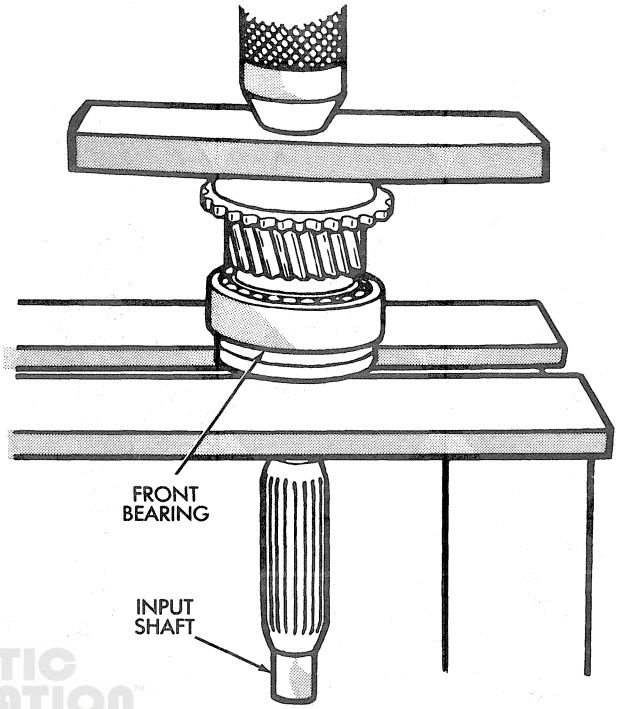
Fig. 72 Removing 3–4 Synchronizer And Third Gear

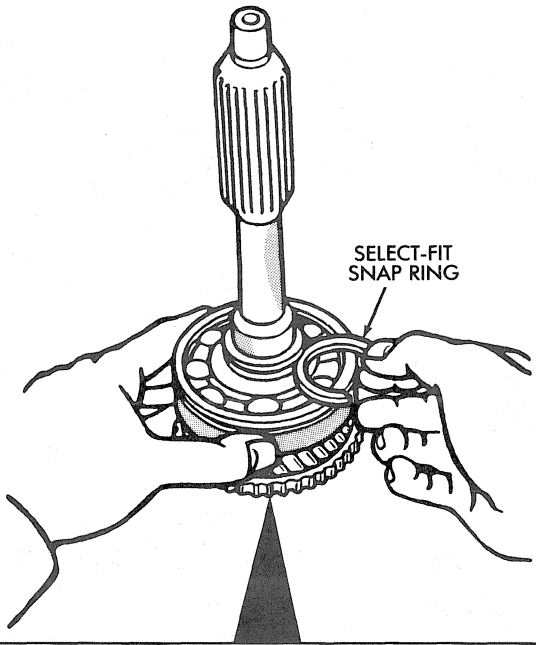
(22) Remove needle roller bearing from shaft or gear.

ASSEMBLING MAINSHAFT

(1) If front bearing was removed from input shaft, press new bearing on shaft (Fig. 73).

(2) Secure front bearing with thickest snap ring that will fit in groove (Fig. 73).





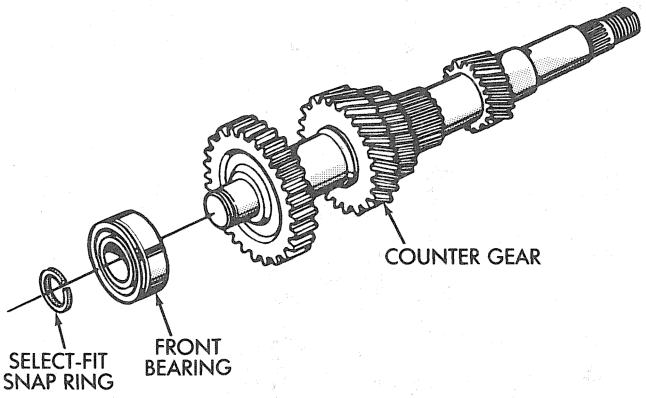
I.D. Mark	Snap Ring Thickness mm (in.)
0	2.05-2.10 (0.0807-0.0827)
1	2.10-2.15 (0.0827-0.0846)
2	2.15-2.20 (0.0846-0.0866)
3	2.20-2.25 (0.0866-0.0886)
4	2.25-2.30 (0.0886-0.0906)
5	2.30-2.35 (0.0906-0.0925)

J8921-50

Fig. 73 Installing Front Bearing And Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Press front bearing on counter gear. Secure bearing with thickest snap ring that will fit in ring groove (Fig. 74).



I.D. Mark	Snap Ring Thickness mm (in.)
1	2.05-2.10 (0.0807-0.0827)
2	2.10-2.15 (0.0827-0.0846)
3	2.15-2.20 (0.0846-0.0866)
4	2.20-2.25 (0.0866-0.0886)
5	2.25-2.30 (0.0886-0.0906)
6	2.30-2.35 (0.0906-0.0925)

Fig. 74 Installing Counter Gear Front Bearing And Snap Ring

(4) Install new oil seals in front bearing retainer and adapter (Fig. 75). Bearing retainer seal depth is 11.2 – 12.1 mm (0.441 – 0.480 in.).

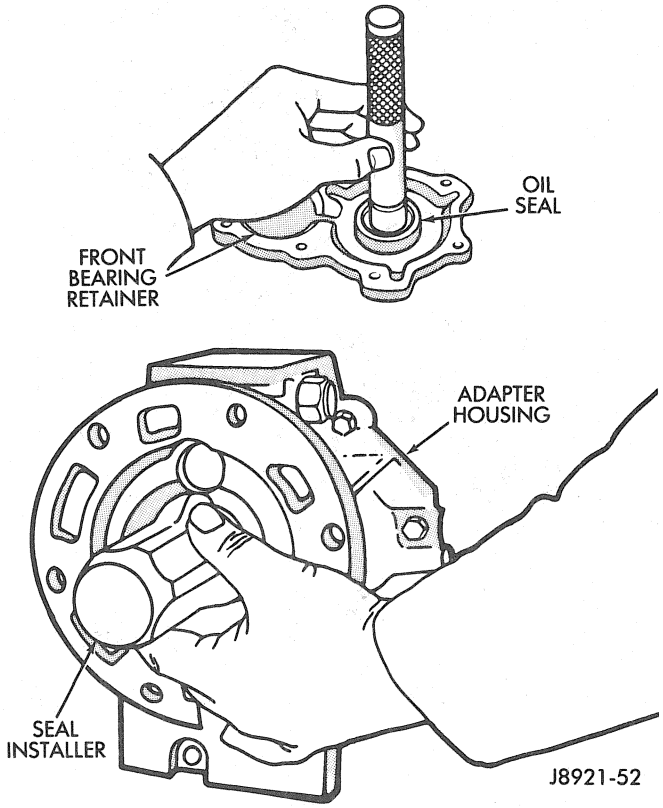


Fig. 75 Oil Seal Installation

(5) Install reverse shaft and shaft retaining pin in adapter. Then install access hole plug with torx bit (Fig. 76).

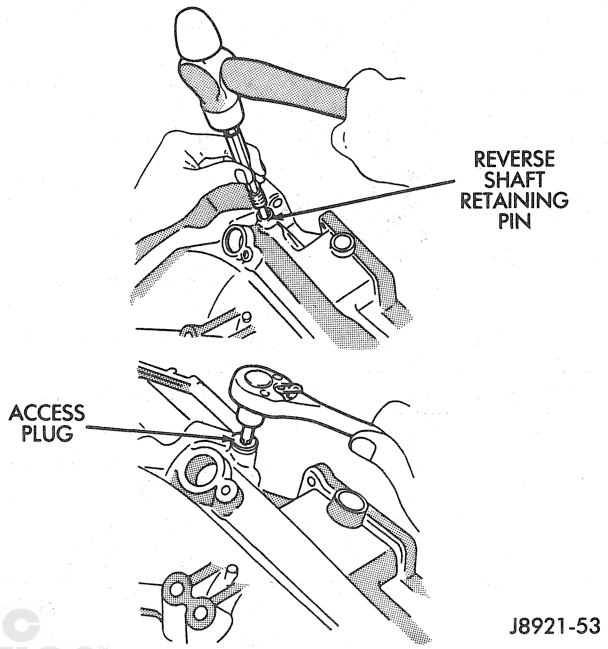


Fig. 76 Installing Reverse Shaft Pin

(6) Lubricate transmission components with specified gear lubricant.

(7) Assemble 1–2 and 3–4 synchronizer hubs, sleeves, springs and key inserts (Fig. 77).

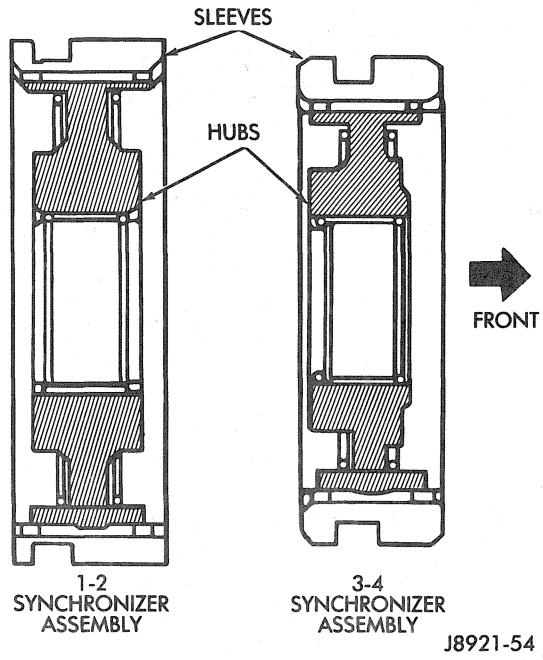
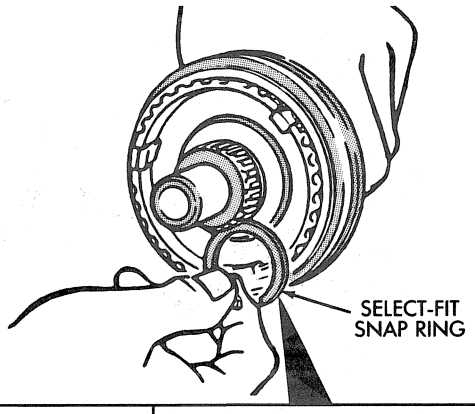


Fig. 77 Synchronizer Identification

(8) Assemble and install third gear, needle bearing, synchronizer ring, 3–4 synchronizer and snap

DISASSEMBLY AND ASSEMBLY (Continued)

ring on output shaft (Fig. 78). Use thickest snap ring that fits in shaft groove.



I.D. Mark	Snap Ring Thickness mm (in.)
C-1	1.75-1.80 (0.0689-0.0709)
D	1.80-1.85 (0.0709-0.0728)
D-1	1.85-1.90 (0.0728-0.0748)
E	1.90-1.95 (0.0748-0.0768)
E-1	1.95-2.00 (0.0768-0.0787)
F	2.00-2.05 (0.0788-0.0807)
F-1	2.05-2.10 (0.0807-0.0827)

J8921-55

Fig. 78 Installing Third Gear And 3–4 Synchronizer

(9) Verify third gear thrust clearance with feeler gauge (Fig. 79). Clearance should be 0.10 – 0.25 mm (0.004 – 0.010 in.).

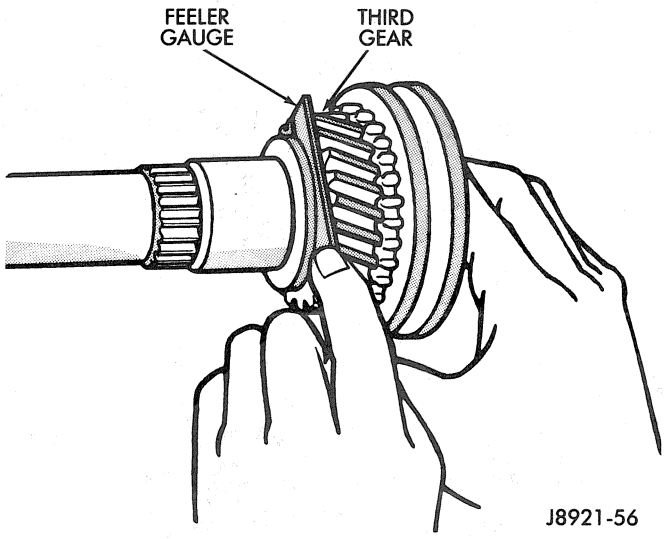


Fig. 79 Checking Third Gear Clearance

(10) Assemble second gear, gear needle bearing, synchronizer ring and 1–2 synchronizer. Then press assembly on output shaft (Fig. 80).

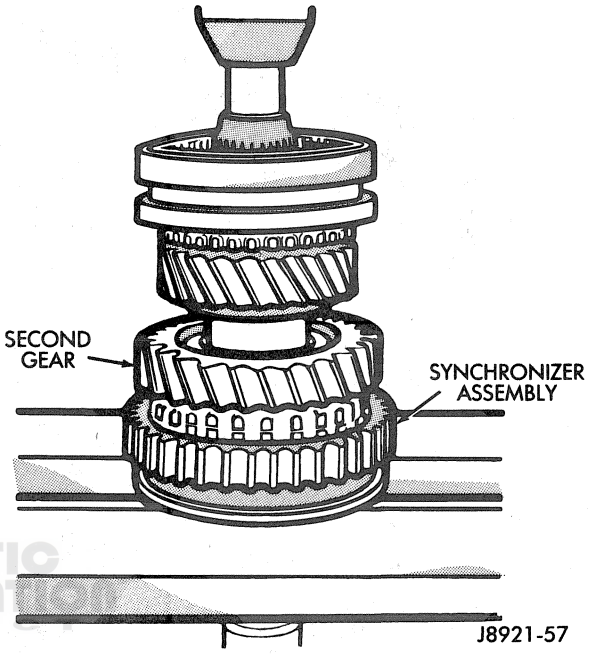


Fig. 80 Installing Second Gear And Synchronizer

(11) Install first gear lock ball in output shaft (Fig. 81).

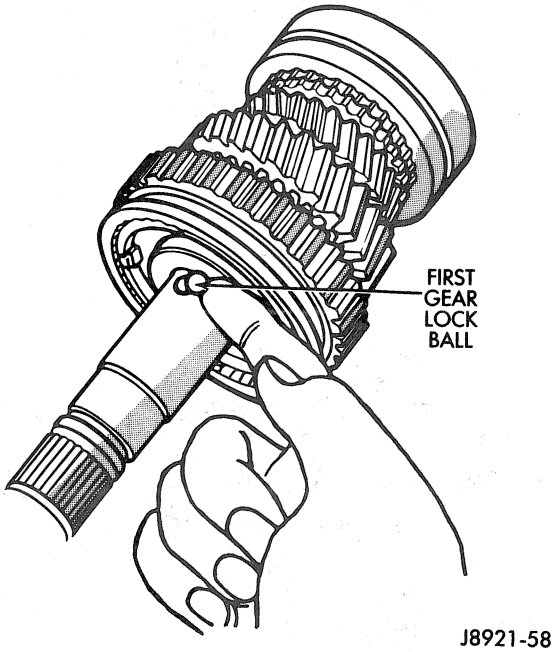


Fig. 81 Installing First Gear And Lock Ball

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Assemble first gear, synchronizer ring, gear needle bearing and inner race (Fig. 82). Then install assembly on output shaft. **Rotate inner race until aligned with locking ball.**

(13) Press rear bearing on shaft (Fig. 82). Snap ring groove in bearing goes toward rear. Use screwdriver to hold inner race in position when installing bearing (Fig. 83).

(14) Install snap ring on rear bearing.

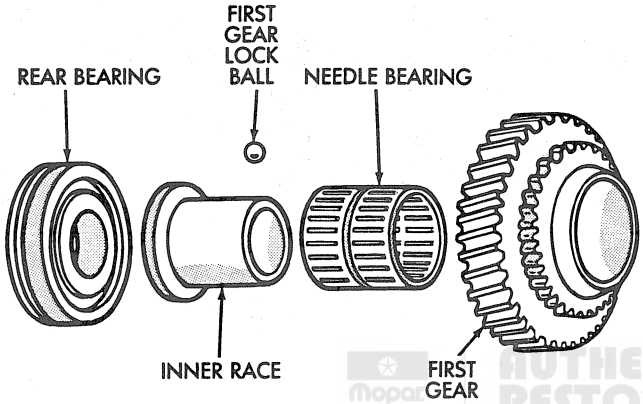


Fig. 82 Assembling First Gear Components

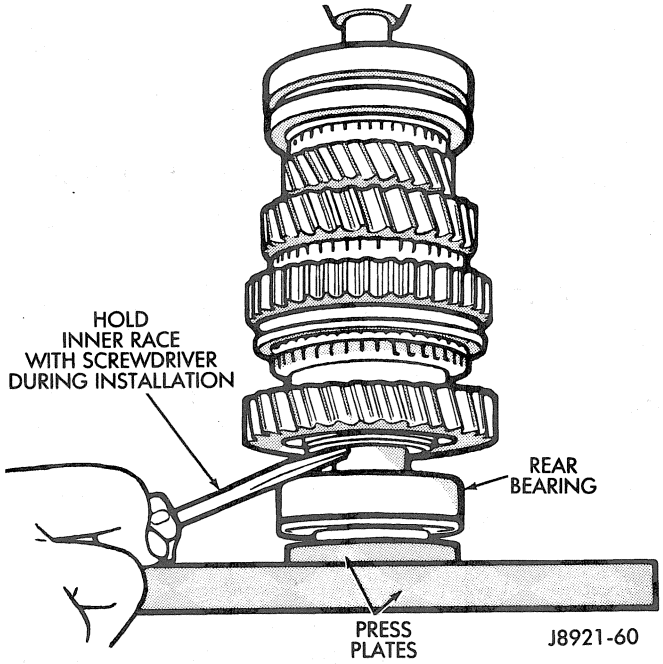


Fig. 83 Installing Output Shaft Rear Bearing

(15) Check first–second gear thrust clearance (Fig. 84). Standard clearance is 0.10 – 0.25 mm (0.004 – 0.010 in.).

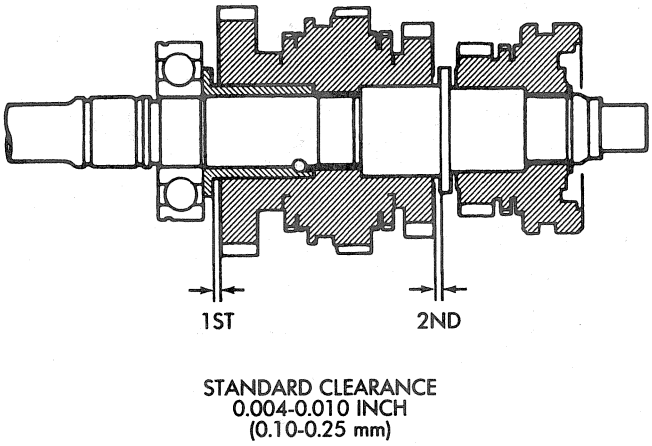


Fig. 84 Checking First–Second Gear Thrust Clearance

(16) Press fifth gear on output shaft (Fig. 85).

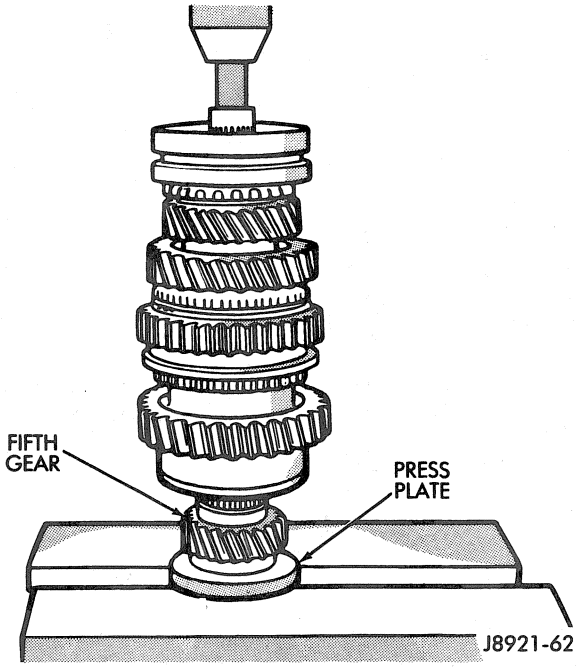
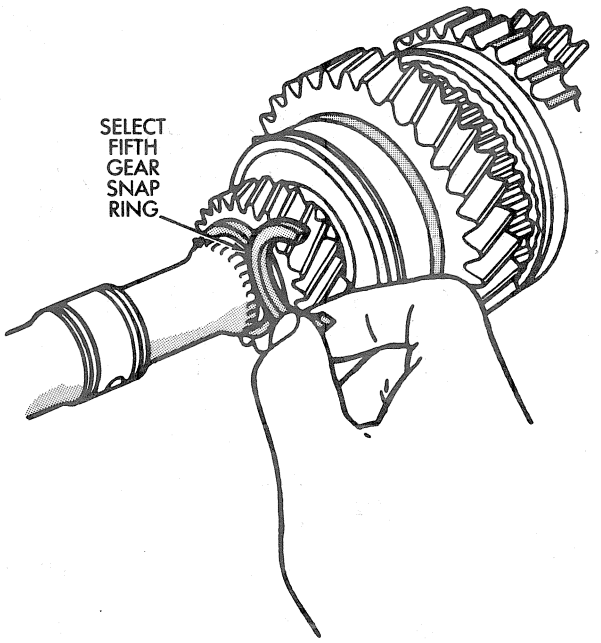
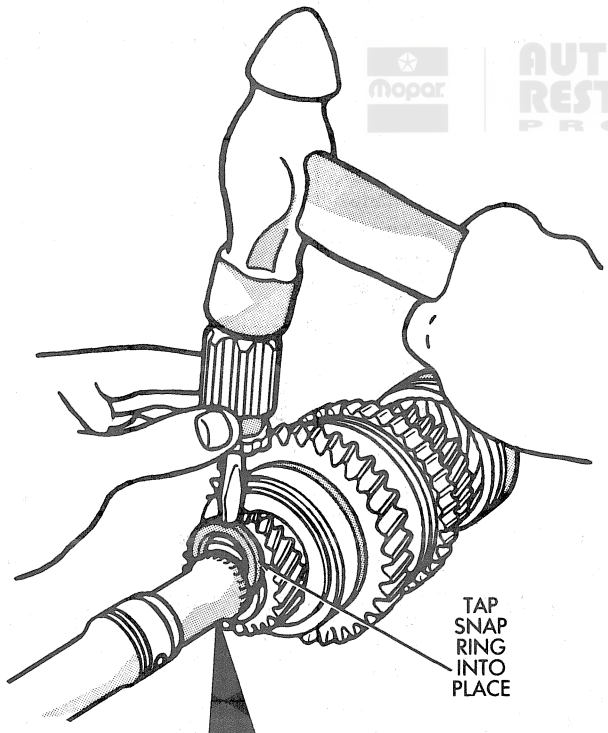


Fig. 85 Installing Output Shaft Fifth Gear

DISASSEMBLY AND ASSEMBLY (Continued)





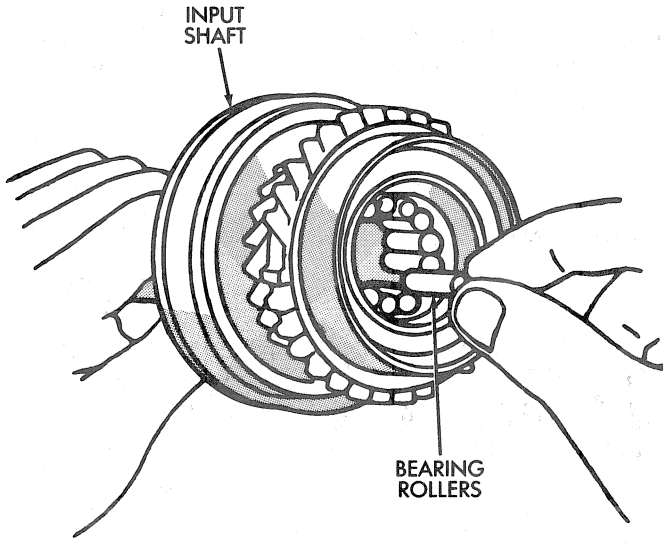
I.D. Mark	Snap Ring Thickness mm (in.)
A	2.67-2.72 (0.1051-0.1071)
B	2.73-2.78 (0.1075-0.1094)
C	2.79-2.84 (0.1098-0.1118)
D	2.85-2.90 (0.1122-0.1142)
E	2.91-2.96 (0.1146-0.1165)
F	2.97-3.02 (0.1169-0.1189)
G	3.03-3.08 (0.1193-0.1213)
H	3.09-3.14 (0.1217-0.1236)
J	3.15-3.20 (0.1240-0.1260)
K	3.21-3.26 (0.1264-0.1283)
L	3.27-3.32 (0.1287-0.1307)

J8921-63

Fig. 86 Selecting/Installing Fifth Gear Snap Ring

(17) Install fifth gear snap ring (Fig. 86). Use thickest snap ring that will fit in shaft groove.

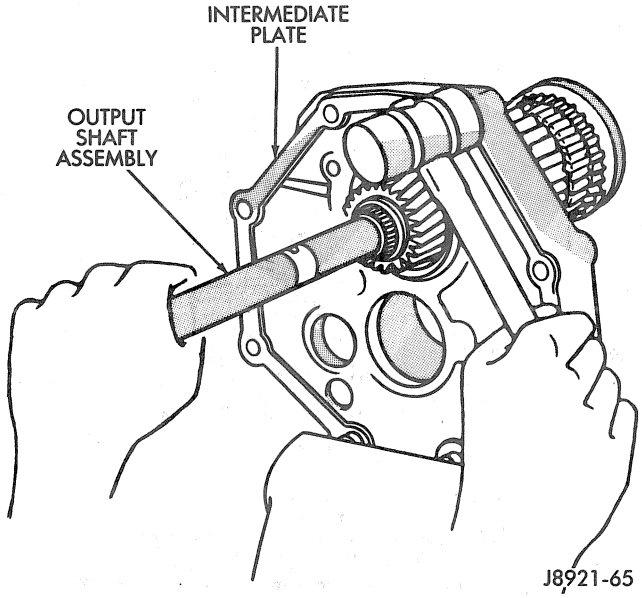
(18) Lubricate input shaft roller bearings with petroleum jelly and install rollers in shaft (Fig. 87).



J8921-64

Fig. 87 Installing Input Shaft Bearing Rollers

(19) Install output shaft assembly in intermediate plate (Fig. 88). Tap plate with mallet and pull on shaft to seat assembly.



J8921-65

Fig. 88 Installing Output Shaft In Intermediate Plate

DISASSEMBLY AND ASSEMBLY (Continued)

(20) Install input shaft on output shaft.
(21) Install counter gear in intermediate plate (Fig. 89).

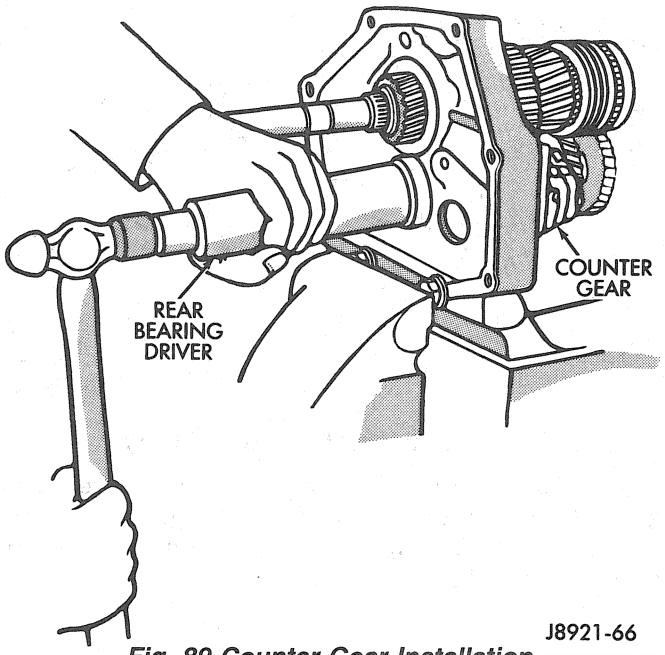


Fig. 89 Counter Gear Installation

(22) Install rear bearing snap ring and install bearing retainer (Fig. 90). Tighten retainer screws to 18 N·m (13 ft. lbs.) torque.

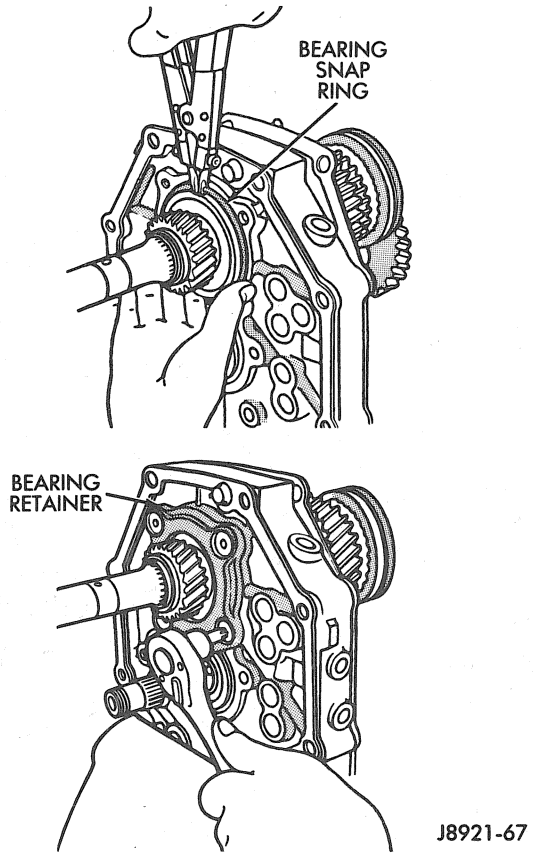


Fig. 90 Installing Bearing Retainer And Snap Ring

(23) Install reverse shift arm (Fig. 91). Tighten attaching bolt to 18 N·m (13 ft. lbs.) torque.

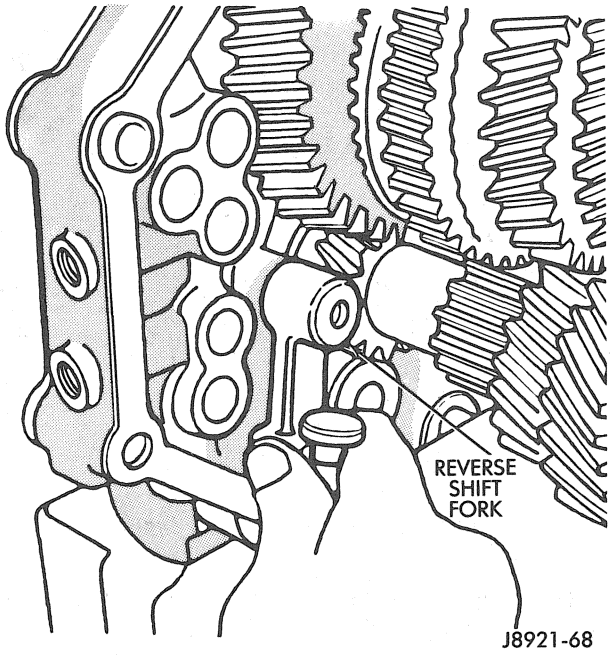


Fig. 91 Installing Reverse Shift Fork

(24) Install lock ball, spacer and needle bearing (Fig. 92) on counter shaft.
(25) On AX 5, assemble counter fifth gear and synchro components (Figs. 42 and 62).

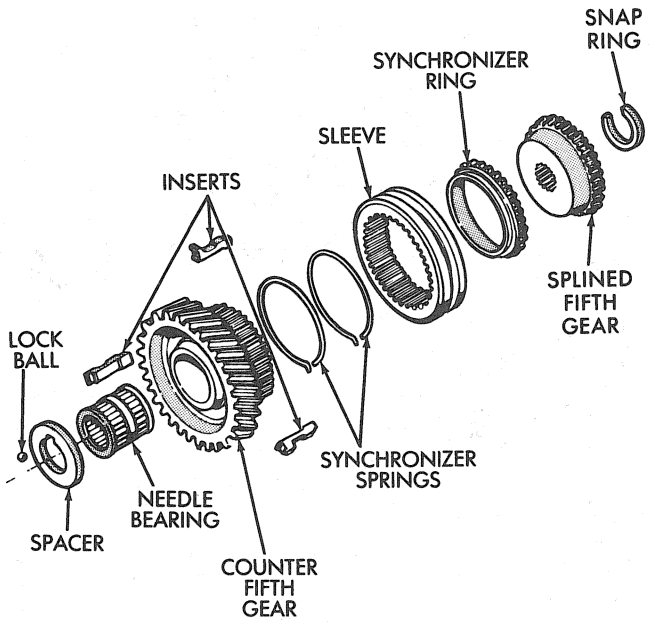


Fig. 92 Counter Fifth Gear And Synchronizer Assembly (AX 5)

DISASSEMBLY AND ASSEMBLY (Continued)

(26) On AX 5, install assembled gear and synchronizer on counter shaft (Fig. 93).

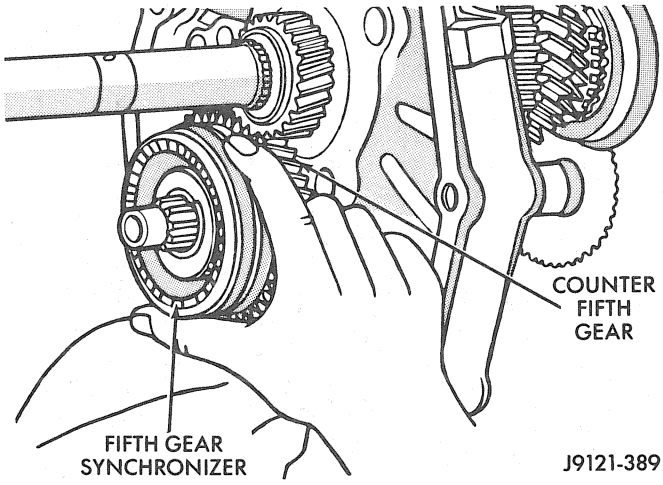


Fig. 93 Fifth Gear And Synchronizer Installation (AX 5)

(27) Install remaining synchronizer ring and spline fifth gear (Fig. 94). Use length of pipe to tap gear into place.

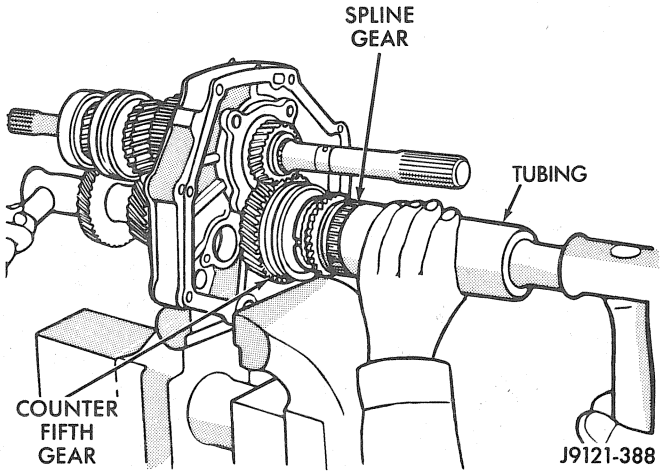


Fig. 94 Installing Fifth Gear (AX 5)

(28) Shift 1–2 and 3–4 synchronizer sleeves into gear to lock output shaft and counter gear (Fig. 58).

(29) On AX 4, install oil slinger and lock nut on counter gear (Fig. 95).

Mopar AUTHENTIC RESTORATION PRODUCT

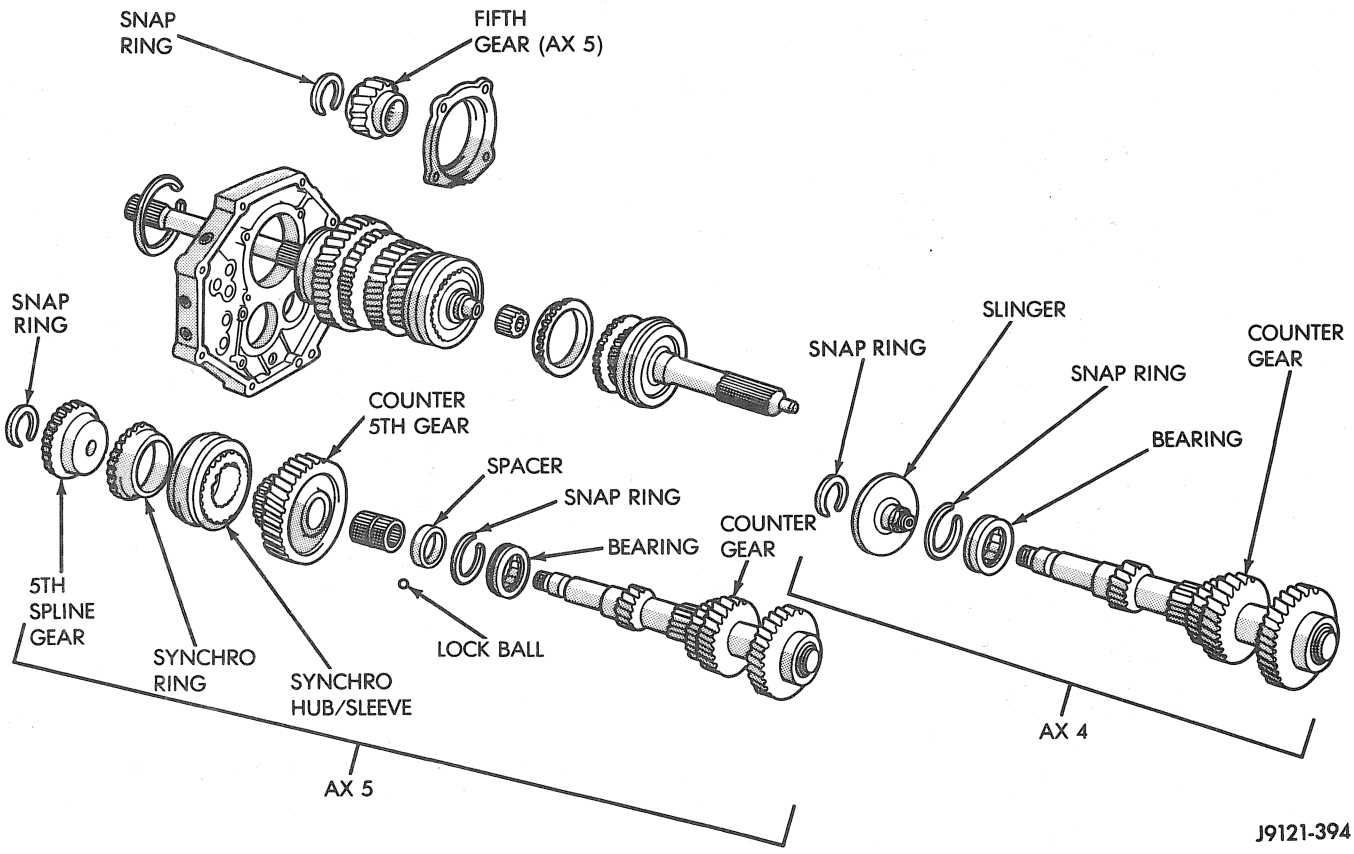


Fig. 95 Counter Gear Components

DISASSEMBLY AND ASSEMBLY (Continued)

(30) On AX 5, install fifth gear snap ring (Fig. 96).

(31) Disengage 1–2 and 3–4 synchronizer sleeves.

(32) On AX 5, check counter fifth gear thrust clearance (Fig. 97). Standard clearance is 0.10 – 0.30 mm (0.004 – 0.010 in.). Adjust clearance with different thickness snap ring if necessary.

Mopar AUTHENTIC RESTORATION PRODUCT

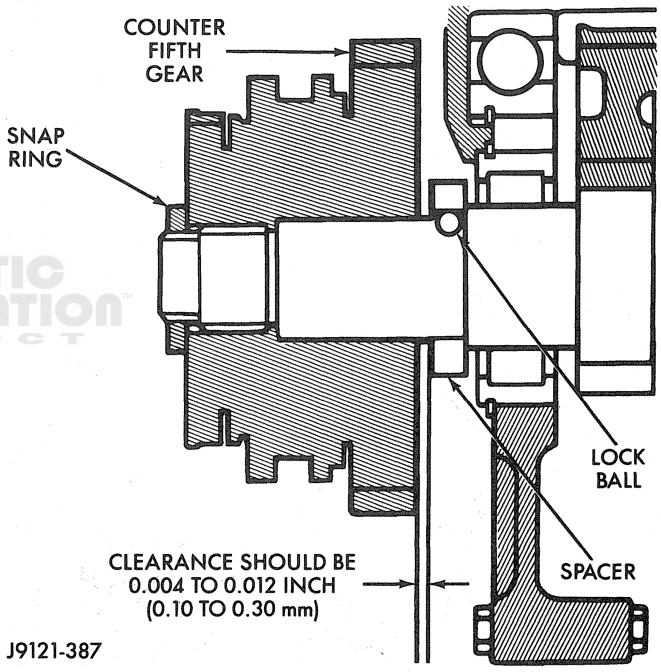
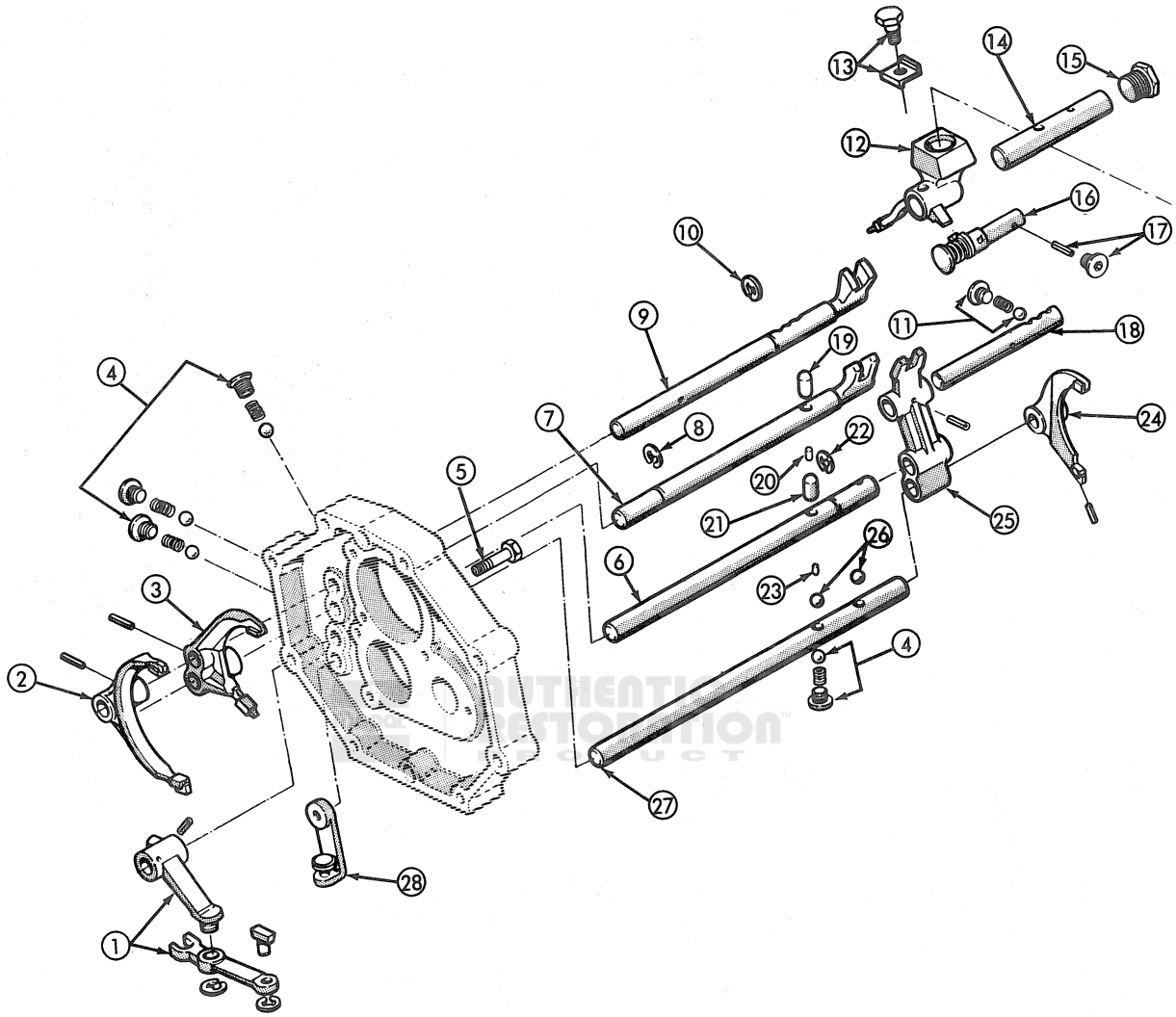


Fig. 96 Checking Fifth Gear Thrust Clearance (AX 5)

DISASSEMBLY AND ASSEMBLY (Continued)



1. REVERSE FORK AND SHIFT ARM
2. 1-2 SHIFT FORK
3. 3-4 SHIFT FORK
4. LOCK BALL, SPRING AND PLUG (AX 5)
5. BRACKET BOLT
6. NO. 3 SHIFT RAIL
7. NO. 1 SHIFT RAIL
8. C-RING
9. NO. 2 SHIFT RAIL
10. C-RING
11. LOCK BALL, SPRING AND PLUG
12. SHIFT ARM
13. SET BOLT AND LOCK PLATE
14. SHIFT LEVER SHAFT
15. SHAFT PLUG
16. REVERSE PIN
17. RETAINING PIN AND PLUG
18. NO. 5 SHIFT RAIL
19. INTERLOCK PIN
20. INTERLOCK PIN
21. INTERLOCK PIN
22. C-RING
23. INTERLOCK PIN
24. FIFTH-REVERSE FORK (AX 5)
25. REVERSE SHIFT HEAD
26. LOCK BALLS (AX 5)
27. NO. 4 SHIFT RAIL (AX 5)
28. REVERSE ARM BRACKET

J9021-122

Fig. 97 Shift Components

CLEANING AND INSPECTION

AX 4/5 MANUAL TRANSMISSION COMPONENTS

Clean the transmission components in solvent. Dry the cases, gears, shift mechanism and shafts with compressed air. **Dry the bearings with clean, dry shop towels only. Never use compressed air on the bearings. This could cause severe damage to the bearing roller and race surfaces.**

Inspect the transmission case. Replace the case if cracked, porous, or if any of the bearing and gear bores are damaged.

Check thickness of the output shaft and inner bearing race flanges with a micrometer or vernier calipers (Fig. 98).

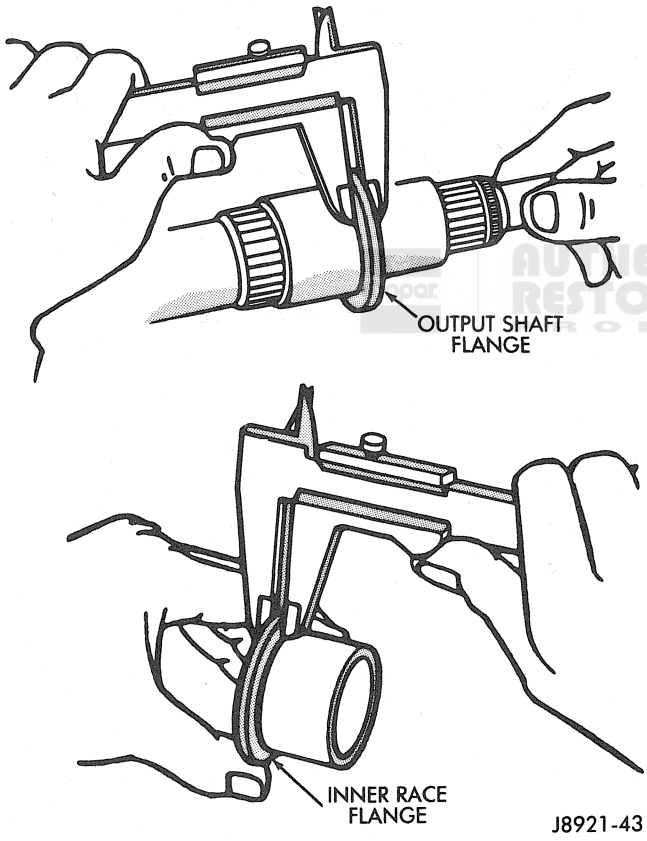


Fig. 98 Checking Shaft And Bearing Race Flange Thickness

- Minimum thickness for shaft flange is 4.8 mm (0.189 in.)
- Minimum thickness for bearing race flange is 3.99 mm (0.157 in.)

Measure diameter of the output shaft journal surfaces with a micrometer. Replace the shaft if either of these surfaces are worn beyond specified limits.

- Second gear surface minimum diameter is 37.96 mm (1.495 in.)
- Third gear surface minimum diameter is 34.98 mm (1.377 in.)

Measure output shaft runout with a dial indicator (Fig. 99). Runout should not exceed 0.05 mm (0.002 in.).

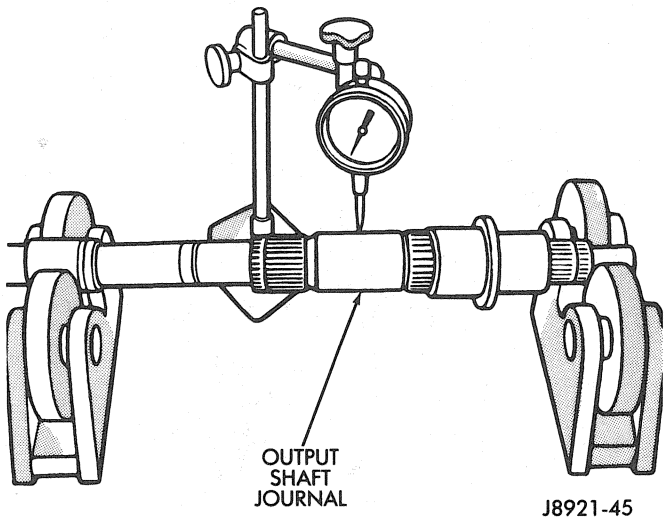


Fig. 99 Checking Output Shaft Runout

Install the needle bearing and inner race in the first gear. Then check oil clearance between the gear and inner race (Fig. 100). Clearance should be 0.009 – 0.032 mm (0.0004 – 0.0013 in.).

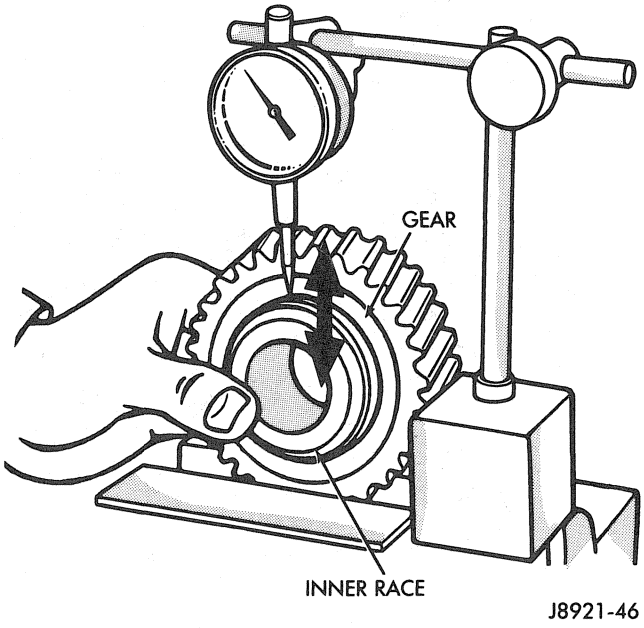


Fig. 100 Checking Gear–To–Race Clearance

Install the needle bearings and the second, third and counter fifth gears on the output shaft. Then check oil clearance between the gears and shaft with a dial indicator (Fig. 101). Oil clearance for all three gears is 0.009 – 0.0013 mm (0.0004 – 0.0013 in.).

Check synchronizer ring wear (Fig. 102). Insert each ring in matching gear. Measure clearance

CLEANING AND INSPECTION (Continued)

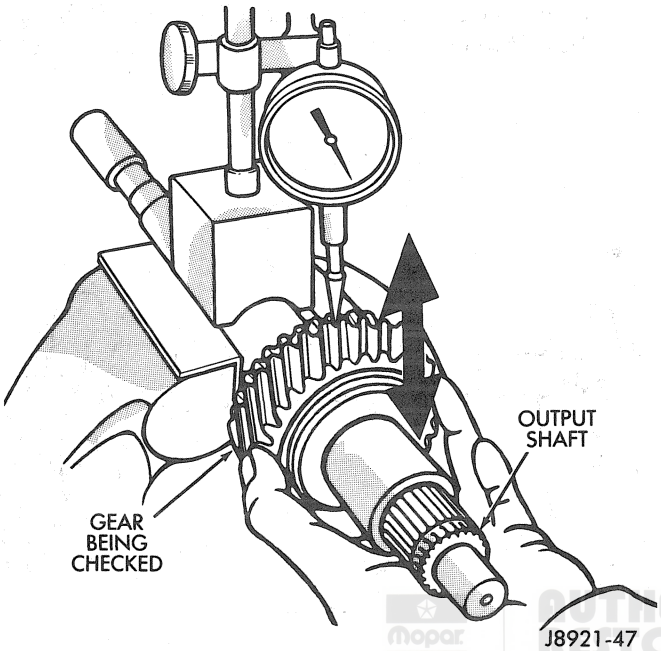


Fig. 101 Checking Gear–To–Shaft Oil Clearance

between each ring and gear with feeler gauge. Replace ring if clearance exceeds 2.0 mm (0.078 in.).

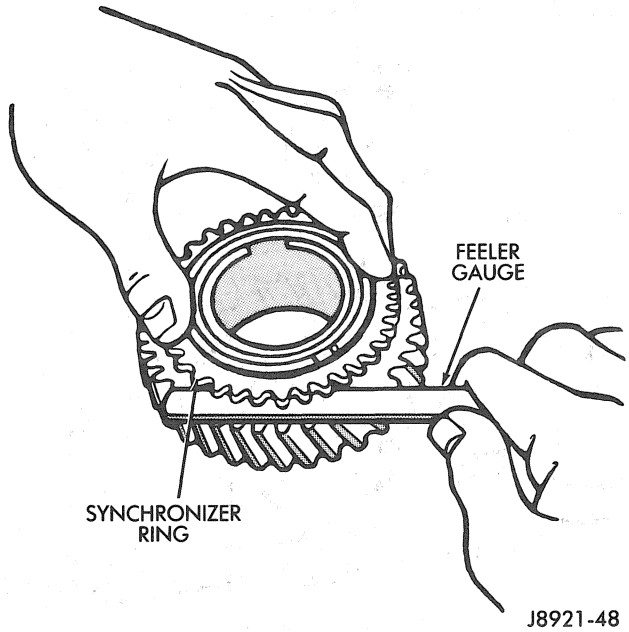


Fig. 102 Checking Synchronizer Ring Wear

Check shift fork–to–synchronizer hub clearance with a feeler gauge (Fig. 103). Replace the fork if clearance exceeds 1.0 mm (0.039 in.).

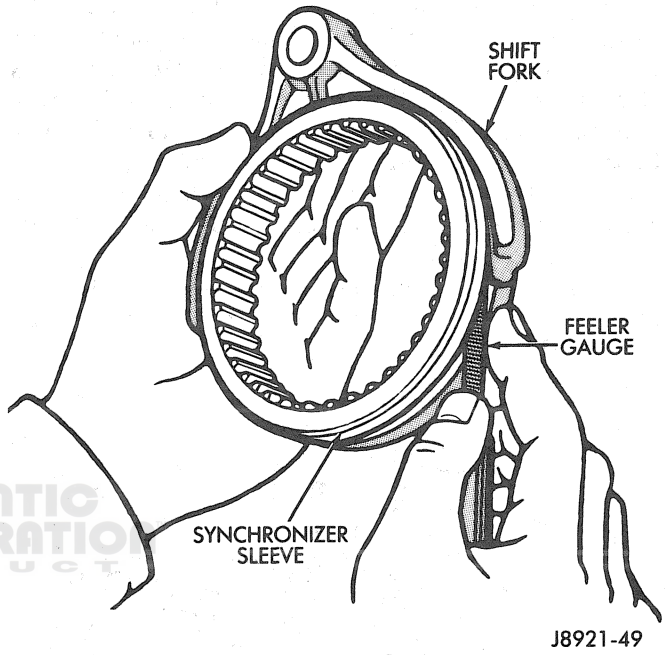


Fig. 103 Checking Fork–To–Hub Clearance

SPECIFICATIONS

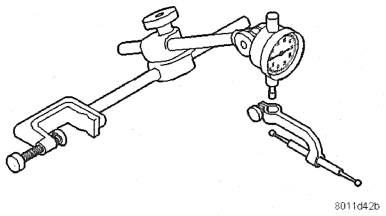
AX4/5 MANUAL TRANSMISSION TORQUE

Description	Torque
Access Plugs	19 N•m (14 ft. lbs.)
Adapter Housing Bolts	37 N•m (27 ft. lbs.)
Backup Light Switch	37 N•m (27 ft. lbs.)
Drain and Fill Plugs	37 N•m (27 ft. lbs.)
Front Bearing Retainer Bolts	17 N•m (12 ft. lbs.)
Interlock and Detent Ball Plugs	19 N•m (14 ft. lbs.)
Propeller Shaft Clamp Screws	16-23 N•m (140-200 in. lbs.)
Rear Mount-To-Transmission Bolts	33-60 N•m (24-44 ft. lbs.)
Rear Mount Clevis Bolt/Nut	54-75 N•m (40-55 ft. lbs.)
Rear Mount-To-Crossmember Nuts	33-49 N•m (24-36 ft. lbs.)
Restrictor Pins	19 N•m (14 ft. lbs.)
Reverse Shift Arm Bracket Bolts	18 N•m (13 ft. lbs.)
Shift Arm Set Screw	38 N•m (28 ft. lbs.)
Shift Fork Set Screws	20 N•m (15 ft. lbs.)
Shift Knob Nut	20-34 N•m (15-25 ft. lbs.)
Shift Lever Floor Cover Screws	2-3 N•m (17-30 in. lbs.)
Shift Tower Bolts	18 N•m (13 ft. lbs.)
Transfer Case Mounting Nuts	30-41 N•m (22-30 ft. lbs.)

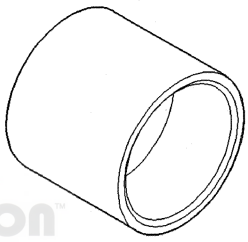
J9321-89

SPECIAL TOOLS

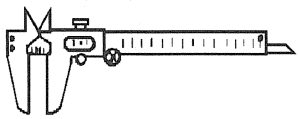
AX4/5



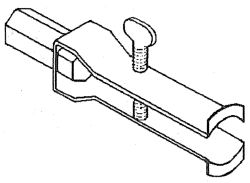
C-3339 Dial Indicator Set



C-3995-A Installer, Extension Housing Seal



C-4959 Caliper, Metric Vernier



7794-A Puller, Bearing & Seal

AX15 MANUAL TRANSMISSION

INDEX

	page
GENERAL INFORMATION	
GENERAL INFORMATION	36
TRANSMISSION ASSEMBLY INFORMATION	38
TRANSMISSION GEAR RATIOS	38
TRANSMISSION IDENTIFICATION	37
TRANSMISSION LUBRICANT	37
TRANSMISSION SHIFT PATTERN	37
TRANSMISSION SWITCH AND PLUG LOCATIONS	37
DIAGNOSIS AND TESTING	
HARD SHIFTING	38
LOW LUBRICANT LEVEL	38
TRANSMISSION NOISE	38
REMOVAL AND INSTALLATION	
TRANSMISSION	38
DISASSEMBLY AND ASSEMBLY	
ADAPTER HOUSING	40
FIFTH GEAR AND SYNCHRO ASSEMBLY	48
GEAR CASE	45
OUTPUT SHAFT AND CLUSTER GEAR	61
OUTPUT SHAFT	64
SHIFT RAIL AND FORK	54
CLEANING AND INSPECTION	
AX15 COMPONENTS	68
AX15 TRANSMISSION	67
SPECIFICATIONS	
AX15 MANUAL TRANSMISSION	69
SPECIAL TOOLS	
AX15	71

GENERAL INFORMATION

GENERAL INFORMATION

The AX 15 is a 5–speed, synchromesh, manual transmission. Fifth gear is an overdrive range with a ratio of 0.79:1. The shift mechanism is integral and mounted in the shift tower portion of the adapter housing (Fig. 1).

An adapter housing is used to attach the transmission to the transfer case on 4–wheel drive models. A standard extension housing is used on 2–wheel drive models.

The AX 15 is used with a 4.0L engine. The AX 15 is used for two and four–wheel drive applications.

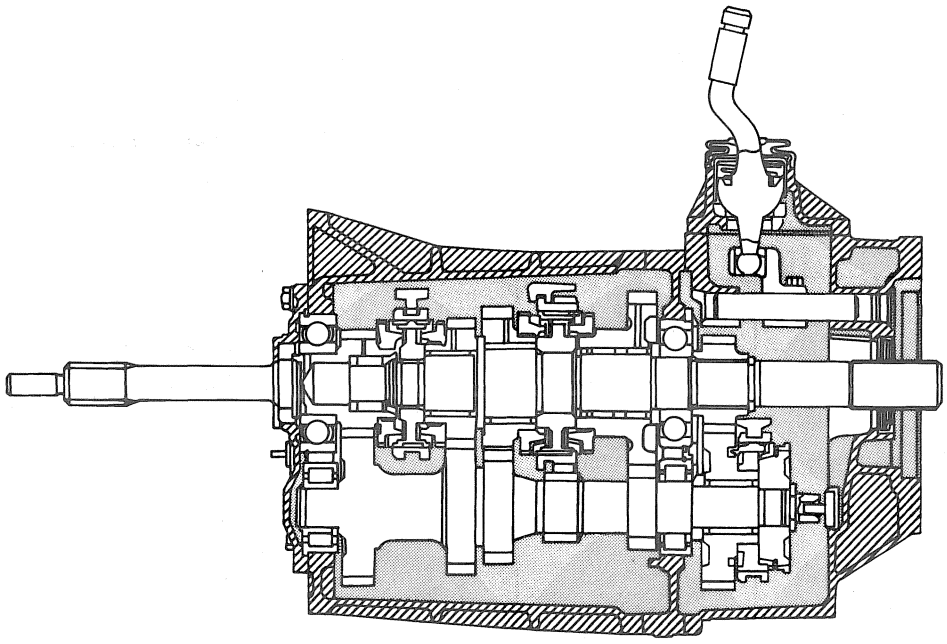


Fig. 1 AX 15 Manual Transmission

GENERAL INFORMATION (Continued)

TRANSMISSION IDENTIFICATION

The AX 15 identification code numbers are on the bottom surface of the transmission gear case (Fig. 2).

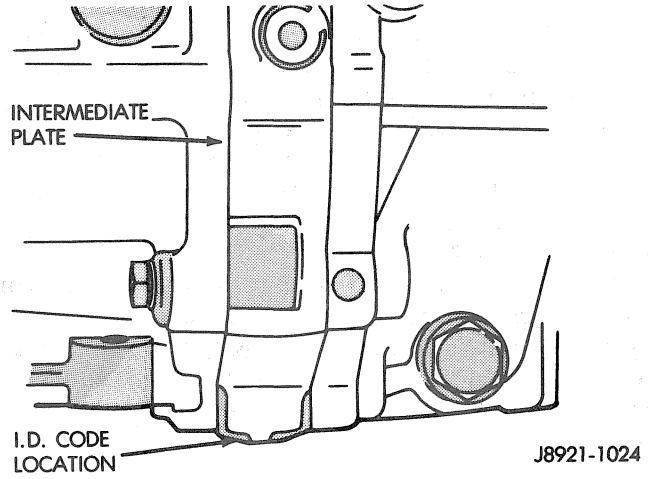


Fig. 2 Identification Code Number Location

The first number is year of manufacture. The second and third numbers indicate month of manufacture. The next series of numbers is the transmission serial number.

TRANSMISSION SHIFT PATTERN

The AX 15 shift pattern is shown in (Fig. 3). First and second and third and fourth gear ranges are in line for improved shifting. Fifth and reverse gear ranges are also in line at the extreme right of the pattern (Fig. 3).

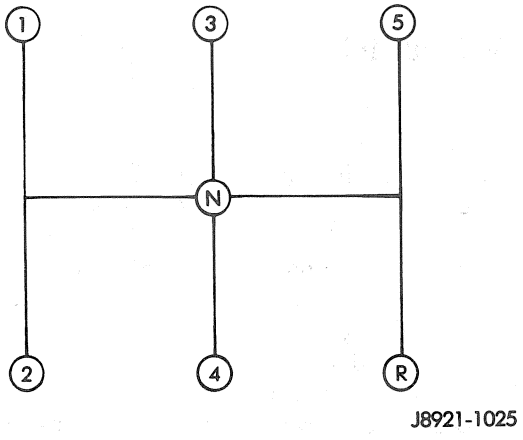


Fig. 3 AX 15 Shift Pattern

The AX 15 is equipped with a reverse lockout mechanism. The shift lever must be moved through the Neutral detent before making a shift to reverse.

TRANSMISSION LUBRICANT

Recommended lubricant for AX 15 transmissions is Mopar 75W–90, API Grade GL–5 gear lubricant, or equivalent.

Correct lubricant level is from the bottom edge, to no more than 6 mm (1/4 in.) below the bottom edge of the fill plug hole.

Approximate dry fill lubricant capacity is:

- 3.10 liters (3.27 qts.) in 4–wheel drive models
- 3.15 liters (3.32 qts.) in 2–wheel drive models

TRANSMISSION SWITCH AND PLUG LOCATIONS

The fill plug is at the driver side of the gear case (Fig. 4).

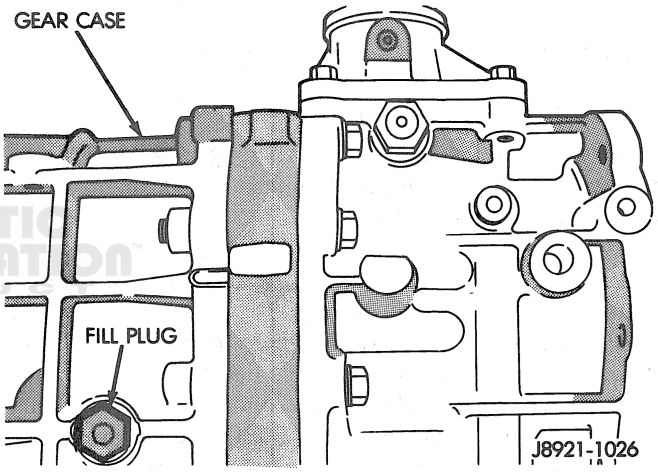


Fig. 4 Fill Plug Location

The drain plug and backup light switch are on the passenger side of the gear case (Fig. 5).

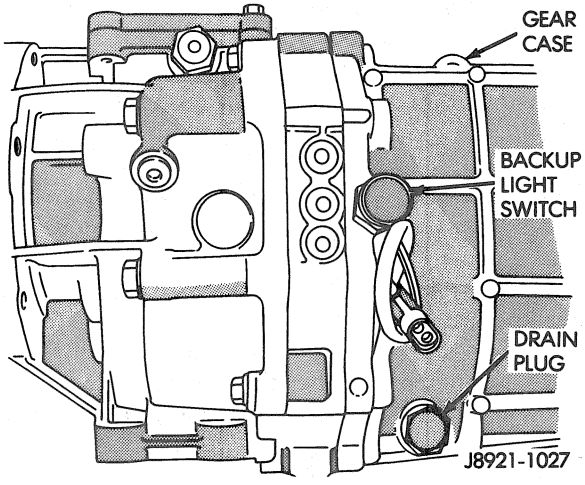


Fig. 5 Drain Plug/Backup Light Switch Location

GENERAL INFORMATION (Continued)

TRANSMISSION GEAR RATIOS

AX 15 gear ratios are:

- First gear 3.83:1
- Second gear 2.33:1
- Third gear 1.44:1
- Fourth gear 1.00:1
- Fifth gear 0.79:1
- Reverse 4.22:1

TRANSMISSION ASSEMBLY INFORMATION

Lubricate the transmission components with gear lubricant during assembly. Use petroleum jelly to lubricate seal lips and/or hold parts in place during installation.

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adapter or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will usually be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non–recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing slip, grab and chatter.

Transmissions filled from air or electrically powered lubricant containers can be under filled. This generally happens when the container delivery mechanism is improperly calibrated. Always check the lubricant level after filling to avoid an under fill condition.

A correct lubricant level check can only be made when the vehicle is level; use a drive–on hoist to ensure this. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an under–or–over fill condition.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants, component damage, incorrect clutch adjustment, or by a damaged clutch pressure plate or disc.

Substantial lubricant leaks can result in gear, shift rail, synchro and bearing damage. If a leak goes undetected for an extended period, the first indications of a problem are usually hard shifting and noise.

Incorrect or contaminated lubricants can also contribute to hard shifting. The consequence of using non–recommended lubricants is noise, excessive wear, internal bind and hard shifting.

Improper clutch release is a frequent cause of hard shifting. Incorrect adjustment or a worn, damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result.

Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear–in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears can generate a mild whine that may only be audible at extreme speeds.

Severe, obviously audible transmission noise is generally the result of a lubricant problem. Insufficient, improper, or contaminated lubricant can promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL AND INSTALLATION

TRANSMISSION

REMOVAL

(1) Shift transmission into first or third gear.

(2) Raise vehicle on a hoist.

(3) Disconnect necessary exhaust system components.

(4) Support transmission with adjustable jack stand.

(5) Disconnect rear cushion and mounting bracket from transmission, or transfer case.

(6) Remove rear crossmember.

(7) Disconnect transmission shift linkage, speedometer cable, transfer case vacuum lines and clutch hydraulic lines.

(8) Lower transmission–transfer case assembly no more than 7.6 cm (3 in.) for access to shift lever.

(9) Reach up and around transmission case and unseat shift lever dust boot from transmission shift tower (Fig. 6). Move boot upward on shift lever for access to lever retainer.

(10) Disengage shift lever as follows:

REMOVAL AND INSTALLATION (Continued)

(a) Reach up and around transmission case and press shift lever retainer downward with your fingers.

(b) Turn retainer counterclockwise to release it.

(c) Lift lever and retainer out of shift tower (Fig. 6). **It is not necessary to remove shift lever from floorpan boot. Simply leave lever in place for later installation.**

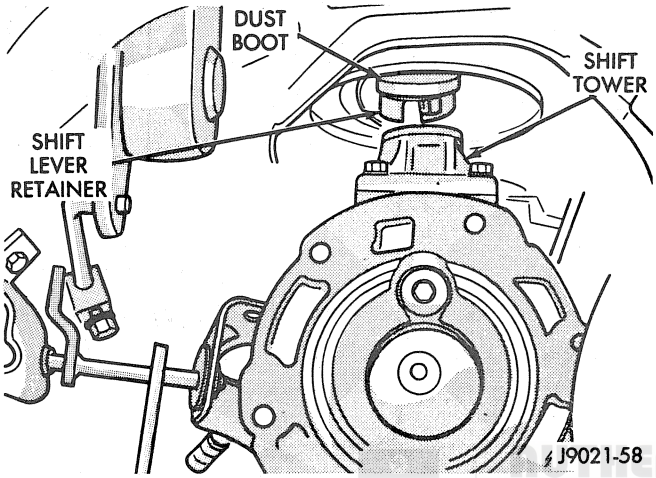


Fig. 6 Removing/Installing Shift Lever

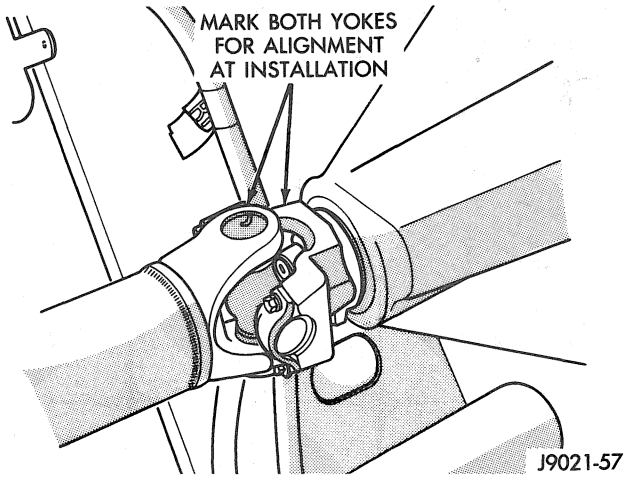


Fig. 7 Marking Propeller Shaft And Axle Yoke

(11) Mark front and rear propeller shafts for installation alignment (Fig. 7). Then remove both shafts.

(12) Remove crankshaft position sensor (Fig. 8).

(13) Disconnect transmission and transfer case vent hoses.

(14) Remove slave cylinder from clutch housing.

(15) Remove wire harnesses from clips/tie straps on transmission and transfer case.

(16) Support transmission–transfer case assembly with transmission jack. Secure assembly to jack with safety chains.

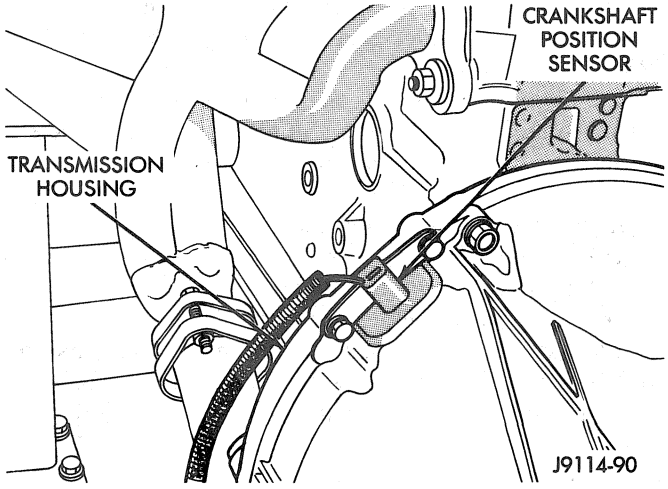


Fig. 8 Crankshaft Position Sensor Location

(17) Reposition adjustable jack stand under engine. Be sure to place wood block between jack and oil pan.

(18) Remove clutch housing brace rod.

(19) Remove clutch housing–to–engine bolts and remove transmission–transfer case assembly.

(20) Remove bolts attaching transmission to transfer case and separate components.

(21) Remove release bearing, fork and retainer clip.

(22) Remove clutch housing from transmission.

TRANSMISSION INSTALLATION

(1) Install clutch housing on transmission. Tighten housing bolts to 37 N·m (27 ft. lbs.) torque.

(2) Lubricate contact surfaces of release fork, lever and pivot ball stud. Then install bearing, fork and clip in clutch housing.

(3) Mount transmission on transmission jack. Secure transmission with safety chains.

(4) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar high temperature grease.

(5) Align transmission input shaft and clutch disc splines and install transmission.

(6) Install and tighten clutch housing–to–engine bolts to 38 N·m (28 ft. lbs.) torque. **Be sure housing is properly seated on engine before tightening bolts.**

(7) Lower transmission no more than 7.6 cm (3 in.) for access to the shift tower.

(8) Reach up and around the transmission and insert shift lever in shift tower. Press lever retainer downward and turn it clockwise to lock it in place. Then install lever dust boot on shift tower.

(9) Install and connect crankshaft position sensor.

REMOVAL AND INSTALLATION (Continued)

(10) Align and install transfer case on transmission. Tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.

(11) Connect transfer case vacuum and vent hoses.

(12) Install and connect transfer case shift linkage. Check and adjust linkage if necessary.

(13) Secure wire harnesses to clips/tie straps on transmission and transfer case.

(14) Connect backup light switch wires.

(15) Install clutch slave cylinder.

(16) Connect vehicle speed sensor wires.

(17) Install rear crossmember and attach cushion and bracket. Tighten crossmember–to–frame bolts to 41 N·m (30 ft. lbs.) torque. Tighten transmission–to–rear cushion and bracket bolts/nuts to 45 N·m (33 ft. lbs.) torque.

(18) Align and install front/rear propeller shafts. Tighten shaft U–joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(19) Install skid plate if removed. Tighten bolts to 42 N·m (31 ft. lbs.) torque. Tighten stud nuts to 17 N·m (150 in. lbs.) torque.

(20) Top off transmission and transfer lubricant levels.

(21) Remove supports and lower vehicle.

DISASSEMBLY AND ASSEMBLY

ADAPTER HOUSING

REMOVAL

(1) Remove release bearing, release lever and release fork from clutch housing. Then remove clutch housing from transmission.

(2) Remove backup light switch. Then remove drain plug (Fig. 9) and drain transmission lubricant into pan.

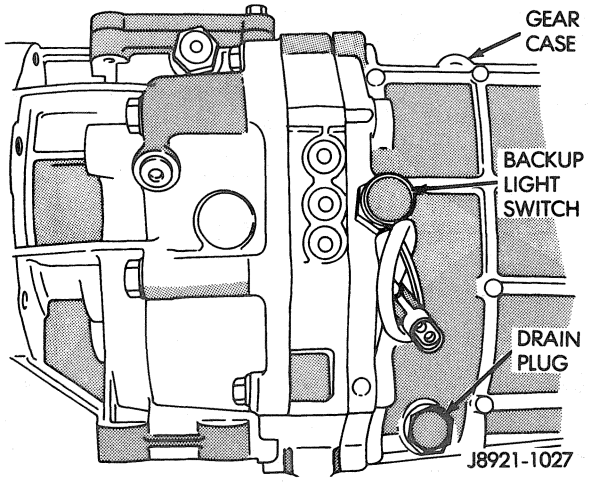


Fig. 9 Drain Plug And Backup Light Switch Location

(3) Remove shift tower bolts and remove tower from adapter or extension housing (Fig. 10).

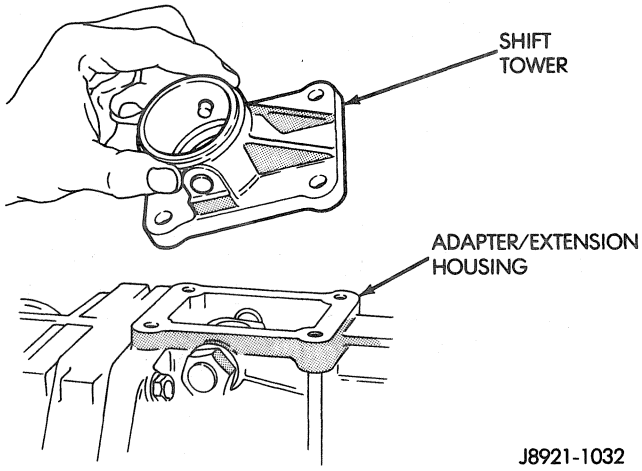


Fig. 10 Shift Tower Removal/Installation

(4) Remove gasket from shift tower (Fig. 11).

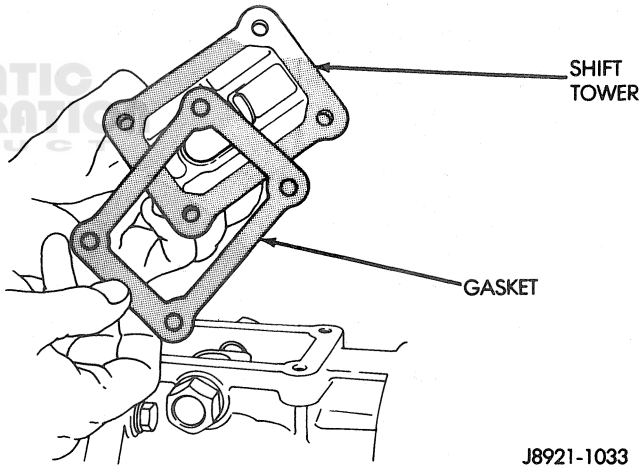


Fig. 11 Shift Tower Gasket Removal/Installation

(5) Remove shift arm retainer bolt (Fig. 12).

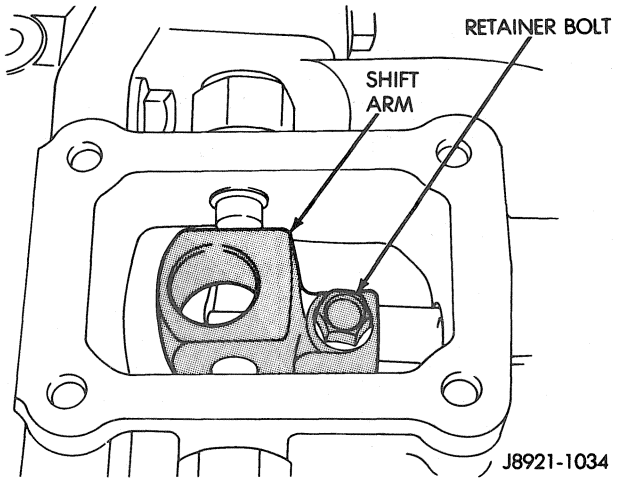


Fig. 12 Shift Arm Retainer Bolt Removal/Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Loosen and remove restrictor pins (Fig. 13).

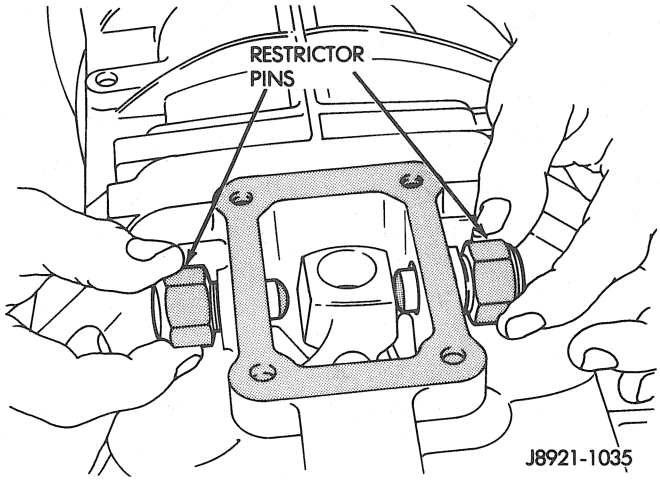


Fig. 13 Removing/Installing Restrictor Pins

(7) Remove shift arm shaft plug (Fig. 14).

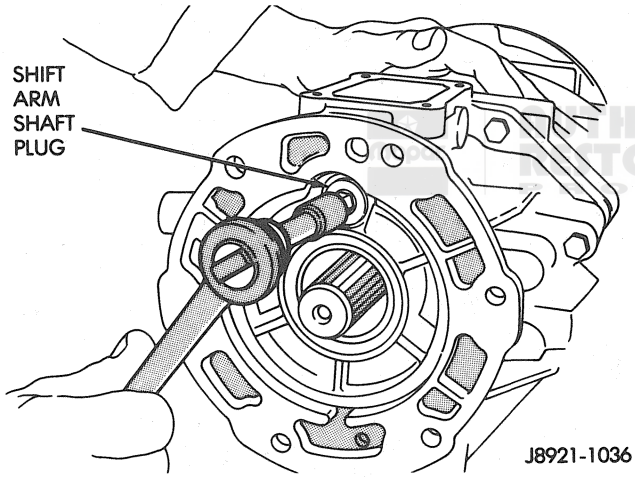


Fig. 14 Removing/Installing Shift Lever Shaft Plug

(8) Remove shift arm shaft with large magnet (Fig. 15).

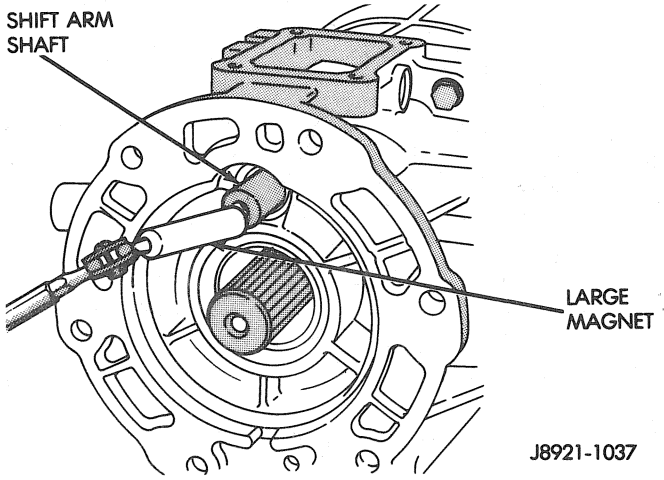


Fig. 15 Removing/Installing Shift Lever Shaft

(9) Remove shift arm (Fig. 16).

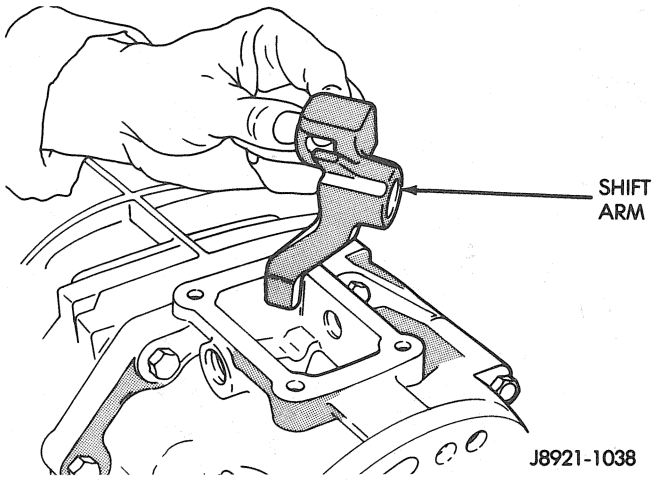


Fig. 16 Shift Arm Removal/Installation

(10) Remove plug for reverse shift head lock ball. Plug is at right side of adapter housing near backup light switch (Fig. 17).

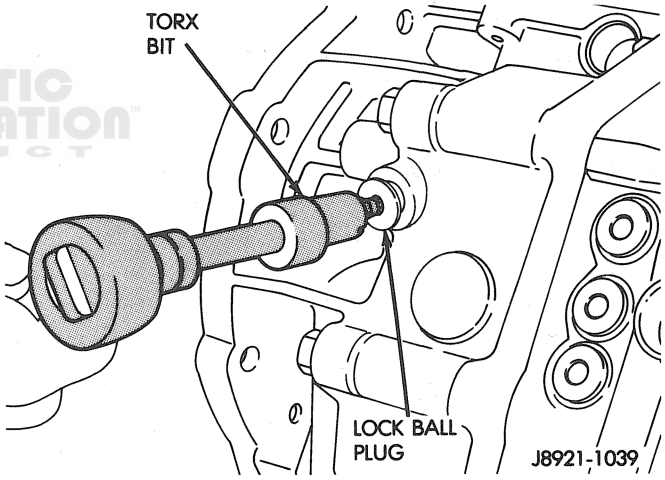


Fig. 17 Removing/Installing Lock Ball Plug

(11) Remove lock ball spring with pencil magnet (Fig. 18).

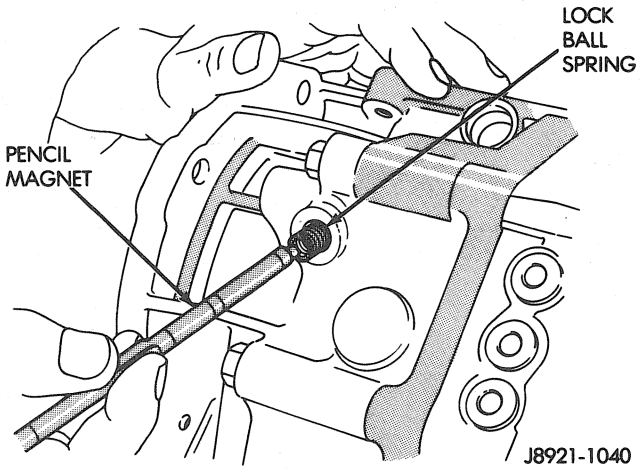


Fig. 18 Removing/Installing Lock Ball Spring

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Remove shift head lock ball with pencil magnet (Fig. 19).

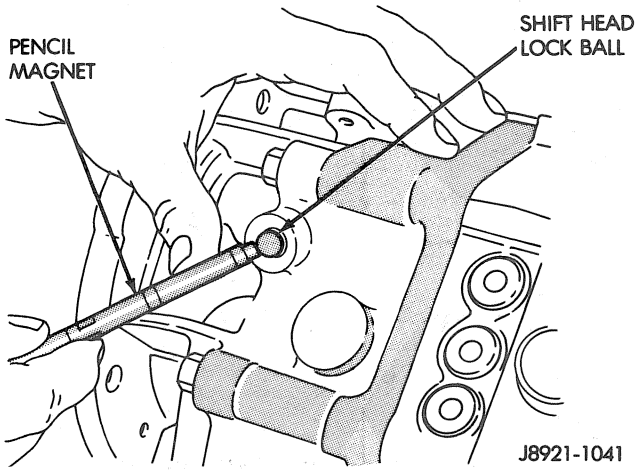


Fig. 19 Removing/Installing Shift Head Lock Ball

(13) Remove adapter housing bolts (Fig. 20).

(14) Loosen adapter/extension housing with rubber mallet (Fig. 21).

(15) Remove housing after loosening it (Fig. 22)

(16) Remove adapter housing oil seal with a pry tool (Fig. 23).

ADAPTER HOUSING INSTALLATION

(1) Inspect condition of reverse pin in adapter/extension housing (Fig. 24). If pin is worn or damaged, replace it as described in following steps.

(2) Remove roll pin access plug (Fig. 25).

(3) Tap roll pin out of housing with pin punch (Fig. 26). Then remove old reverse pin.

(4) Install new reverse pin and secure it with roll pin. Then install and tighten access plug to 19 N·m (14 ft. lbs.) torque.

(5) Clean sealing surfaces of adapter or extension housing and intermediate plate with wax and grease remover. Then wipe dry with a clean cloth.

(6) Apply 3 mm (1/8 in.) wide bead of Mopar Gasket Maker, or Loctite 518 to sealing surface of adapter or extension housing. Keep sealer bead inside bolt holes.

(7) Align and install adapter or extension housing on intermediate plate. Be sure housing is seated on intermediate plate dowel pins.

(8) Coat threads of housing attaching bolts with Mopar silicone sealer. Then install and tighten bolts to 37 N·m (27 ft. lbs.) torque.

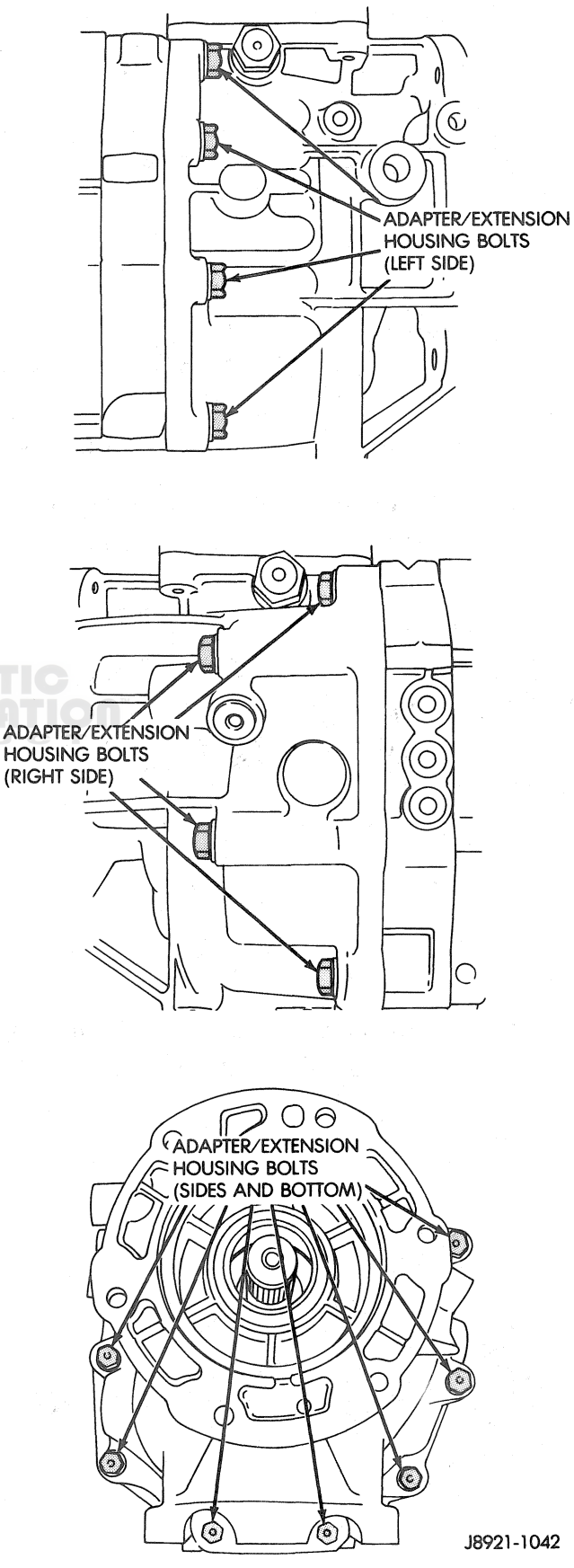


Fig. 20 Adapter Housing Bolt Locations

DISASSEMBLY AND ASSEMBLY (Continued)

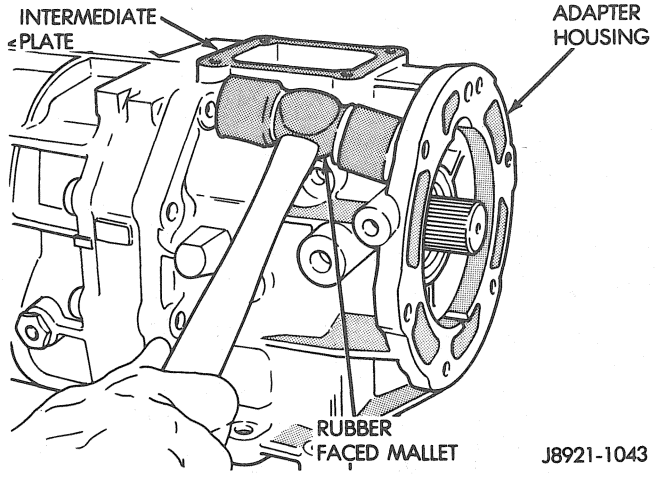


Fig. 21 Loosening Adapter Housing

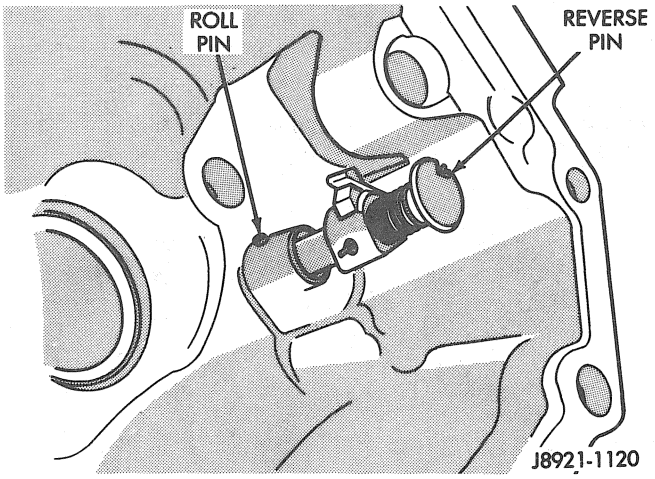


Fig. 24 Reverse Pin Position

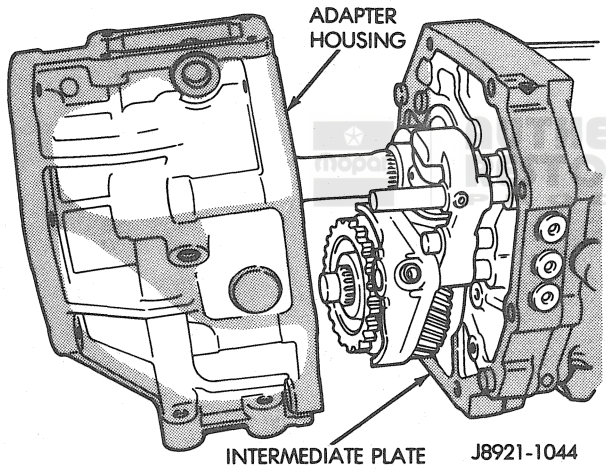


Fig. 22 Adapter Housing Removal

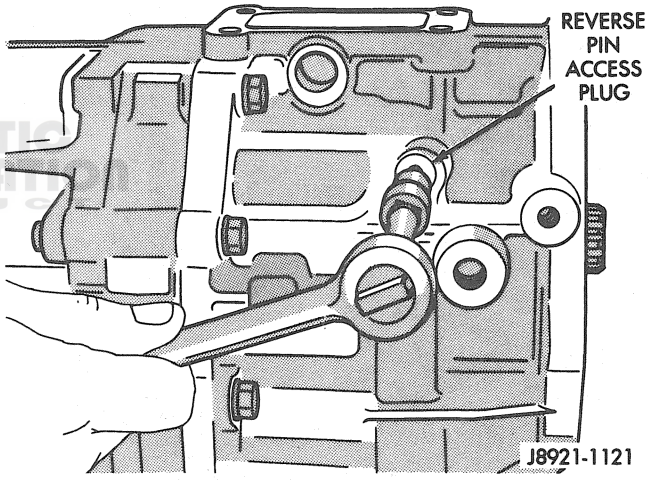


Fig. 25 Reverse Pin Access Plug Removal/ Installation

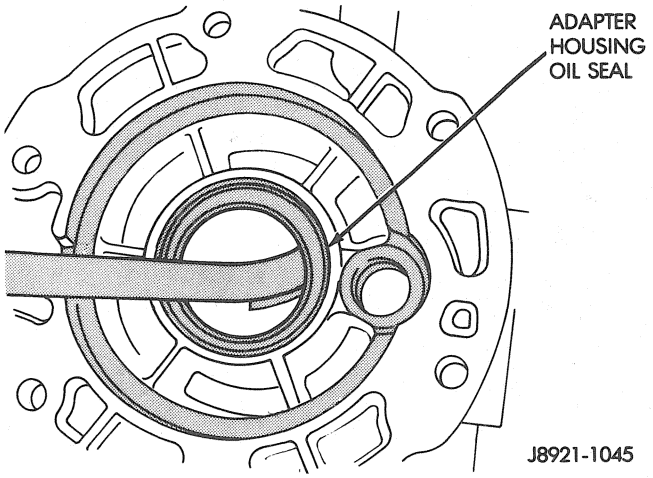


Fig. 23 Removing Adapter Housing Seal

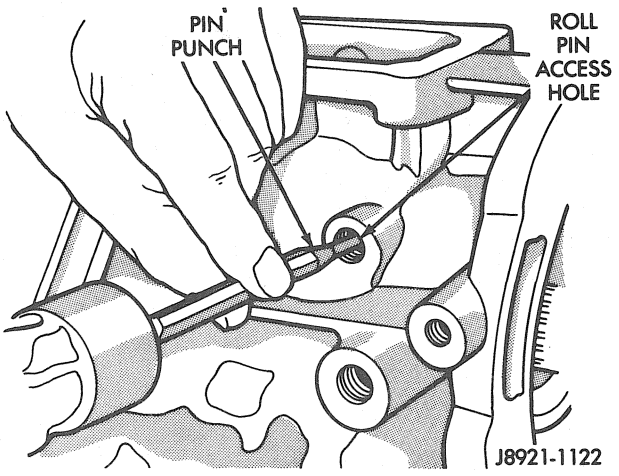


Fig. 26 Roll Pin Removal/Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Install reverse shift head detent ball (Fig. 27). Then install detent spring and plug. Tighten plug to 19 N.m (14 ft. lbs.) torque.

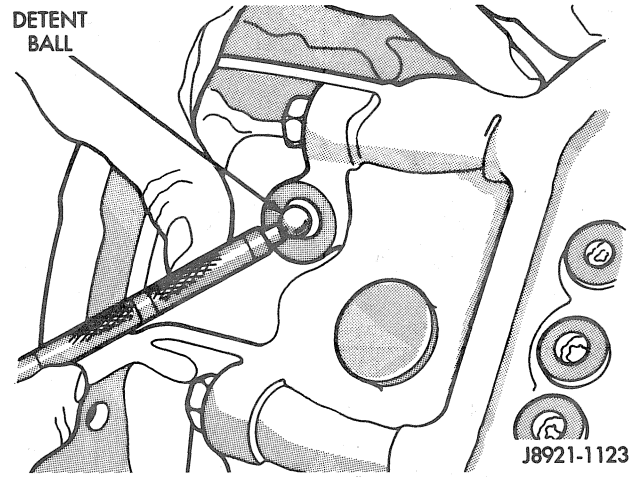


Fig. 27 Reverse Shift Head Detent Ball Installation

(10) Lubricate shift arm shaft and install it in adapter housing (Fig. 28).

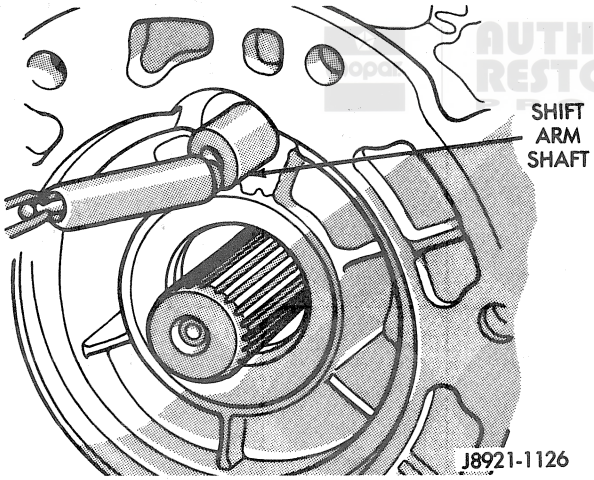


Fig. 28 Shift Arm Shaft Installation

(11) Position shift arm in adapter housing (Fig. 29). Be sure arm is engaged in shift rails.

(12) Align shift arm with shaft and push shaft into arm.

(13) Rotate shift arm shaft until set screw holes in shaft and arm are aligned.

(14) Install and tighten shift arm set screw to 38 N·m (28 ft. lbs.) torque (Fig. 30).

(15) Install and tighten restrictor pins to 19 N·m (14 ft. lbs.) torque (Fig. 30).

(16) Install and tighten shift arm shaft access plug to 19 N·m (14 ft. lbs.) torque (Fig. 31).

(17) Position new shift tower gasket on adapter housing.

(18) Install shift tower. Tighten tower attaching bolts to 18 N·m (13 ft. lbs.) torque.

(19) Install new gasket on backup light switch and install switch. Tighten switch to 37 N·m (27 ft. lbs.) torque.

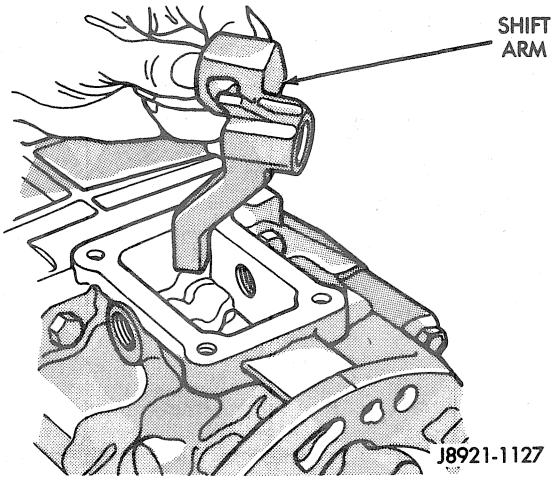


Fig. 29 Shift Arm Installation

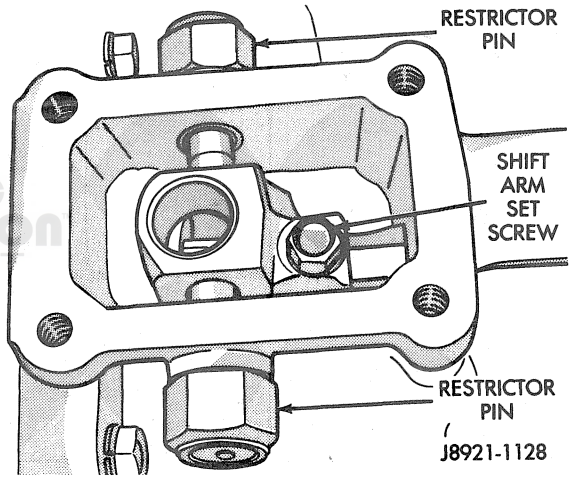


Fig. 30 Set Screw And Restrictor Pin Installation

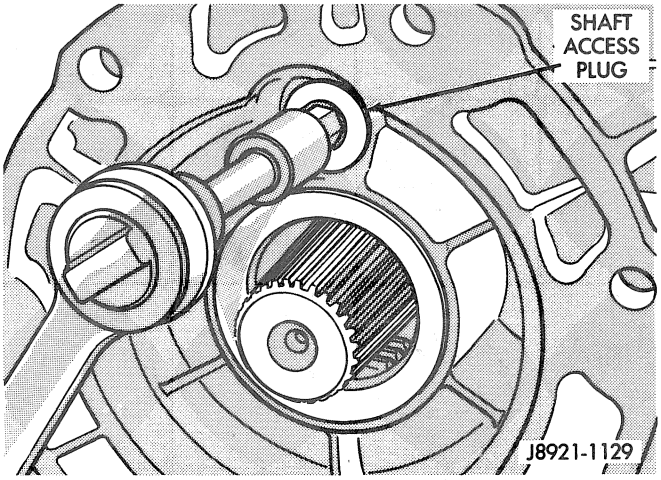


Fig. 31 Access Plug Installation

(20) Install new washer on drain plug. Then install and tighten plug to 37 N·m (27 ft. lbs.) torque.

(21) If transmission will be filled with gear lubricant before installation, place transmission in a level

DISASSEMBLY AND ASSEMBLY (Continued)

position. Then fill with Mopar 75W-90, grade GL-5 gear lubricant.

(22) Install new washer on fill plug. Then install and tighten plug to 37 N·m (27 ft. lbs.) torque.

(23) Install clutch housing and hydraulic concentric bearing.

(24) On models with extension housing, install new seal in housing with suitable size installer tool (Fig. 129). Lubricate seal lips with petroleum jelly before installation.

(25) On models with extension housing, install speedometer driven gear, speedometer adapter and speed sensor.

GEAR CASE

DISASSEMBLE

(1) Remove bearing retainer bolts and remove retainer (Fig. 32).

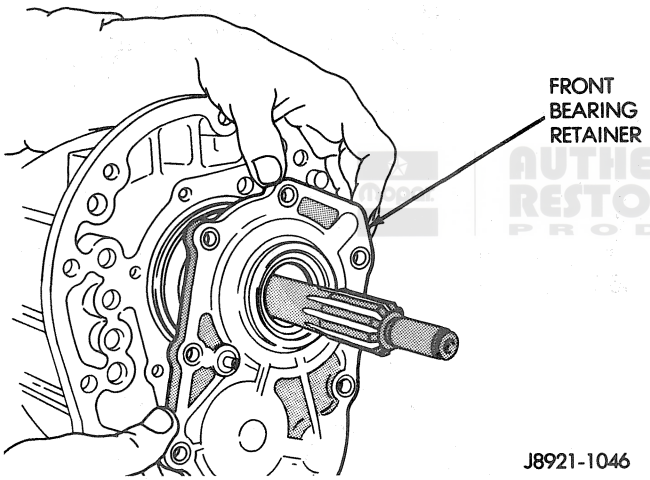


Fig. 32 Front Bearing Retainer Removal

(2) Remove retainer oil seal with pry tool (Fig. 33).

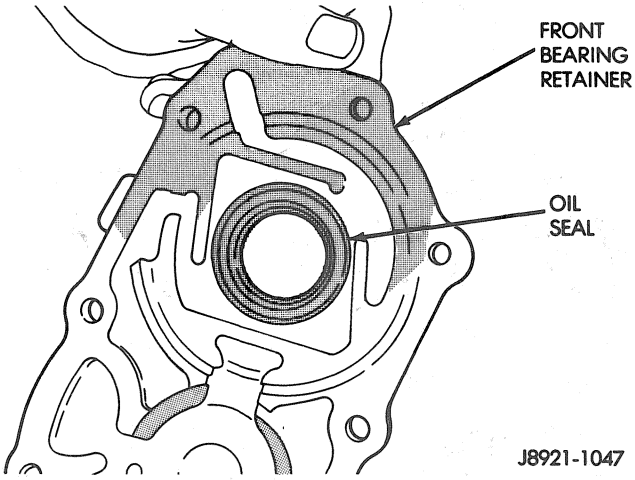


Fig. 33 Front Bearing Retainer Seal Location

(3) Remove input shaft bearing snap ring (Fig. 34).

(4) Remove cluster gear front bearing snap ring (Fig. 35).

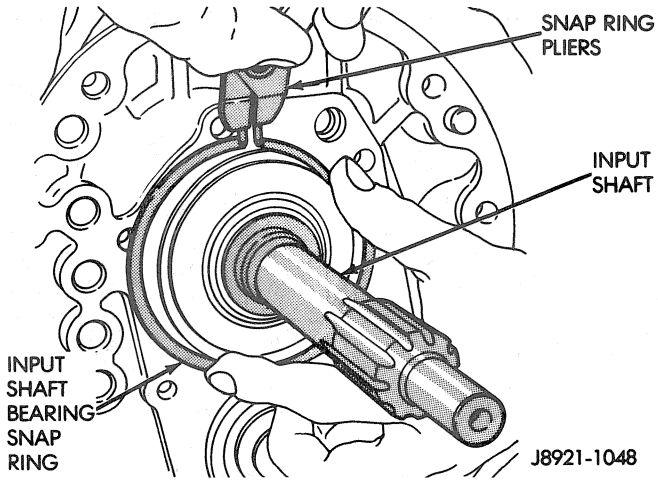


Fig. 34 Removing Input Shaft Bearing Snap Ring

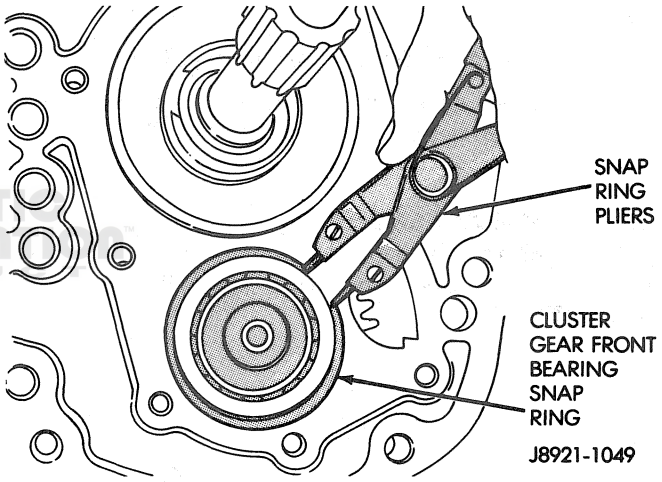


Fig. 35 Removing Cluster Gear Front Bearing Snap Ring

(5) Loosen gear case by tapping it away from intermediate plate with rubber mallet (Fig. 36).

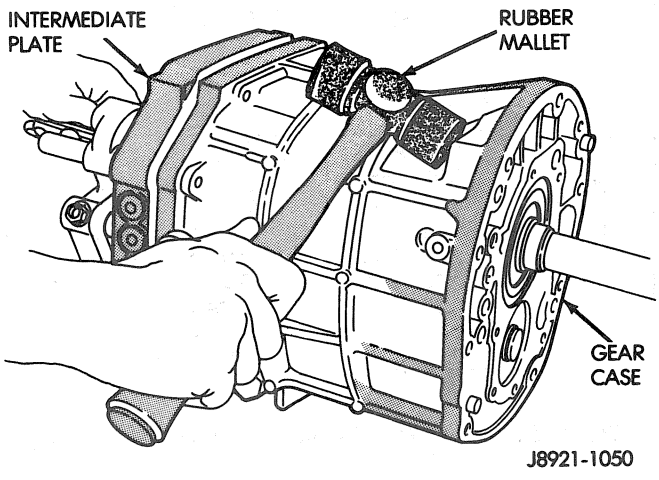


Fig. 36 Loosening Gear Case

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Remove gear case from geartrain and intermediate plate (Fig. 37).

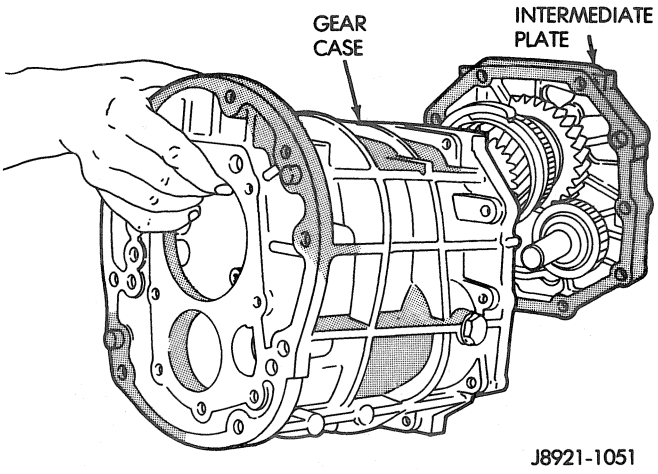
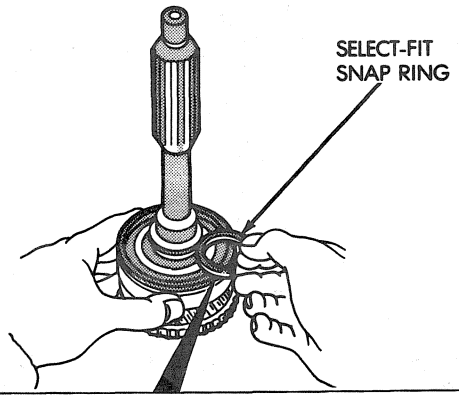


Fig. 37 Gear Case Removal

(7) Remove speedometer gear snap ring and remove speedometer gear and spacer from output shaft.

GEAR CASE ASSEMBLE

(1) Press front bearing on input shaft. Then secure bearing with thickest snap ring that will fit in shaft groove (Fig. 38).

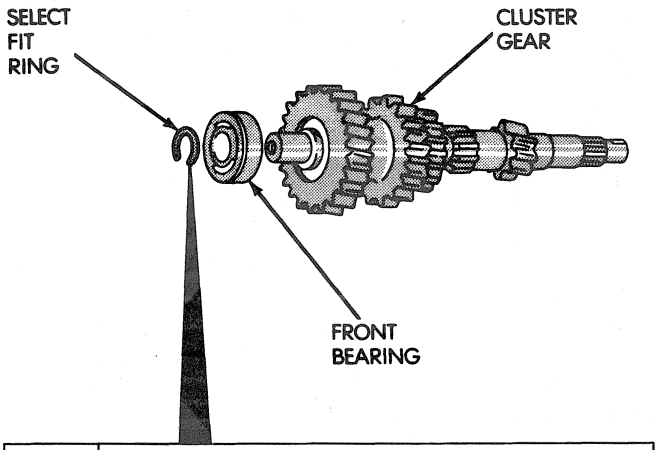


I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.10 - 2.15	(0.0827 - 0.0846)
B	2.15 - 2.20	(0.0846 - 0.0866)
C	2.20 - 2.25	(0.0866 - 0.0886)
D	2.25 - 2.30	(0.0886 - 0.0906)
E	2.30 - 2.35	(0.0906 - 0.0925)
F	2.35 - 2.40	(0.0925 - 0.0945)
G	2.40 - 2.45	(0.0945 - 0.0965)

J8921-1097

Fig. 38 Selecting Input Shaft Front Bearing Snap Ring

(2) Press front bearing on cluster gear. Then secure bearing with thickest snap ring that will fit in ring groove on gear (Fig. 39).



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.00 - 2.05	(0.0787 - 0.0807)
B	2.05 - 2.10	(0.0807 - 0.0827)
C	2.10 - 2.15	(0.0827 - 0.0846)
D	2.15 - 2.20	(0.0846 - 0.0866)
E	2.20 - 2.25	(0.0866 - 0.0886)

J8921-1098

Fig. 39 Selecting Cluster Gear Front Bearing Snap Ring

(3) Install new oil seals in front bearing retainer and adapter housing (Fig. 40). Installation depth for bearing retainer seal is 10.5 to 11.5 mm (0.414 to 0.453 in.).

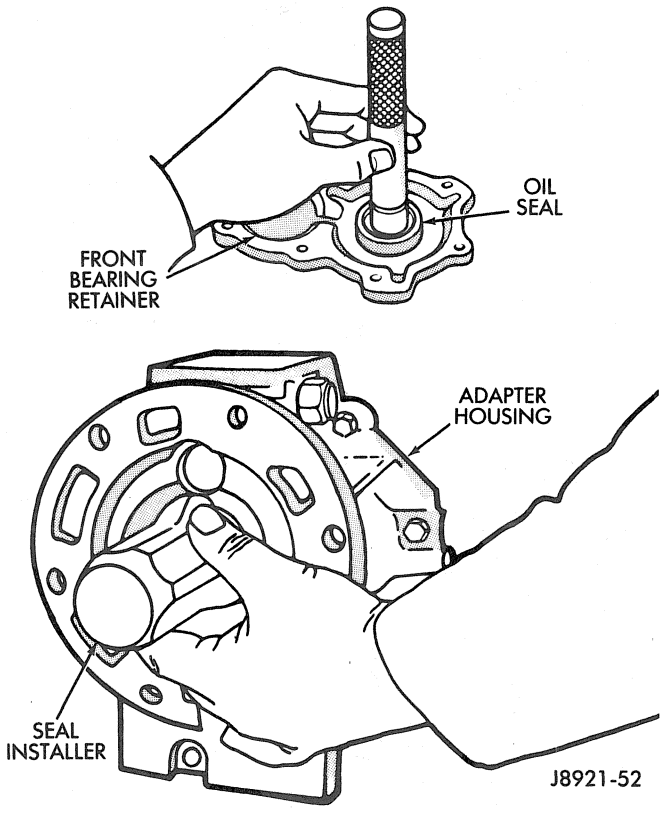


Fig. 40 Oil Seal Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Install reverse shaft and shaft retaining pin in adapter housing. Then install access hole plug with torx bit (Fig. 41).

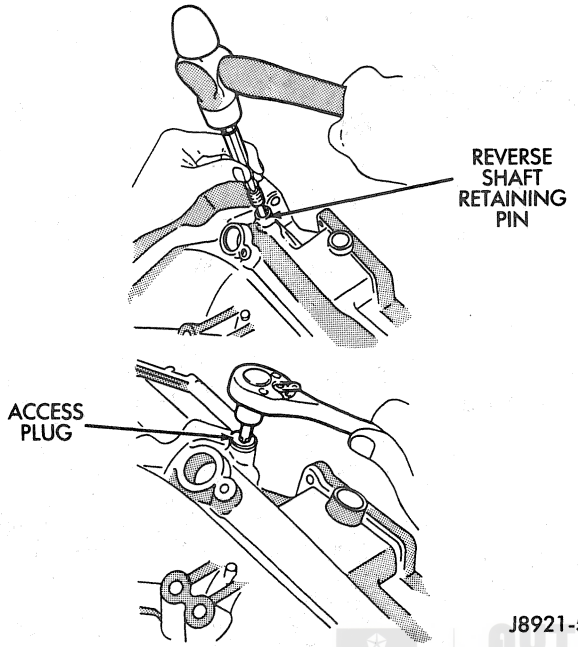


Fig. 41 Installing Reverse Shaft Pin

(5) Lubricate reverse shaft and gear components with Mopar 75W–90 gear lubricant.

(6) Clean mating surfaces of intermediate plate and transmission gear case with wax and grease remover. Then wipe dry with a clean cloth.

(7) Apply 3 mm (1/8 in.) wide bead of Mopar Gasket Maker, or Loctite 518 to mating surface of gear case. Keep sealer bead inside bolt holes as shown (Fig. 42).

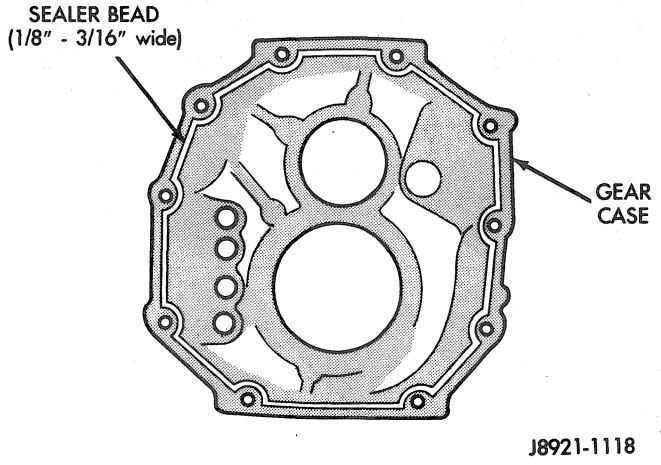


Fig. 42 Applying Sealer To Gear Case

(8) Install gear case (Fig. 43). Align shift rails and bearings in case and tap case into position.

(9) Verify that gear case is seated on intermediate plate dowel pins.

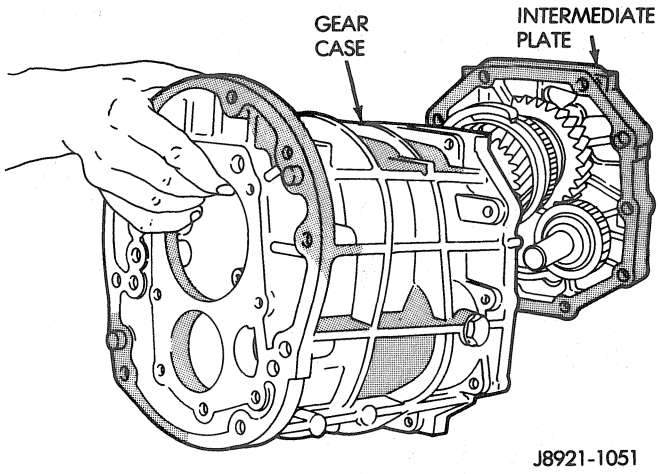


Fig. 43 Gear Case Installation

(10) Install front bearing snap rings (Fig. 44).

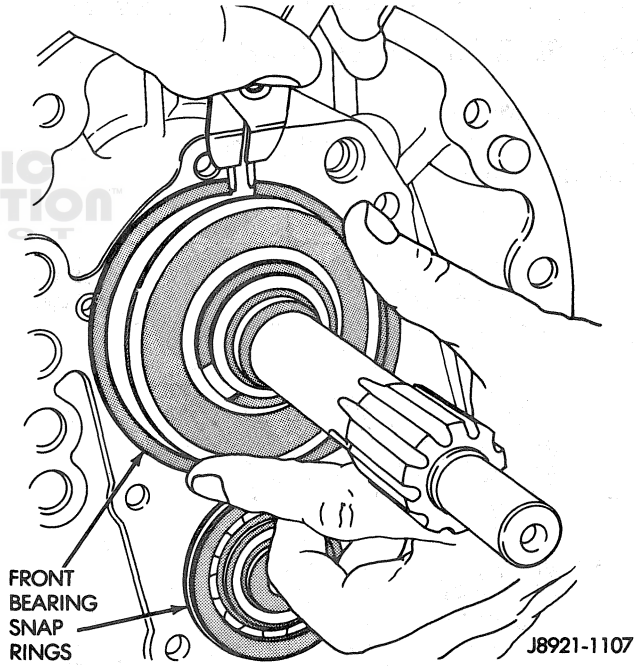


Fig. 44 Front Bearing Snap Ring Installation

(11) Clean gear case and front bearing retainer sealing surfaces with wax and grease remover. Then wipe dry with a clean cloth.

(12) Install new seal in front bearing retainer. Then lubricate seal lip with petroleum jelly. **Installation depth for seal is 10.5 to 11.5 mm (0.413 to 0.453 in.).**

(13) Apply a 3 mm (1/8 in.) wide bead of Mopar Gasket Maker, or Loctite 518 to front bearing retainer sealing surface.

(14) Align and install front bearing retainer (Fig. 45). Be sure retainer is properly seated on case and bearings.

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Install and tighten front bearing retainer bolts to 17 N·m (12 ft. lbs.) torque.

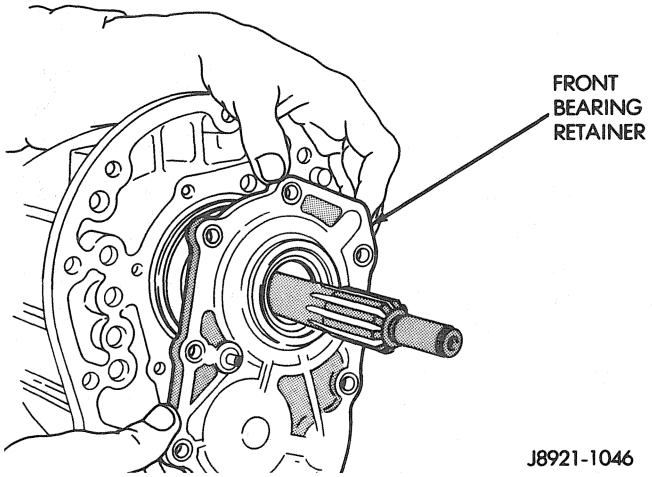


Fig. 45 Front Bearing Retainer Installation

FIFTH GEAR AND SYNCHRO ASSEMBLY

DISASSEMBLE

(1) Remove three lock ball plugs from intermediate plate (Fig. 46).

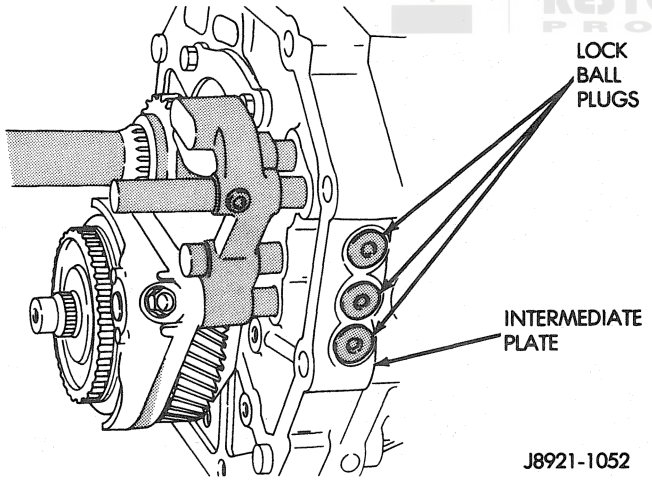


Fig. 46 Lock Ball Plug Locations

(2) Remove three lock ball springs and lock balls from intermediate plate with pencil magnet (Fig. 47).

(3) Mount intermediate plate and geartrain assembly in vise as follows:

(a) Insert two spare bolts in one bottom bolt hole in intermediate plate. Insert bolts from opposite sides of plates (Fig. 48).

(b) Install enough flat washers under each bolt head to prevent bolts from touching (Fig. 48).

(c) Tape bolts and washers in place and mount intermediate plate in vise (Fig. 48).

(d) Clamp vise jaws securely against bolt heads (Fig. 48). **Do not clamp vise jaws on intermediate plate. Clamp only on bolt heads.**

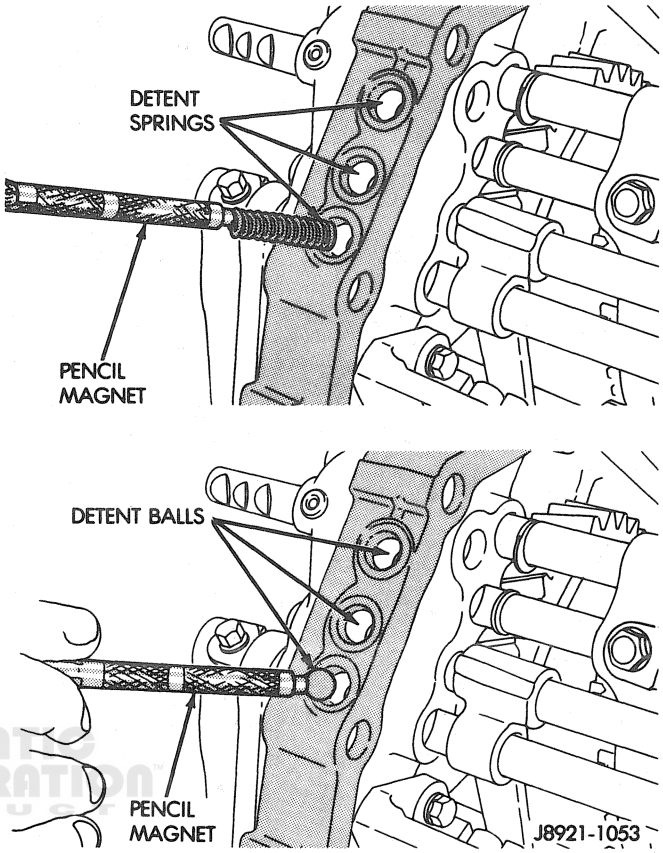


Fig. 47 Removing/Installing Lock Ball And Spring

(4) Remove fifth gear snap ring (Fig. 49). Retain snap ring for assembly reference. It is a select fit component.

(5) Remove E–ring that secures reverse shift arm to fork (Fig. 50).

(6) Remove bolts attaching reverse shift arm bracket to intermediate plate. Then remove bracket (Fig. 51).

(7) Remove reverse shift arm and shoe (Fig. 52).

DISASSEMBLY AND ASSEMBLY (Continued)

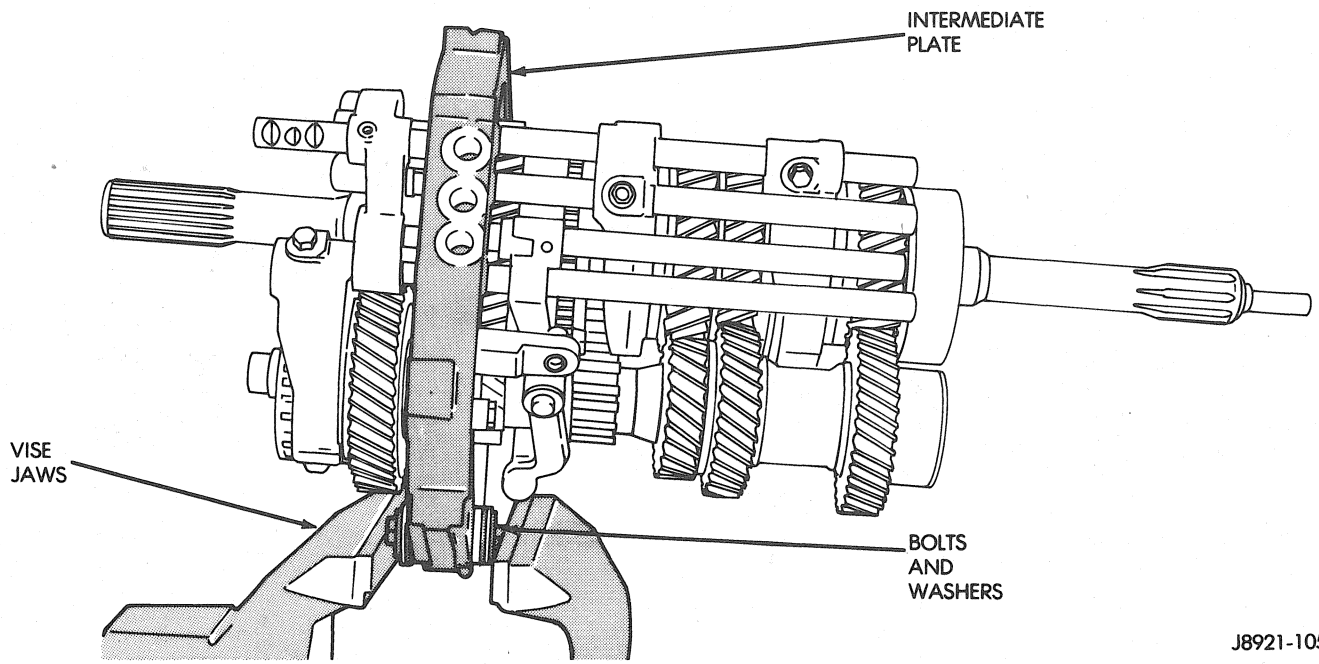


Fig. 48 Mounting Intermediate Plate And Geartrain In Vise

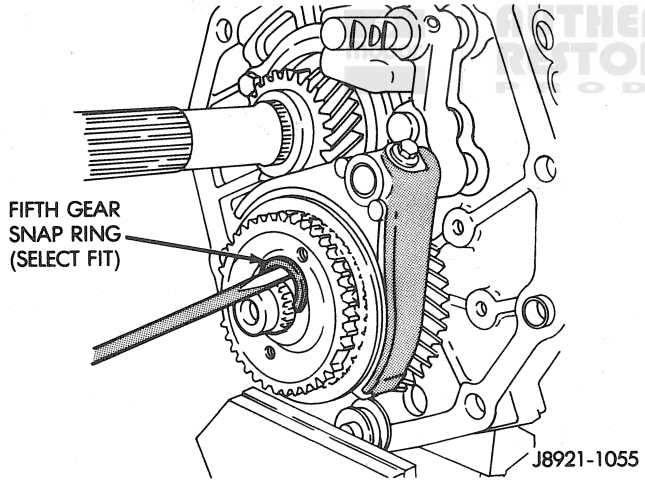


Fig. 49 Fifth Gear Snap Ring Removal

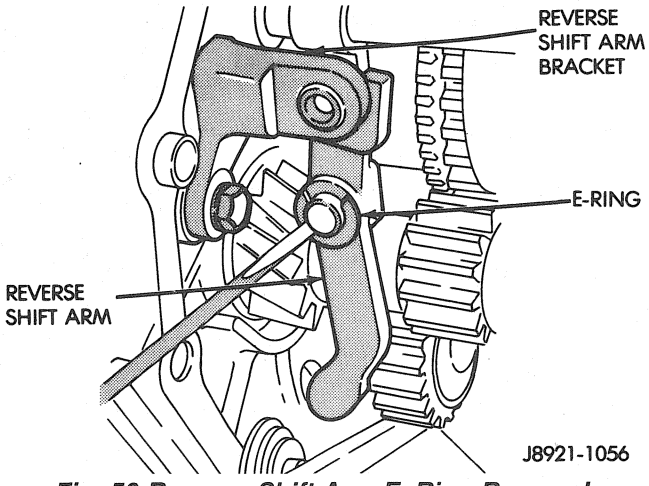


Fig. 50 Reverse Shift Arm E–Ring Removal

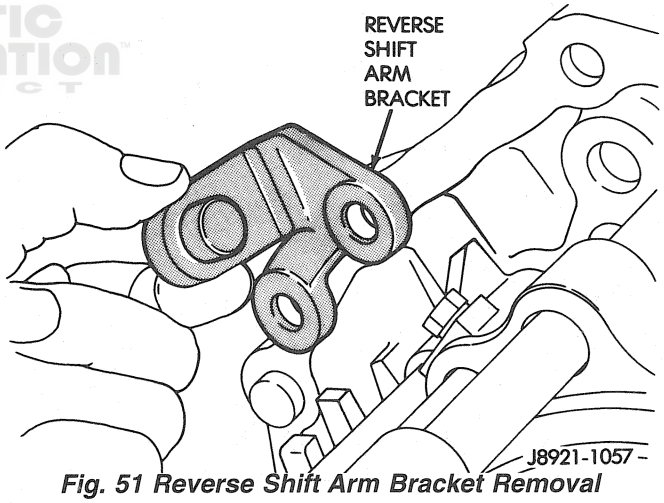


Fig. 51 Reverse Shift Arm Bracket Removal

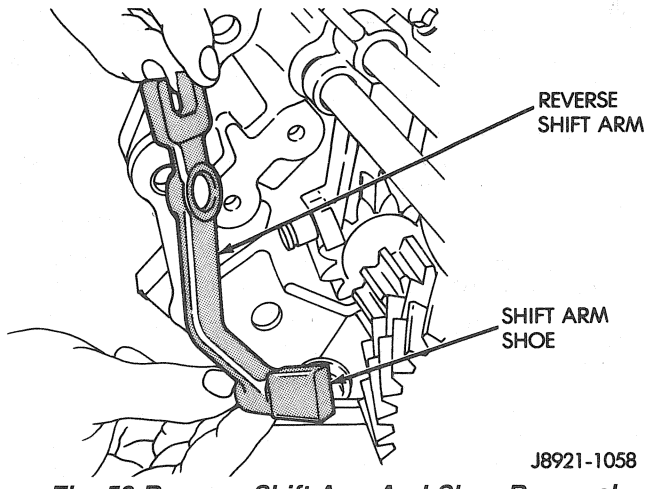


Fig. 52 Reverse Shift Arm And Shoe Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Remove fifth gear shift fork set screw (Fig. 53).

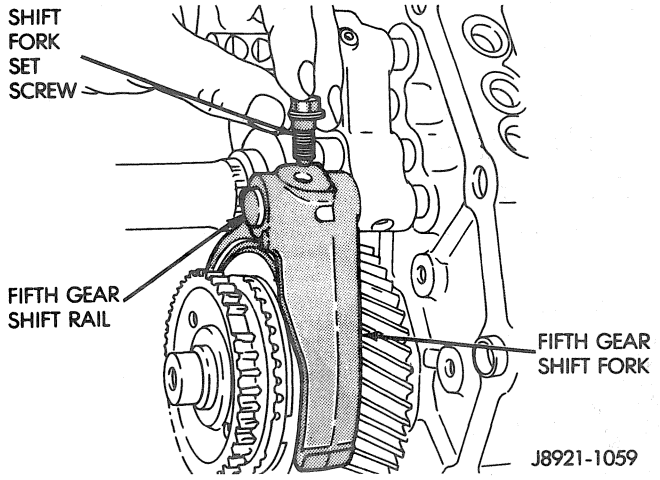


Fig. 53 Fifth Gear Fork Set Screw Removal

(9) Move fifth gear shift rail forward until it clears shift fork.

(10) Remove fifth gear shift fork from synchro sleeve (Fig. 54).

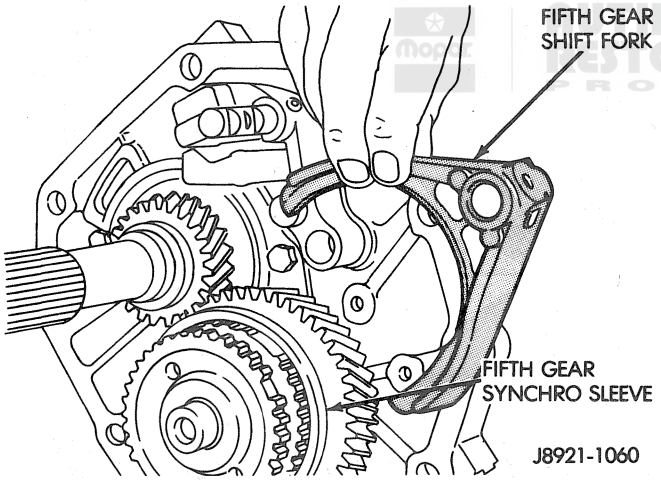


Fig. 54 Fifth Gear Shift Fork Removal

(11) Remove reverse shift rail and reverse shift head as assembly (Fig. 55).

(12) Measure thrust clearance between counter fifth gear and thrust ring with feeler gauge. Clearance should be 0.10 to 0.40 mm (0.003 to 0.019 in.). If clearance exceeds limits, gear and/or ring will have to be replaced.

(13) Loosen fifth spline gear with standard two–jaw puller (Fig. 56). **Position puller jaws behind fifth counter gear as shown.**

(14) Remove fifth spline gear (Fig. 57).

(15) Remove fifth gear synchro ring (Fig. 58).

(16) Remove fifth gear synchro and sleeve assembly (Fig. 59).

(17) Remove counter fifth gear thrust ring (Fig. 60).

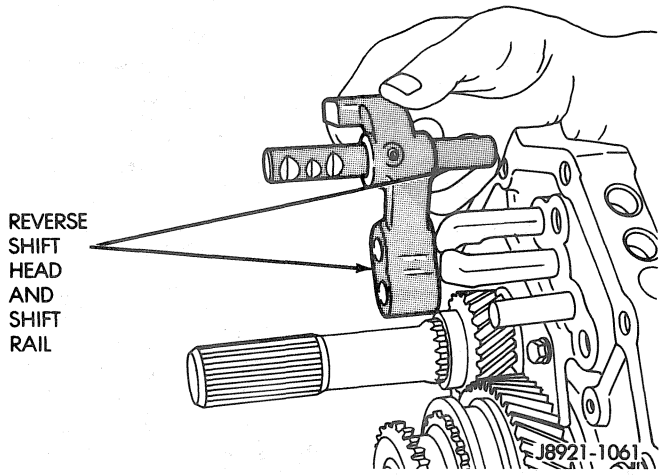


Fig. 55 Reverse Shift Head And Rail Removal

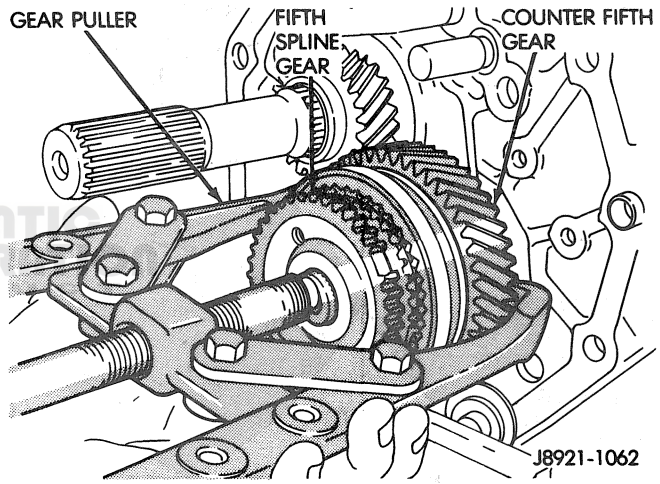


Fig. 56 Loosening Fifth Spline Gear

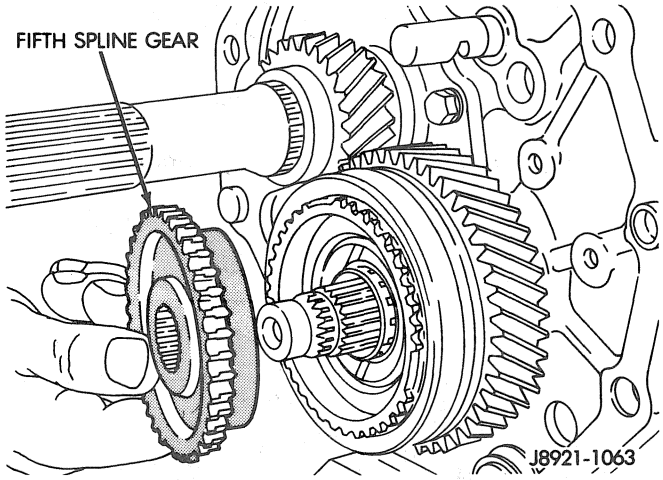


Fig. 57 Fifth Spline Gear Removal

(18) Remove thrust ring lock ball with pencil magnet (Fig. 61).

(19) Remove bolts attaching output shaft rear bearing retainer to intermediate plate (Fig. 62).

(20) Remove rear bearing retainer (Fig. 63).

DISASSEMBLY AND ASSEMBLY (Continued)

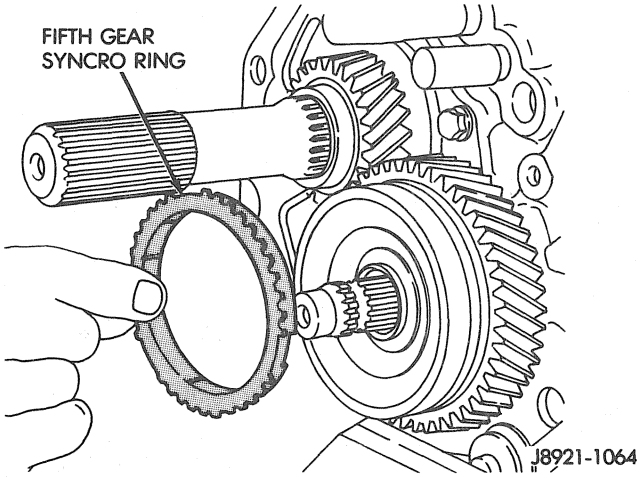


Fig. 58 Fifth Gear Synchro Ring Removal

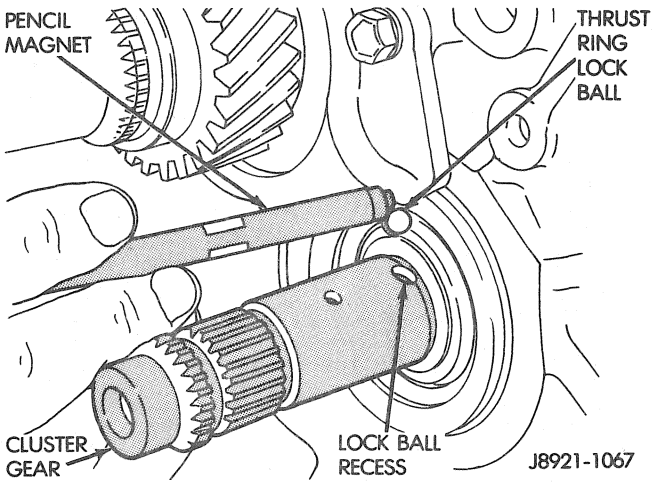


Fig. 61 Thrust Ring Lock Ball Removal

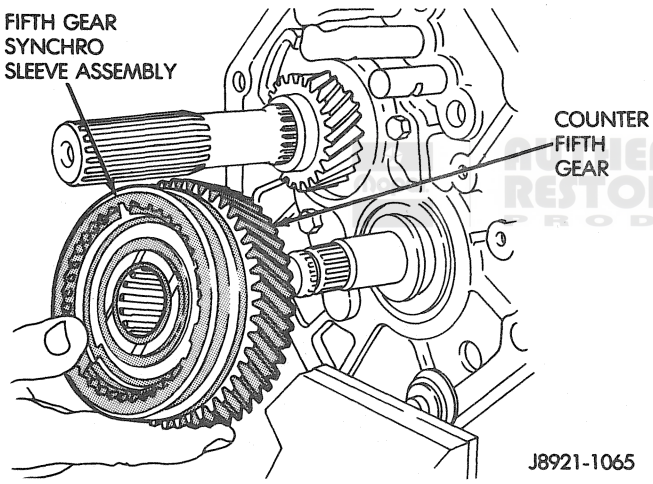


Fig. 59 Counter Fifth Gear And Synchro Assembly Removal

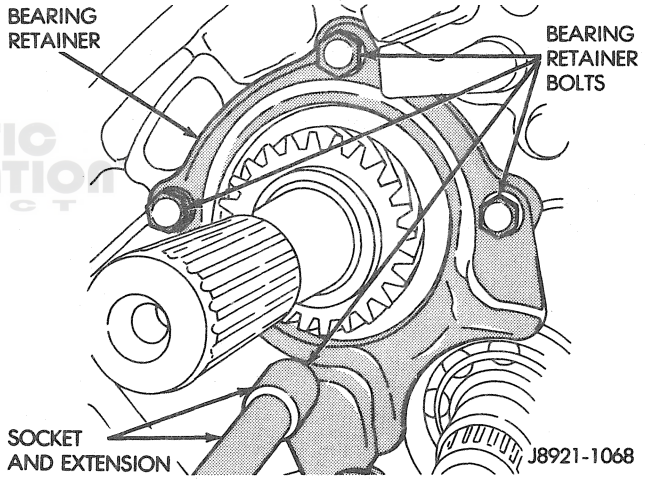


Fig. 62 Output Shaft Rear Bearing Retainer Bolt Removal

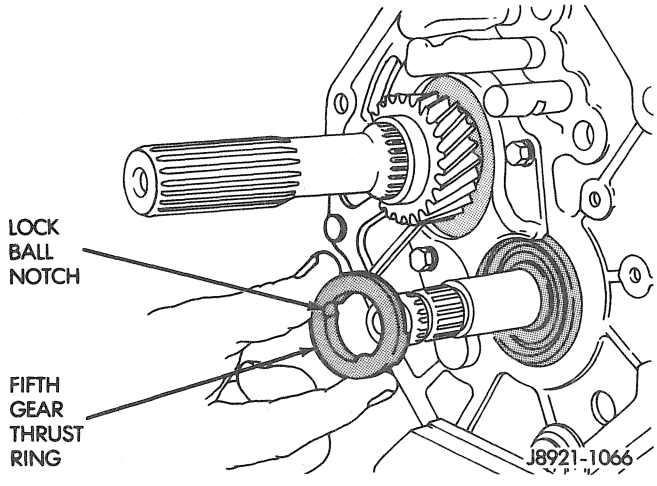


Fig. 60 Fifth Gear Thrust Ring Removal

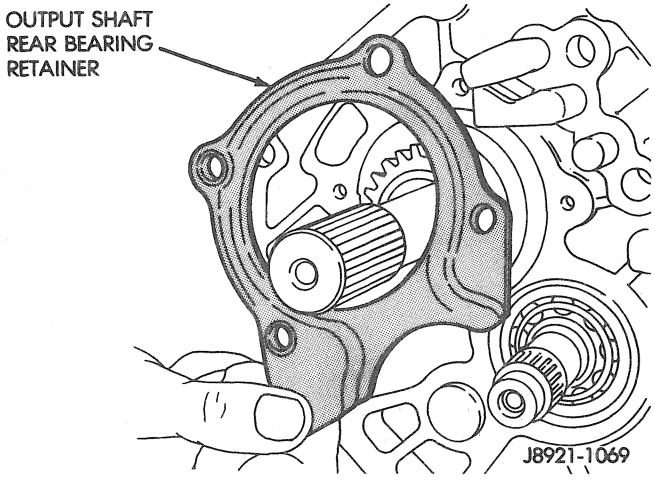


Fig. 63 Output Shaft Rear Bearing Retainer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(21) Remove reverse gear and shaft (Fig. 64).

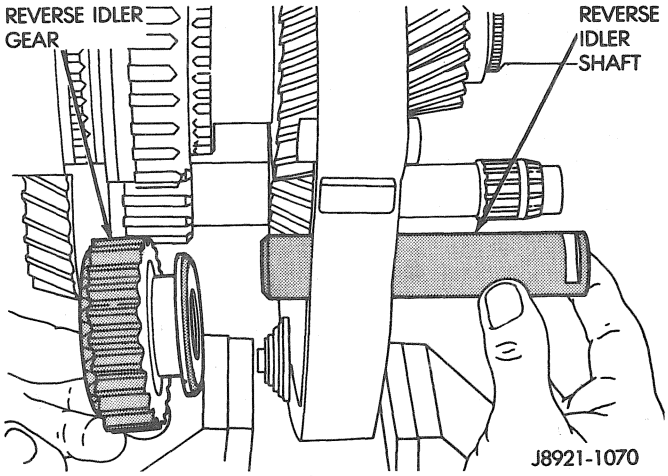


Fig. 64 Reverse Idler Gear And Shaft Removal

FIFTH GEAR AND SYNCHRO ASSEMBLE

(1) Install thrust ring lock ball in cluster gear journal (Fig. 65). Use petroleum jelly to hold ball in place.

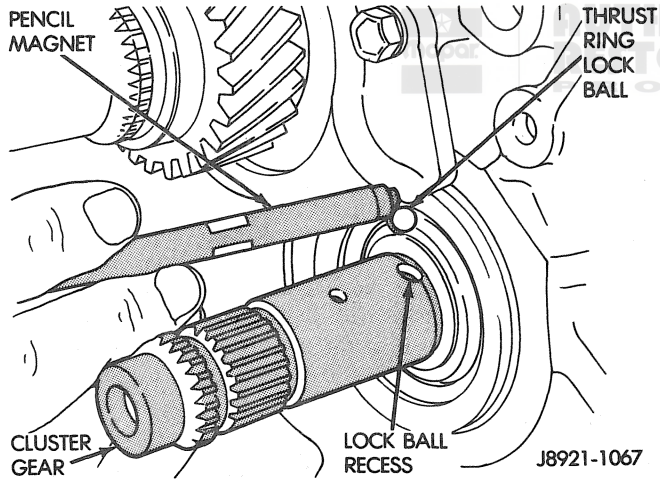


Fig. 65 Installing Thrust Ring Lock Ball

(2) Install fifth gear thrust ring (Fig. 66). Be sure thrust ring notch fits over lock ball.

(3) Assemble counter fifth gear, synchro sleeve, inserts and insert springs (Fig. 67).

(4) Lubricate two–piece bearing with petroleum jelly and install it in counter fifth gear (Fig. 68).

(5) Install counter fifth gear and synchro assembly on cluster gear journal (Fig. 69).

(6) Install synchro ring in synchro sleeve (Fig. 70).

(7) Install fifth spline gear on cluster journal (Fig. 71). Tap spline gear into place with plastic mallet if necessary.

(8) Install fifth gear selective snap ring (Fig. 72). Use thickest snap ring that will fit in shaft groove.

(9) Install reverse shift head and rail (Fig. 73). Then install lock ball in shift head.

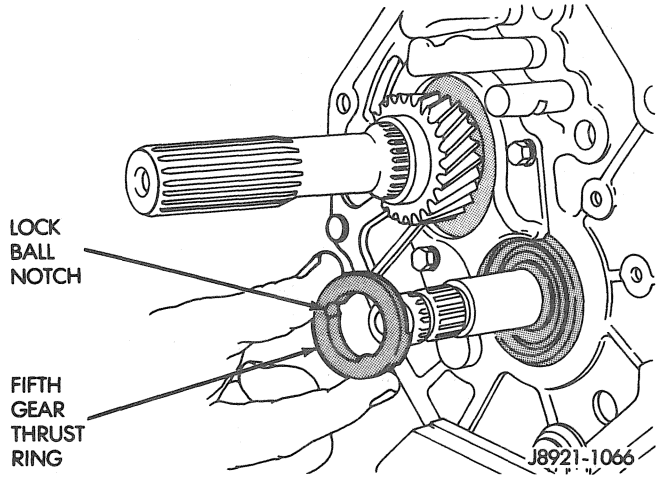


Fig. 66 Installing Fifth Gear Thrust Ring

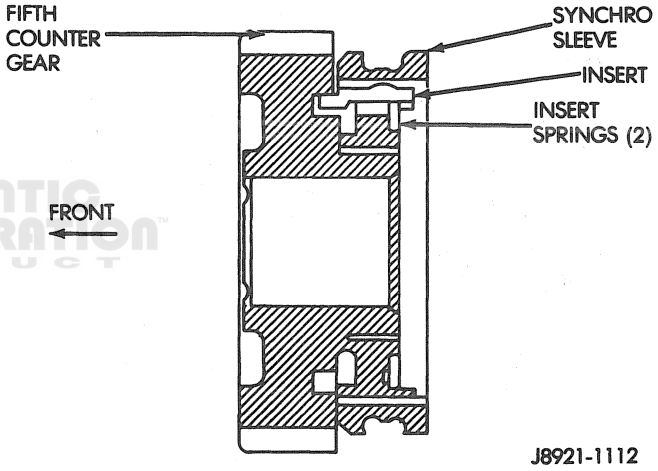


Fig. 67 Assembling Fifth Gear And Synchro Assembly

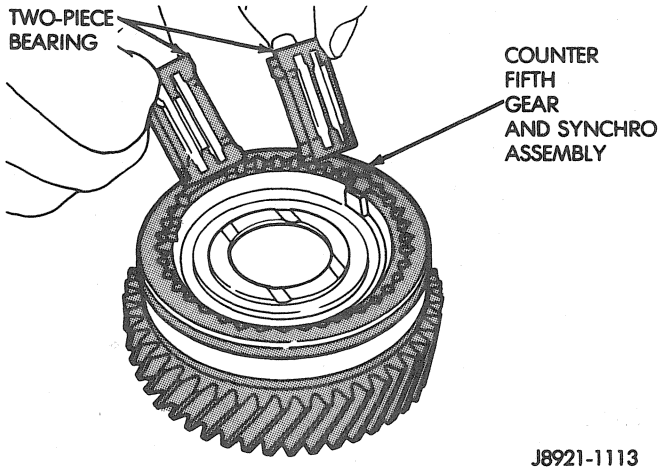


Fig. 68 Installing Counter Fifth Gear Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

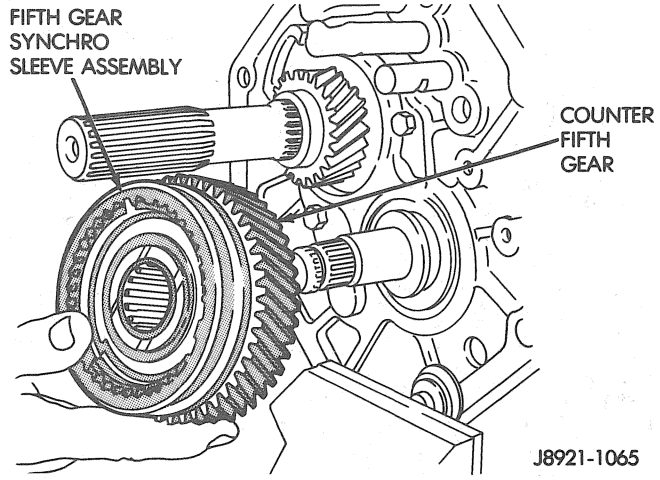


Fig. 69 Installing Counter Fifth Gear And Sleeve

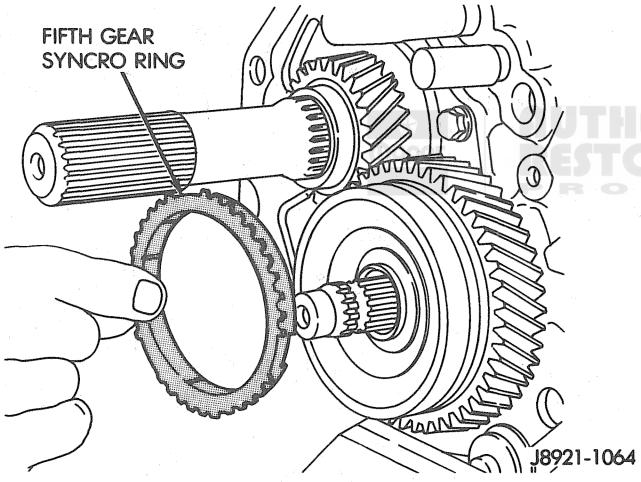


Fig. 70 Installing Fifth Gear Synchro Ring

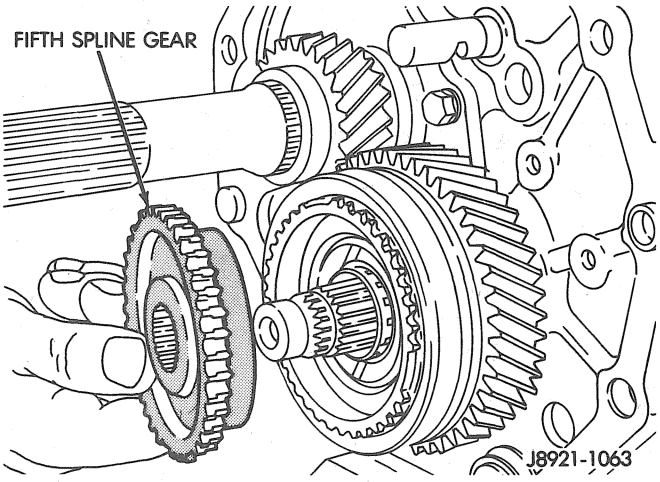
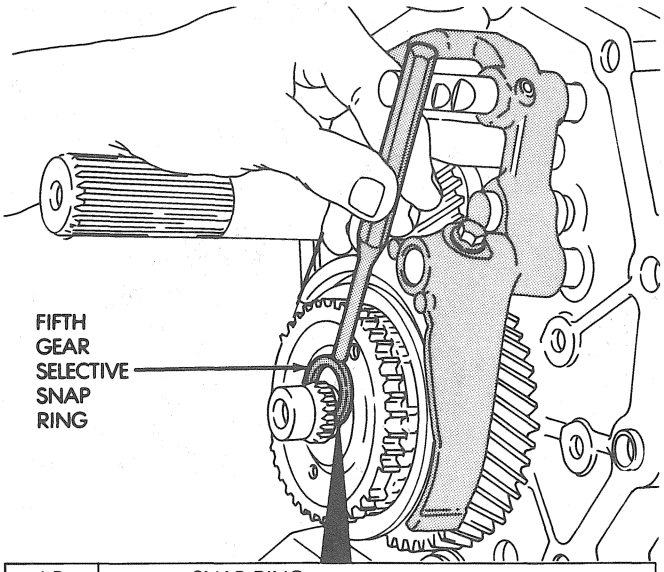


Fig. 71 Installing Fifth Spline Gear



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.85 - 2.90	(0.1122 - 0.1142)
B	2.90 - 2.95	(0.1142 - 0.1161)
C	2.95 - 3.00	(0.1161 - 0.1181)
D	3.00 - 3.05	(0.1181 - 0.1201)
E	3.05 - 3.10	(0.1201 - 0.1220)
F	3.10 - 3.15	(0.1220 - 0.1240)
G	3.15 - 3.20	(0.1240 - 0.1260)
H	3.20 - 3.25	(0.1260 - 0.1280)

J8921-1114

Fig. 72 Installing Fifth Gear Snap Ring

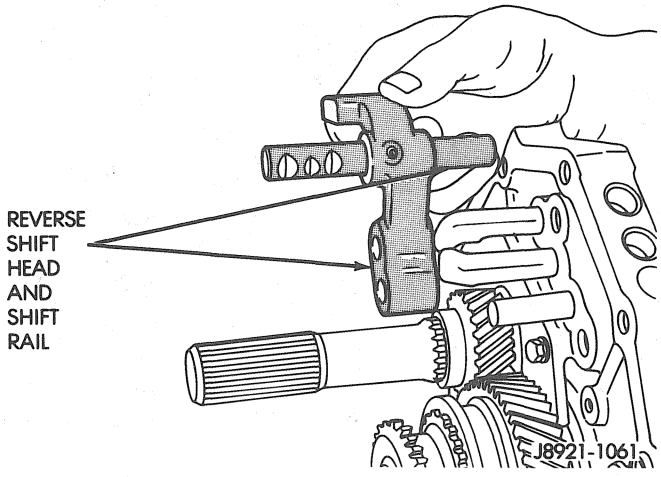


Fig. 73 Installing Reverse Shift Head And Rail

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Position fifth gear shift fork in synchro sleeve (Fig. 74).

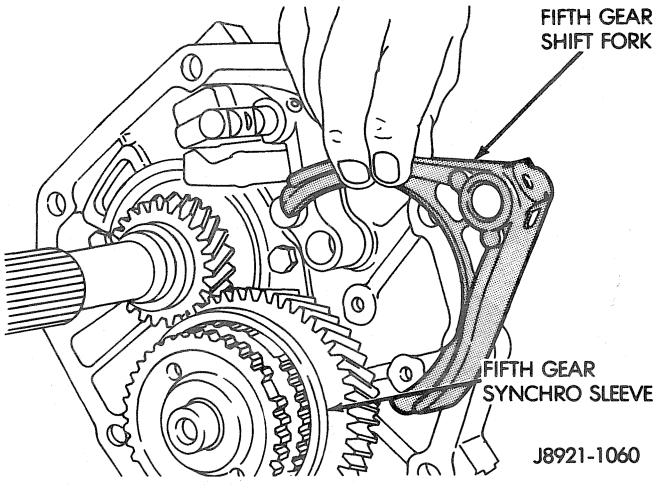


Fig. 74 Fifth Gear Shift Fork Installation

(11) Install fifth gear shift rail (Fig. 75). Slide rail through fork, shift head, intermediate plate and reverse shift fork. Be sure interlock ball is not displaced during installation.

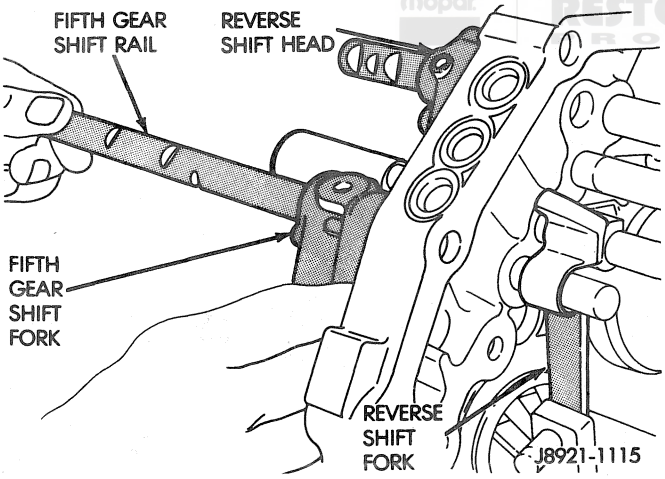


Fig. 75 Fifth Gear Shift Rail Installation

(12) Align screw holes in shift fork and rail and install set screw (Fig. 76). Tighten screw to 20 N·m (15 ft. lbs.) torque.

(13) Install lock balls and springs in intermediate plate (Fig. 77). Then install and tighten lock ball plugs to 19 N·m (14 ft. lbs.) torque.

(14) Install reverse shift arm bracket (Fig. 78). Tighten bracket bolts to 18 N·m (13 ft. lbs.) torque.

(15) Install reverse shift arm (Fig. 78). Position arm on reverse fork pin and engage it with pin on shift arm bracket.

(16) Verify that shift arm shoe is engaged in reverse idler gear. Then secure shift arm to pin on reverse fork with new E– clip.

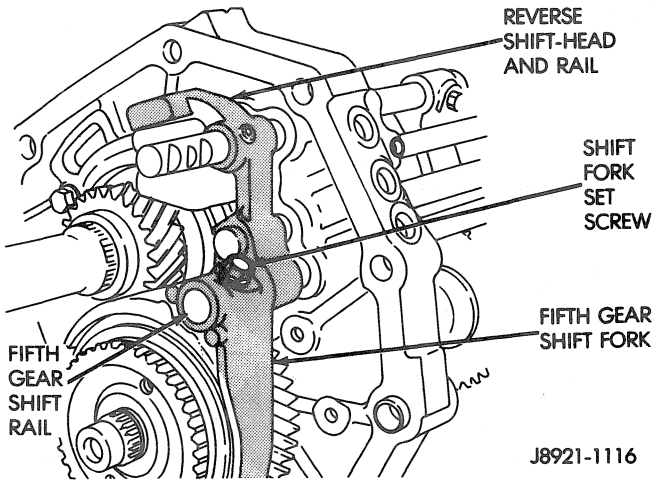


Fig. 76 Shift Fork Set Screw Installation

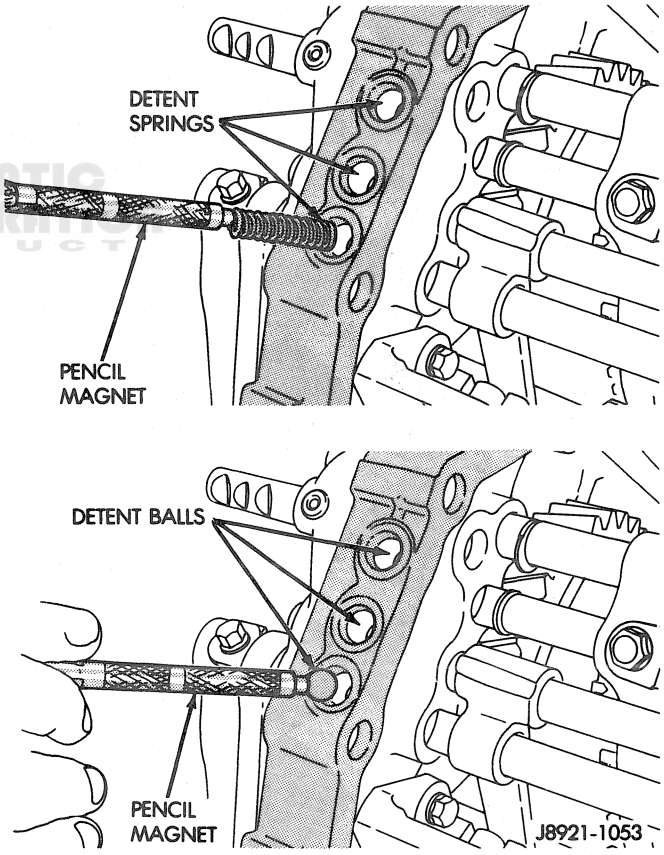


Fig. 77 Detent Ball And Spring Installation

SHIFT RAIL AND FORK

DISASSEMBLE

There are a total of five shift rails in the AX 15 transmission. The 1–2, 3–4, fifth gear and front reverse shift rails are shown in Figure 41.

Two shift rails are used for reverse gear range. The front reverse rail is at the forward side of the intermediate plate (Fig. 79). The short rear reverse rail

DISASSEMBLY AND ASSEMBLY (Continued)

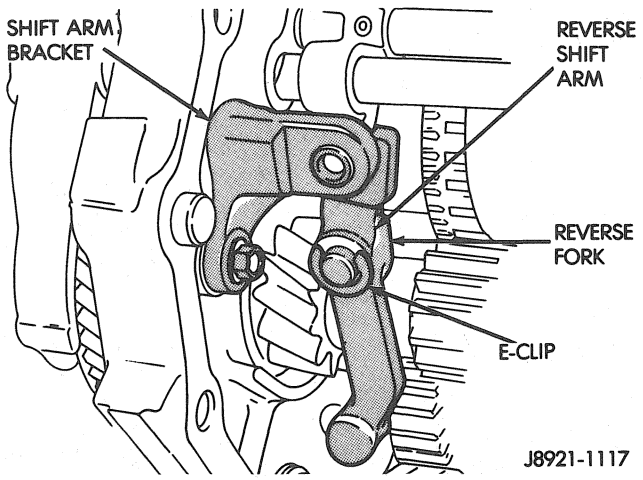


Fig. 78 Reverse Shift Arm And Bracket Installation

and reverse shift head are at the rear side of the intermediate plate.

It is not necessary to remove the shift rails if they are in good condition. Only the shift forks need be removed for access to the shafts and gears.

(1) Remove fifth gear shift rail (Fig. 79). Catch lock ball in your hand as rail comes out of intermediate plate.

(2) Remove 1–2 and 3–4 shift rail C–rings with two screwdrivers of equal size and length (Fig. 80).

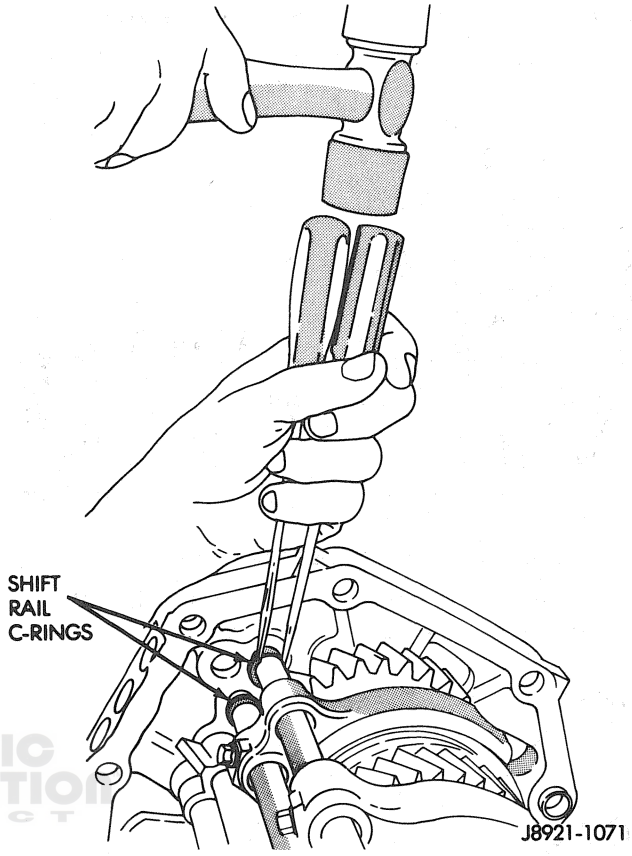


Fig. 80 Shift Rail C–Ring Removal

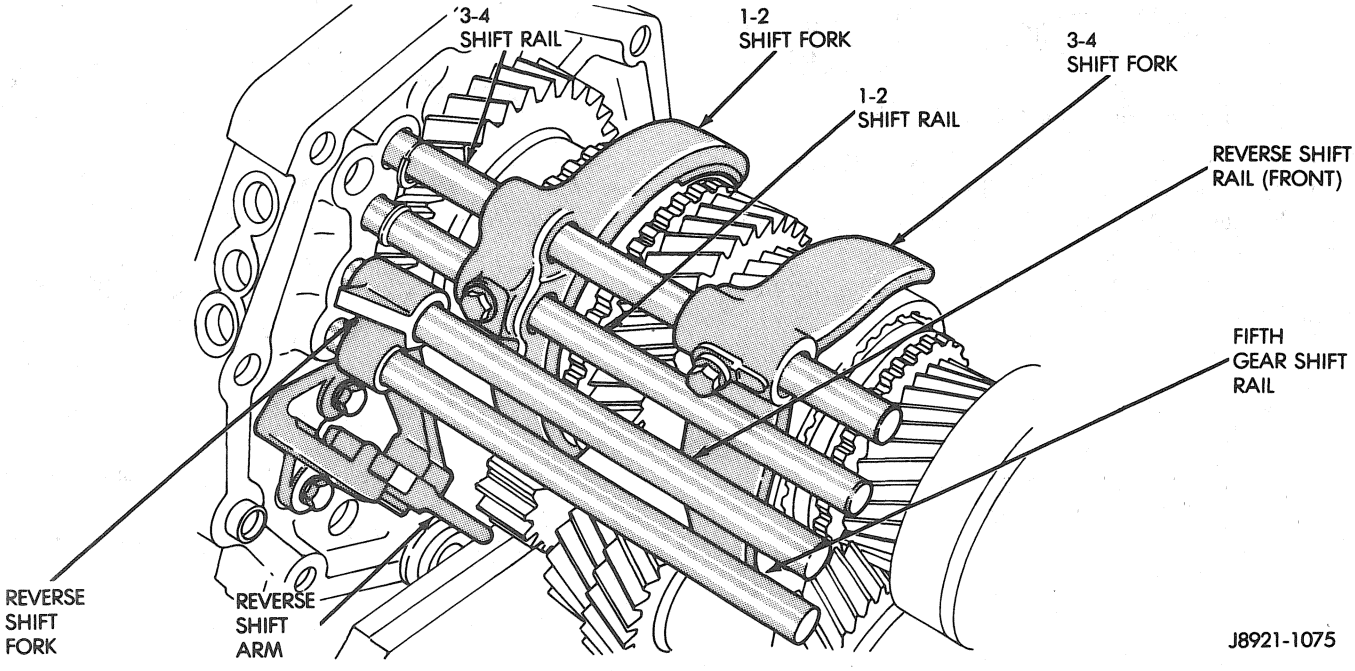


Fig. 79 Shift Rail Identification

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove shift fork set screws (Fig. 81).

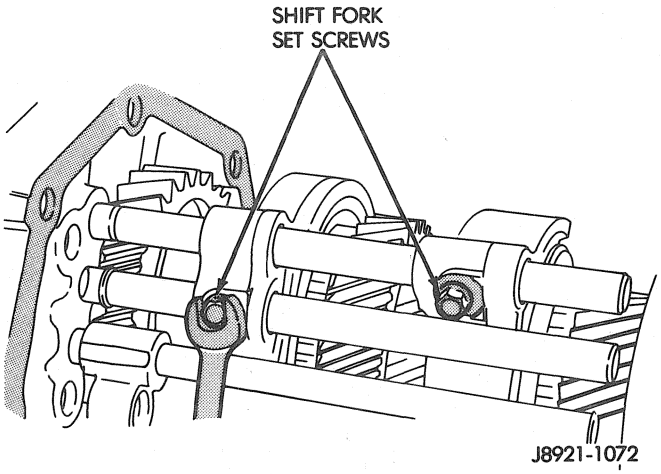


Fig. 81 Shift Fork Set Screw Removal

(4) Remove 3–4 shift rail from shift fork and intermediate plate (Fig. 82).

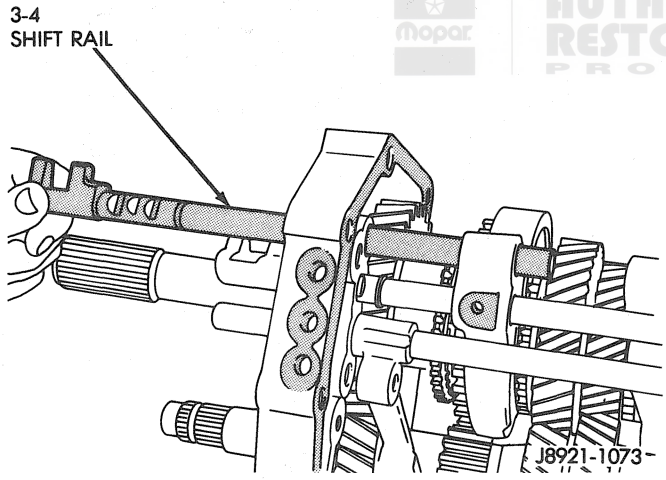


Fig. 82 Removing 3–4 Shift Rail

(5) Remove 3–4 shift rail interlock plug from intermediate plate with magnet (Fig. 83).

(6) Remove 1–2 shift rail from shift fork and intermediate plate (Fig. 84).

(7) Remove 1–2 shift rail interlock pin from shift rail (Fig. 85).

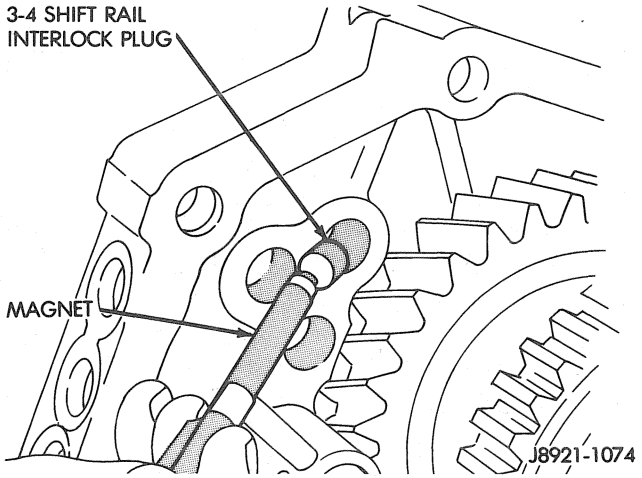


Fig. 83 Removing 3–4 Shift Rail Interlock Plug

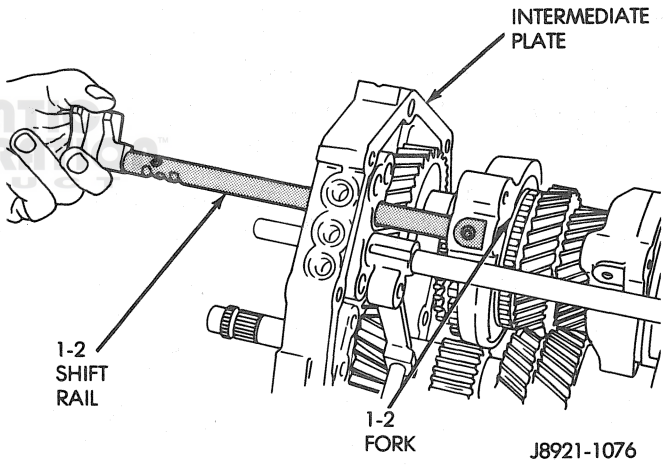


Fig. 84 Removing 1–2 Shift Rail

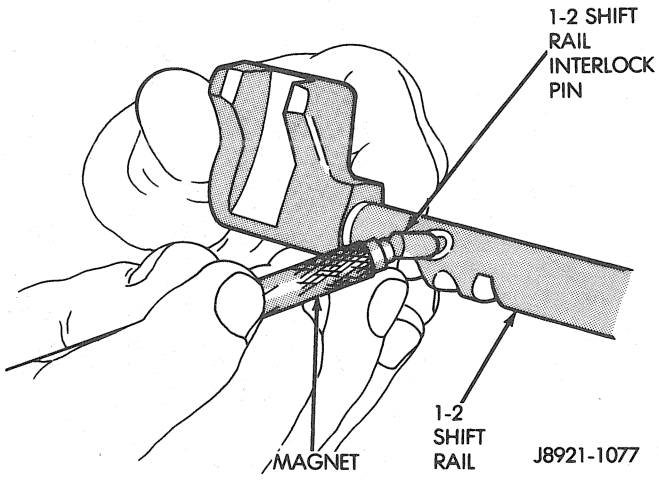


Fig. 85 Removing 1–2 Shift Rail Interlock Pin

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Remove 1–2 shift rail interlock plug from intermediate plate (Fig. 86).

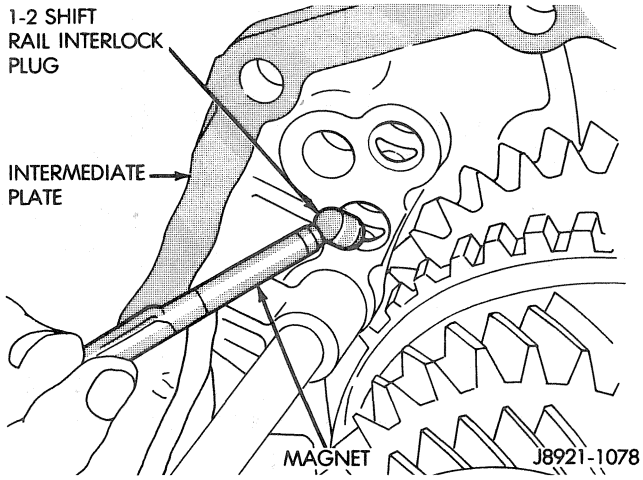


Fig. 86 Removing 1–2 Shift Rail Interlock Plug

(9) Lift reverse shift fork upward and remove fifth gear shift rail lock ball (Fig. 87).

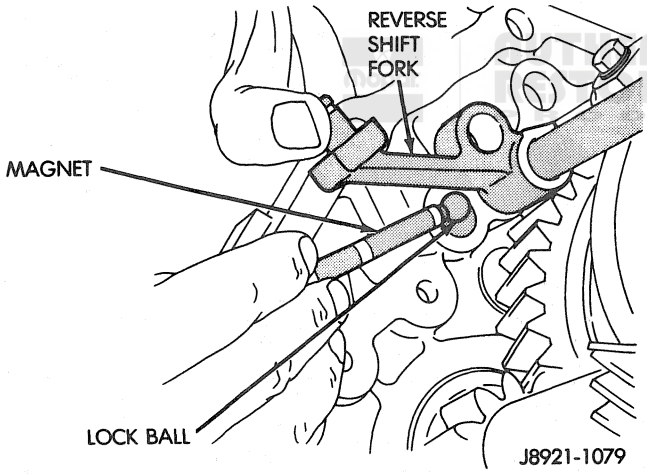


Fig. 87 Fifth Gear Shift Rail Lock Ball Removal

(10) Remove 3–4 shift fork (Fig. 88).

(11) Remove 1–2 shift fork (Fig. 88).

(12) Remove reverse shift rail C–ring with two equal length and size screwdrivers (Fig. 89).

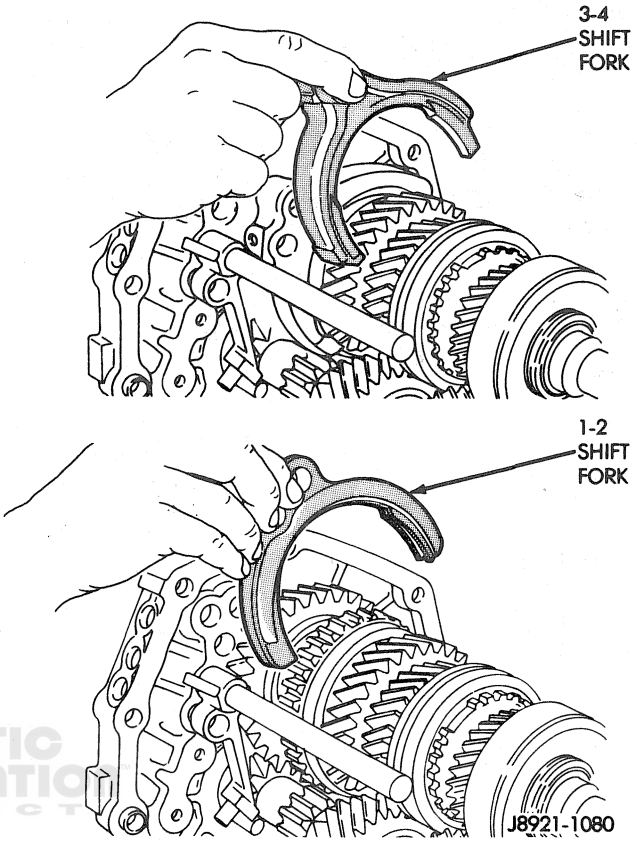


Fig. 88 Shift Fork Removal

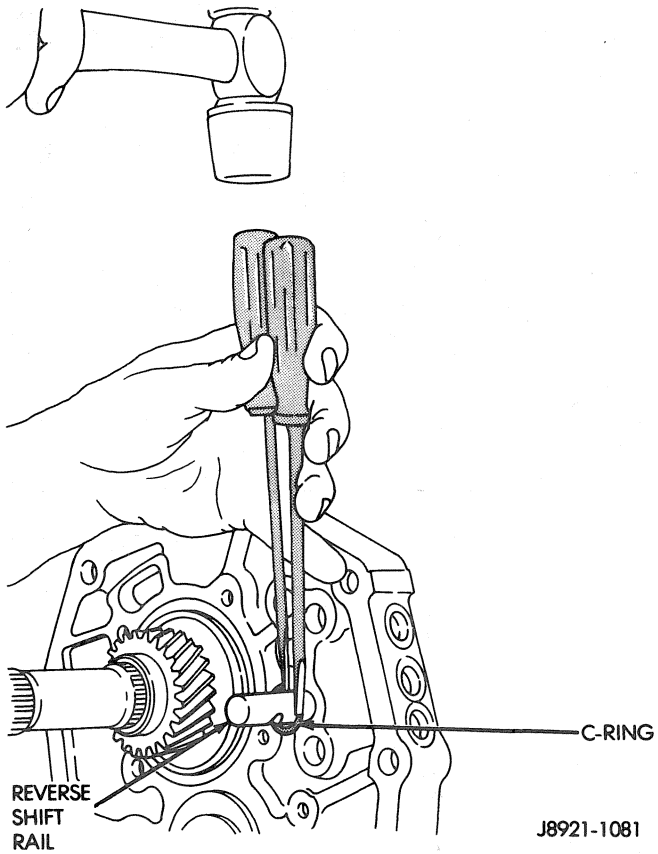


Fig. 89 Reverse Shift Rail C–Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

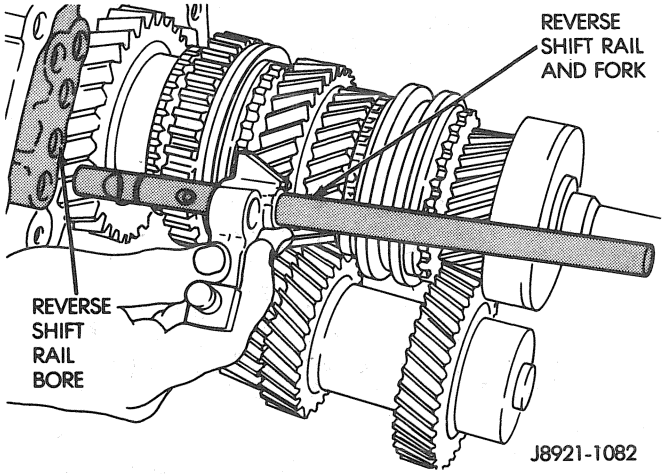


Fig. 90 Reverse Shift Rail And Fork Removal

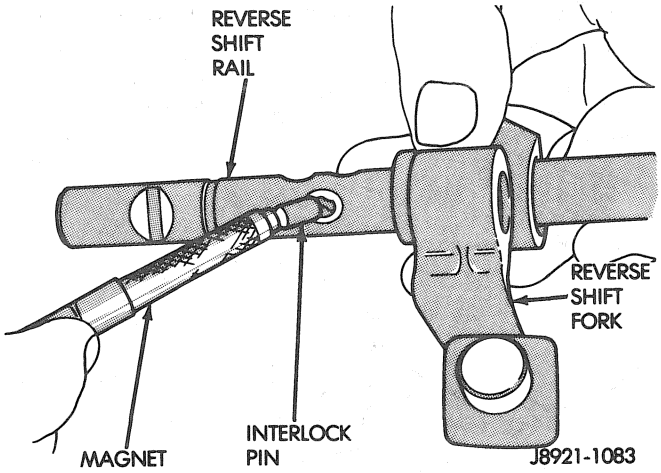


Fig. 91 Reverse Shift Rail Interlock Pin Removal

(13) Remove reverse shift rail and fork (Fig. 90).

(14) Remove interlock pin from reverse shift rail (Fig. 91).

(15) Position shift rails, shift forks, lock balls, interlock plugs and interlock pins on the workbench in order of removal. This will help in identifying components during inspection and assembly.

SHIFT RAIL AND FORK ASSEMBLE

The shift rail interlock pins, balls and plugs must be installed in the correct sequence for proper shifting. Refer to the installation diagram (Fig. 92) during assembly.

Coat the intermediate plate shift rail bores and the interlock balls, pins and plugs with a thick covering of petroleum jelly before assem-

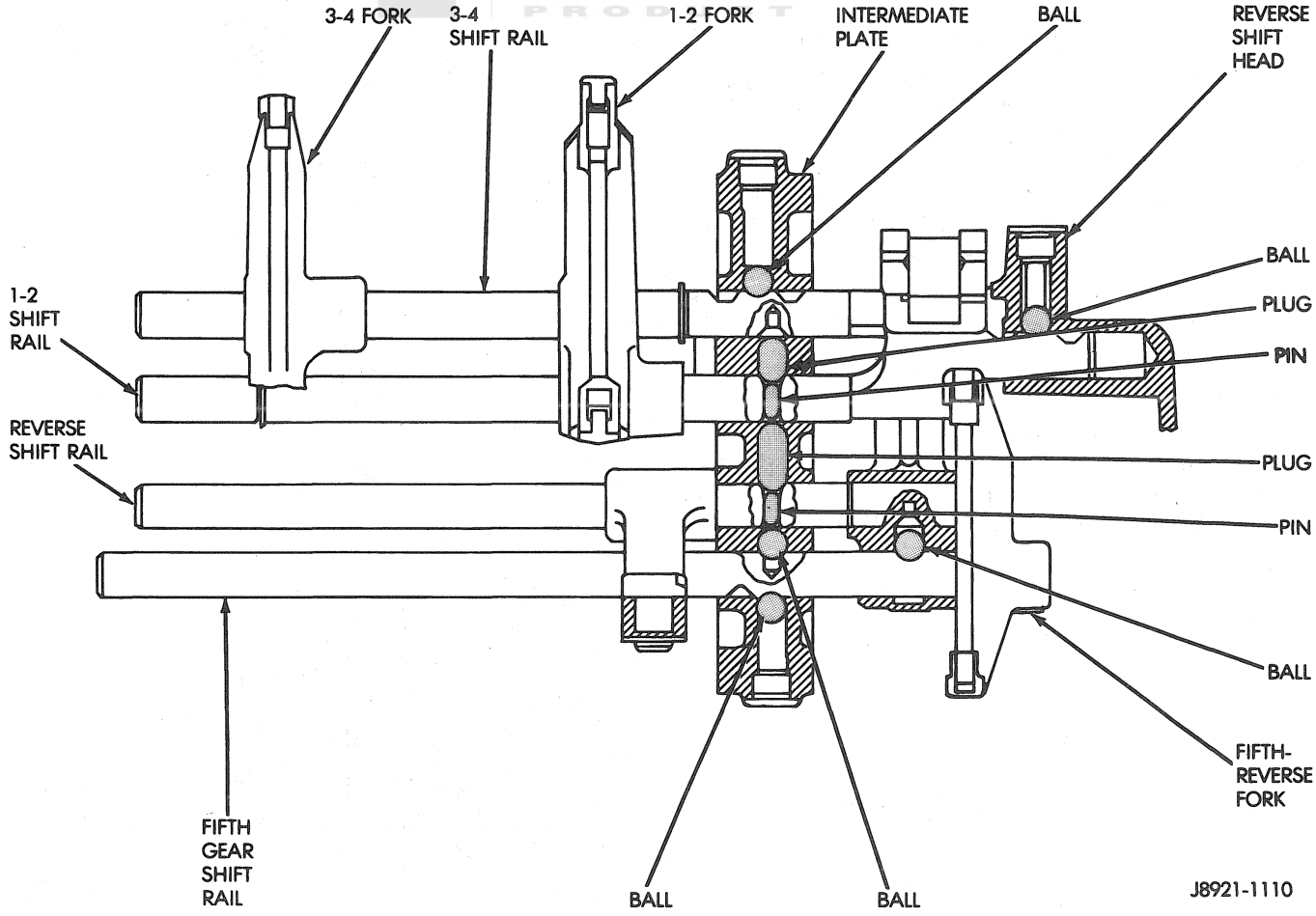


Fig. 92 Shift Rail Ball–Plug–Pin Position

DISASSEMBLY AND ASSEMBLY (Continued)

bly. The jelly will hold the interlock components in place making installation easier. Use a pencil magnet to hold and insert the interlocks. Then use a small screwdriver to push the interlock components into place.

(1) Coat reverse rail interlock pin with petroleum jelly and install pin in rail (Fig. 93).

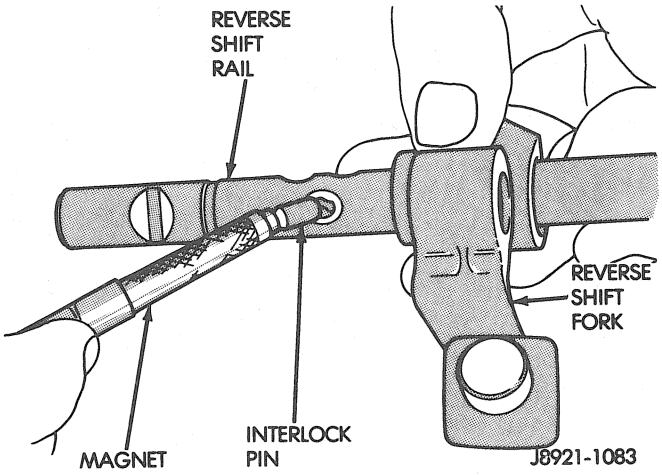


Fig. 93 Installing Reverse Shift Rail Interlock Pin

(2) Install reverse shift rail in intermediate plate (Fig. 94).

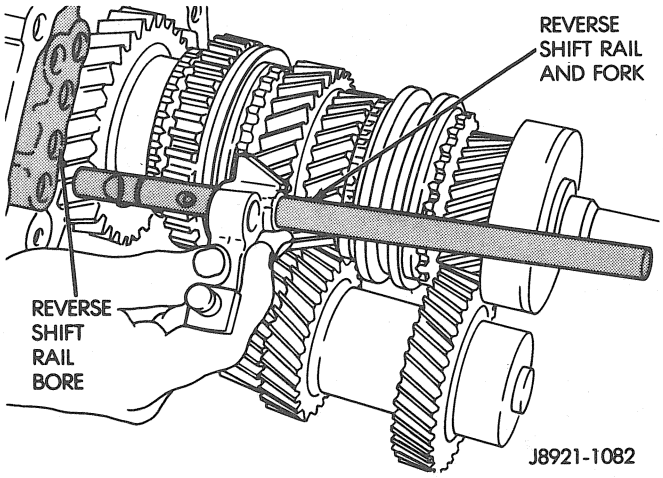


Fig. 94 Installing Reverse Shift Rail And Fork

(3) Install reverse shift rail C–ring (Fig. 89).

(4) Position 1–2 and 3–4 shift forks in synchro sleeves (Fig. 95).

(5) Coat reverse rail lock ball with petroleum jelly. Then tilt reverse shift fork upward and insert ball in intermediate plate (Fig. 96).

(6) Coat 1–2 shift rail interlock plug with petroleum jelly and install it in intermediate plate bore (Fig. 97).

(7) Coat 1–2 shift rail interlock pin with petroleum jelly and insert it in shift rail (Fig. 98).

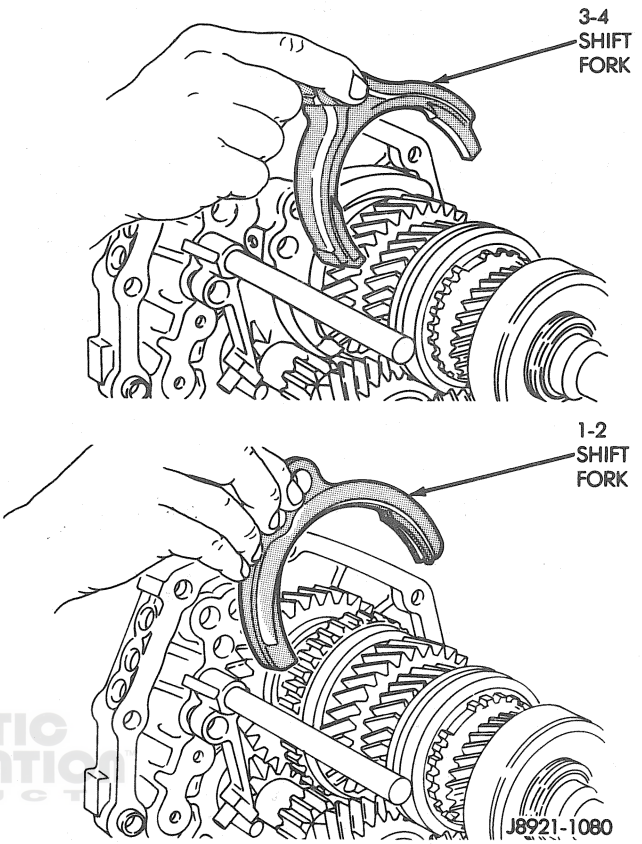


Fig. 95 Shift Fork Installation

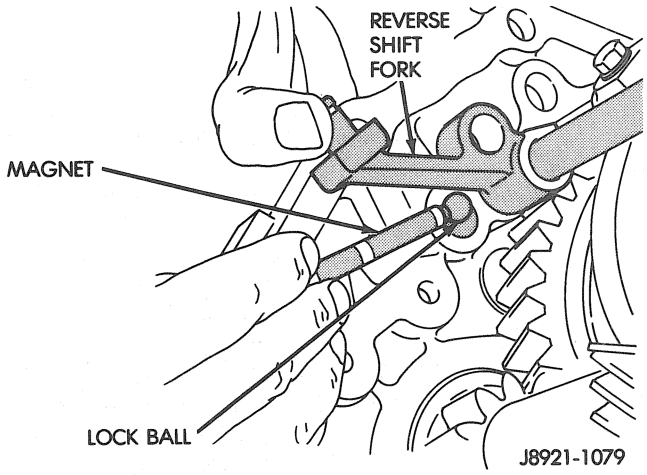


Fig. 96 Installing Reverse Shift Rail Lock Ball

(8) Install 1–2 shift rail in intermediate plate and 1–2 fork (Fig. 99).

(9) Coat 3–4 shift rail interlock plug with petroleum jelly and install plug in intermediate plate (Fig. 100).

DISASSEMBLY AND ASSEMBLY (Continued)

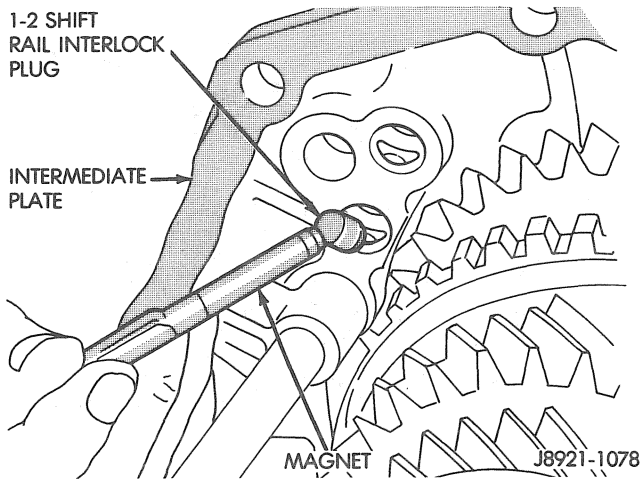


Fig. 97 Installing 1–2 Shift Rail Interlock Plug

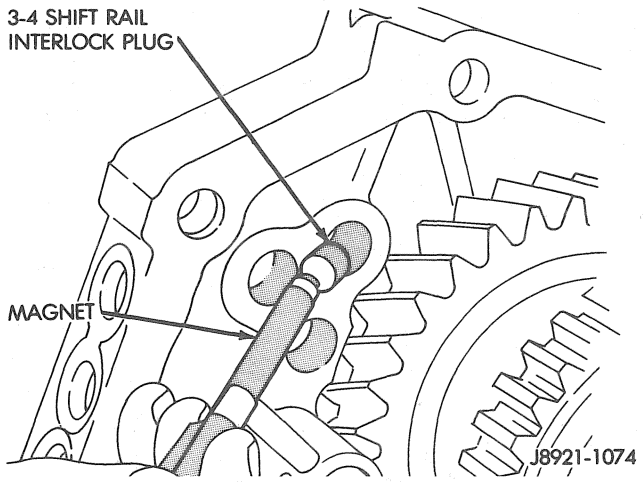


Fig. 100 Installing 3–4 Shift Rail Interlock Plug

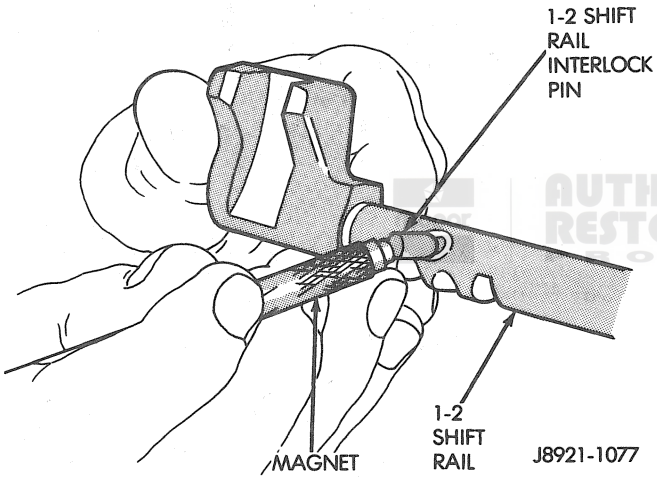


Fig. 98 Installing 1–2 Shift Rail Interlock Pin

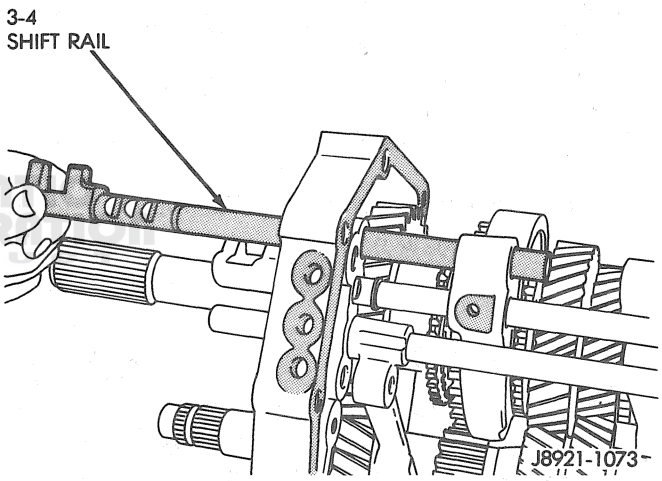


Fig. 101 Installing 3–4 Shift Rail

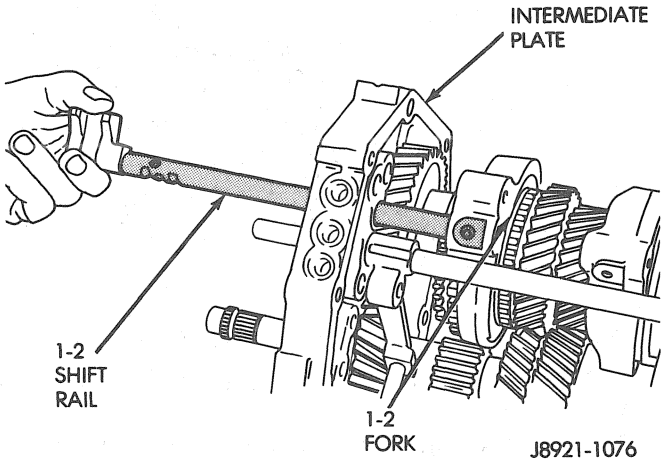


Fig. 99 Installing 1–2 Shift Rail

(10) Install 3–4 shift rail in intermediate plate and in both shift forks (Fig. 101).

(11) Verify that none of the interlock balls, plugs, or pins were displaced during shift rail installation.

(12) Install and tighten shift fork setscrews to 20 N·m (14 ft. lbs.) torque (Fig. 102).

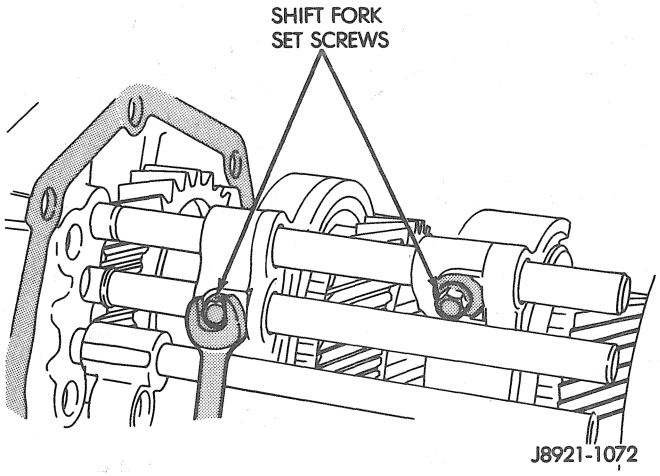


Fig. 102 Installing Shift Fork Set Screws

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Install 1–2 and 3–4 shift rail C–rings (Fig. 103).

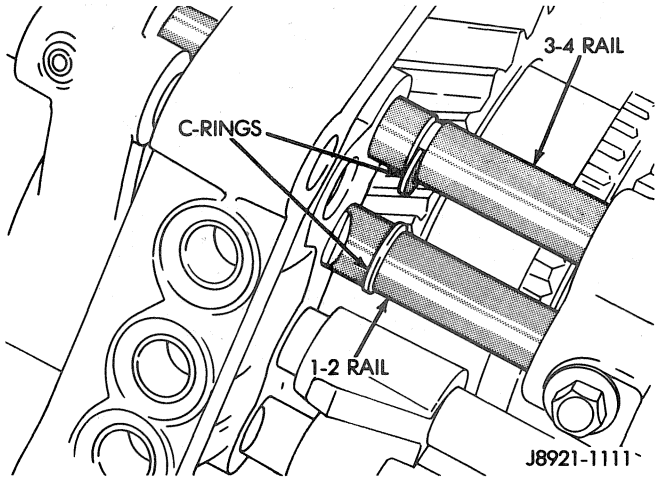


Fig. 103 Installing Shift Rail C–Rings

(14) Insert fifth gear shift rail through reverse shift fork. **Then slide rail into intermediate plate just far enough to secure interlock ball. Do not fully install shift rail at this time.**

OUTPUT SHAFT AND CLUSTER GEAR

DISASSEMBLE

(1) Remove output shaft rear bearing snap ring (Fig. 104).

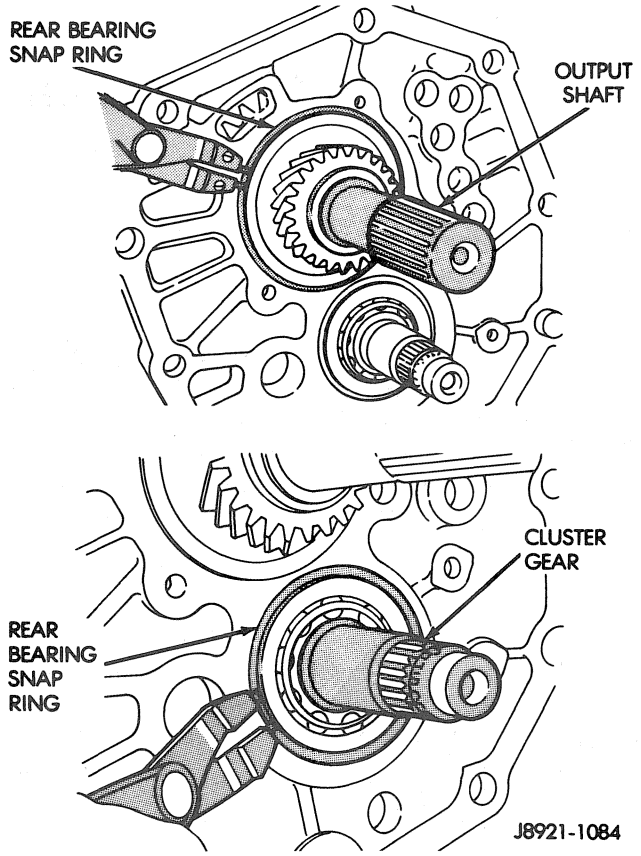


Fig. 104 Removing Bearing Snap Rings

(2) Remove cluster gear rear bearing snap ring (Fig. 104).

(3) Tap end of output shaft with mallet to unseat and start rear bearing out of intermediate plate (Fig. 105).

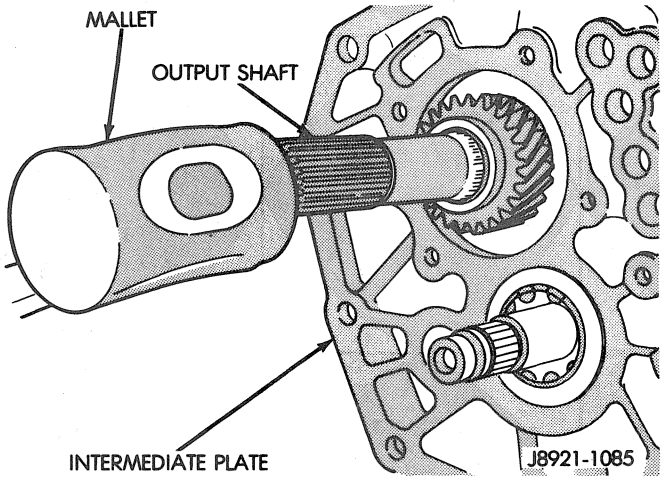


Fig. 105 Unseating Output Shaft Rear Bearing

(4) Remove output shaft by rocking it lightly until rear bearing comes out of intermediate plate (Fig. 106).

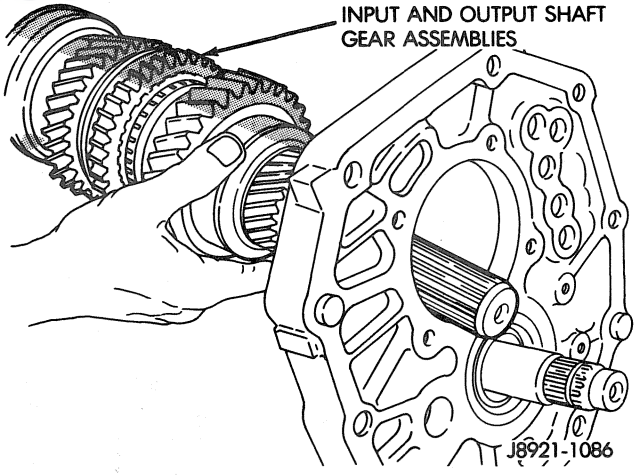


Fig. 106 Input And Output Shaft Removal

(5) Remove cluster gear by pulling it straight out of rear bearing (Fig. 107).

(6) Remove cluster gear rear bearing from intermediate plate (Fig. 108).

(7) Remove input shaft from output shaft (Fig. 109).

(8) Remove output shaft pilot bearing from input shaft (Fig. 110).

(9) Remove synchro ring from input shaft (Fig. 111).

(10) Remove bearing snap ring and press bearing off input shaft (Fig. 111).

DISASSEMBLY AND ASSEMBLY (Continued)

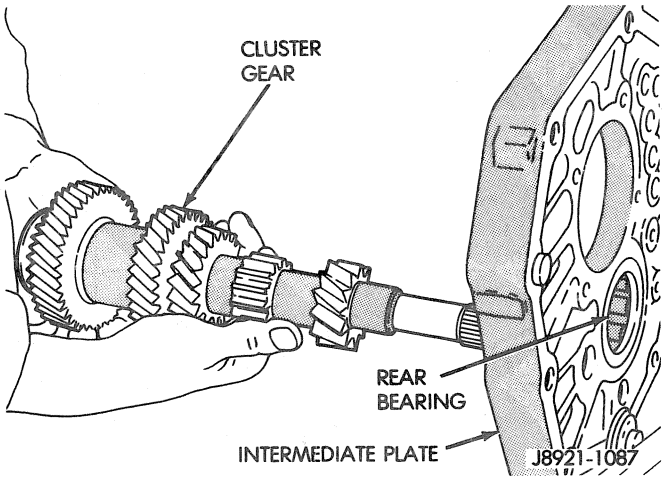


Fig. 107 Cluster Gear Removal

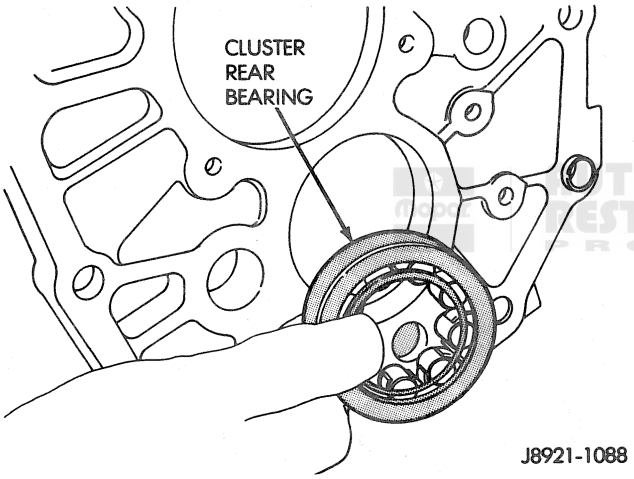


Fig. 108 Removing Cluster Gear Rear Bearing

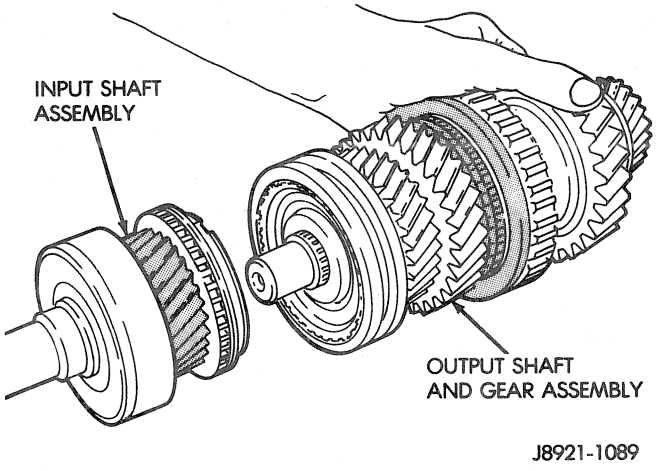


Fig. 109 Input Shaft Removal

OUTPUT SHAFT AND CLUSTER GEAR ASSEMBLE

(1) Mount intermediate plate in vise (Fig. 112).

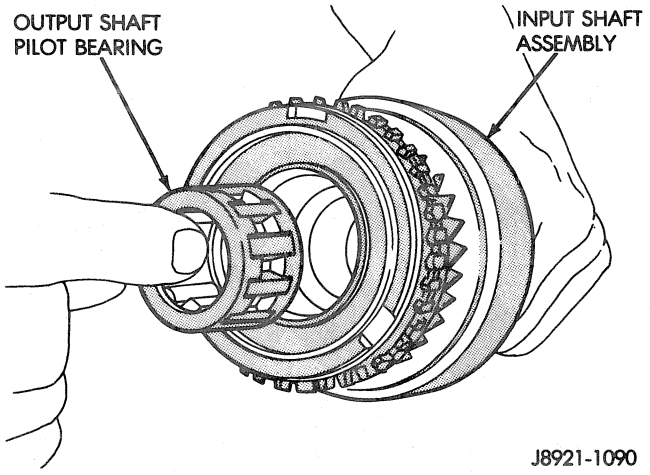


Fig. 110 Input Shaft Pilot Bearing Removal

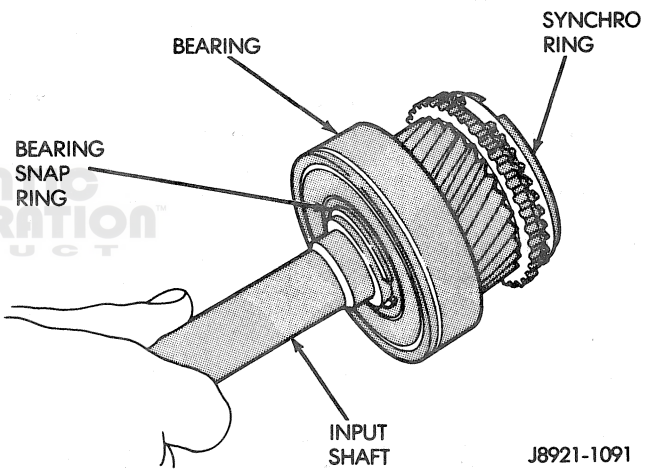


Fig. 111 Input Shaft Components

(2) Lubricate cluster gear journal and rear bearing with petroleum jelly or gear lubricant.

(3) Install cluster gear rear bearing in intermediate plate (Fig. 113). Be sure snap ring groove in bearing is rearward as shown.

(4) Start cluster gear into bearing (Fig. 107). Then hold bearing and push gear into place. Use plastic or rawhide mallet to seat bearing if necessary.

(5) Start output shaft rear bearing in intermediate plate. Push shaft rearward and tap intermediate plate with mallet to seat bearing.

(6) Install snap rings on cluster and output shaft **rear** bearings only (Fig. 114). Do not install front bearing snap rings at this time.

(7) Install reverse idler gear and shaft (Fig. 115).

(8) Position rear bearing retainer over output shaft and rear bearing. **Be sure bearing retainer tab is engaged in reverse idler shaft notch (Fig. 116).**

(9) Install and tighten rear bearing retainer bolts to 18 N·m (13 ft. lbs.).

DISASSEMBLY AND ASSEMBLY (Continued)

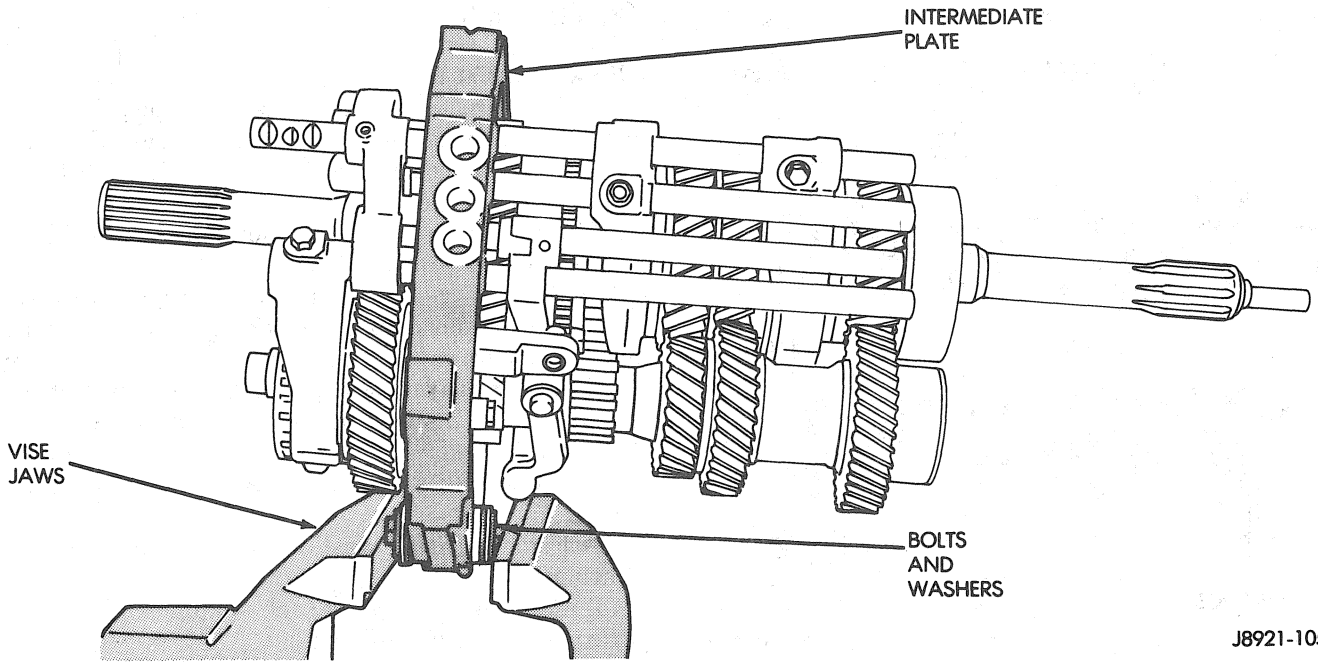


Fig. 112 Mounting Intermediate Plate And Geartrain In Vise

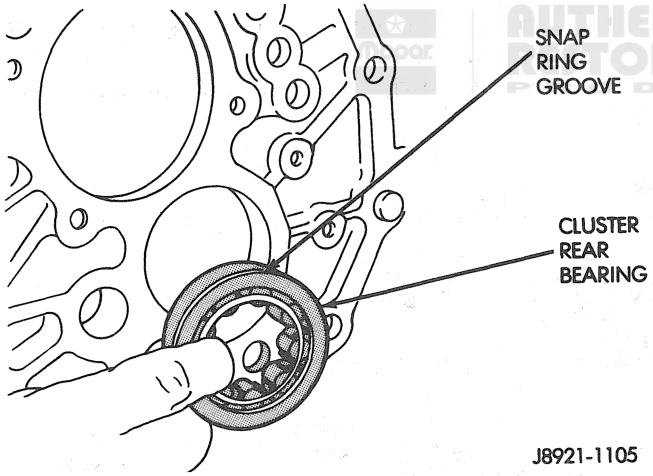


Fig. 113 Installing Cluster Gear Rear Bearing

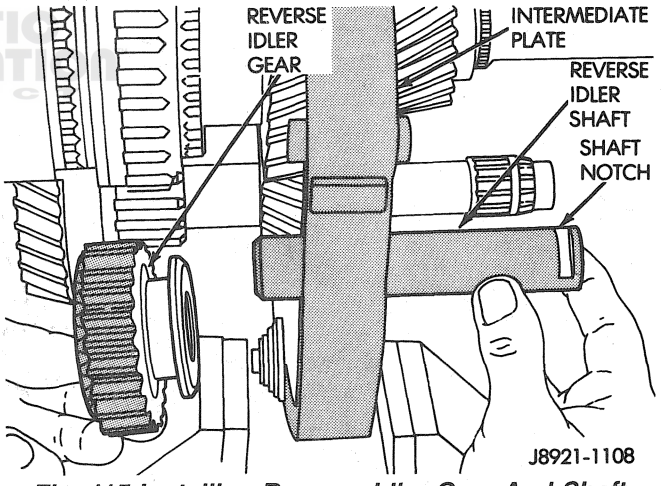


Fig. 115 Installing Reverse Idler Gear And Shaft

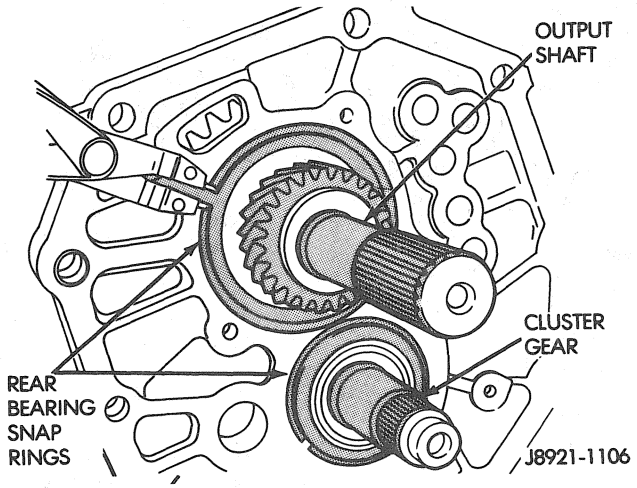


Fig. 114 Installing Rear Bearing Snap Rings

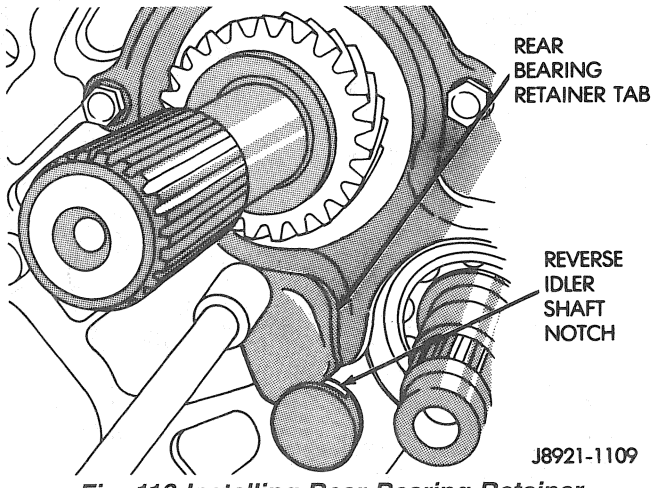


Fig. 116 Installing Rear Bearing Retainer

DISASSEMBLY AND ASSEMBLY (Continued)

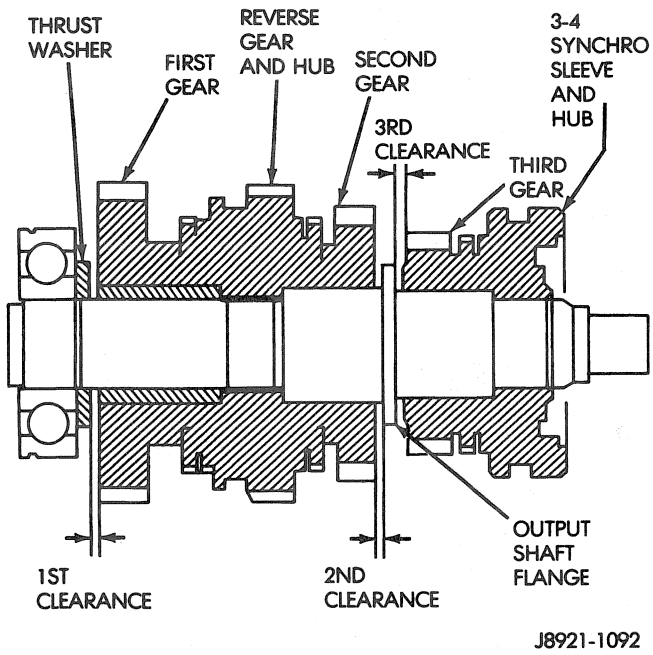


Fig. 117 Checking Output Shaft Gear Thrust Clearance

OUTPUT SHAFT

DISASSEMBLE

(1) Measure thrust clearance of output shaft first, second and third gears with feeler gauge (Fig. 117).

- First gear clearance should be 0.10—0.40 mm (0.003—0.0197 in).
- Second—third gear clearance should be 0.10—0.30 mm (0.003—0.0118 in.).

(2) If first gear thrust clearance is incorrect, replace gear and thrust washer. **If second or third gear clearance is incorrect, either gear and bearing, or output shaft flange is worn. Refer to output shaft inspection in Cleaning and Inspection section.**

(3) Press fifth gear and rear bearing off rear of output shaft.

(4) Remove thrust washer, pin, and first gear and bearing (Fig. 118).

(5) Remove first/reverse hub snap ring (Fig. 118).

(6) Remove synchro ring.

(7) Press reverse gear and first/reverse hub off shaft as assembly.

(8) Remove remaining synchro ring and second gear and bearing (Fig. 118).

(9) Remove snap ring at front of output shaft (Fig. 118).

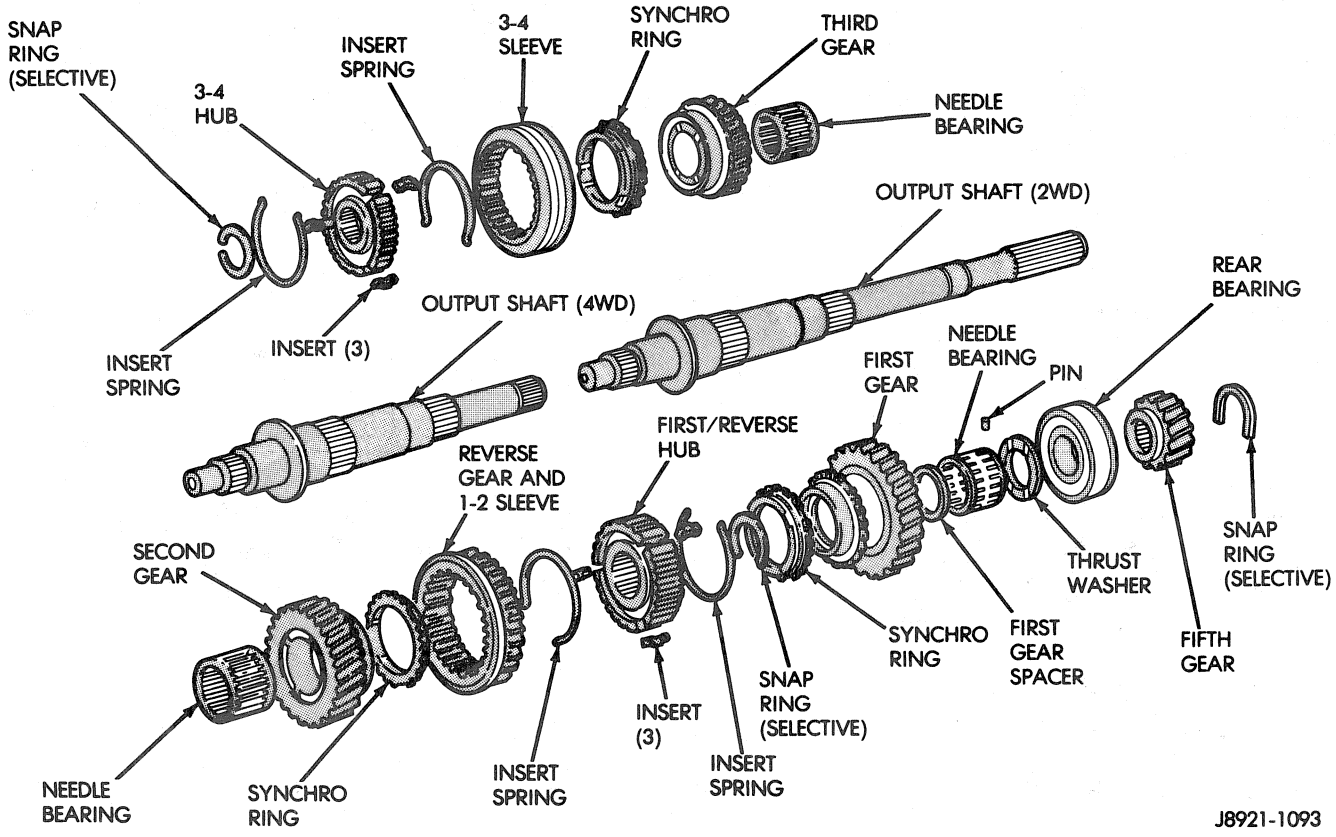


Fig. 118 Output Shaft And Gears

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Press 3–4 hub and sleeve off output shaft as assembly (Fig. 118).

(11) Remove synchro ring.

(12) Remove third gear and needle bearing (Fig. 118).

OUTPUT SHAFT ASSEMBLY

(1) Lubricate output shaft journals, gears and needle bearings with recommended gear lubricant.

(2) Install third gear and needle bearing on shaft (Fig. 118)

(3) Install synchro ring on third gear (Fig. 118).

(4) Assemble 1–2 and 3–4 synchro hubs and sleeves (Fig. 119).

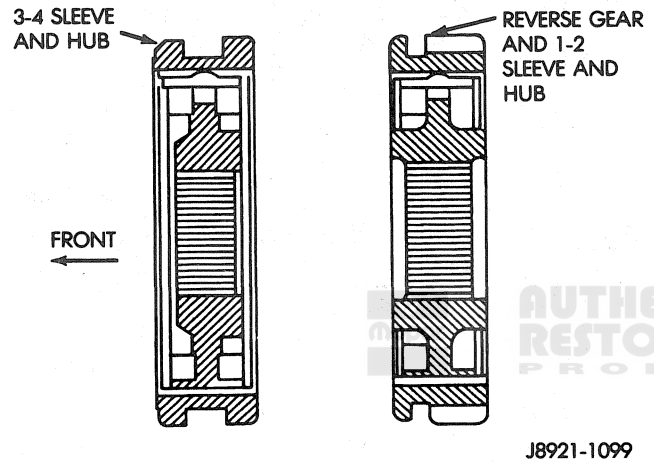


Fig. 119 Synchro Sleeve And Hub Identification

(5) Install inserts and springs in synchro sleeves. Position open ends of springs 180° apart as shown (Fig. 120).

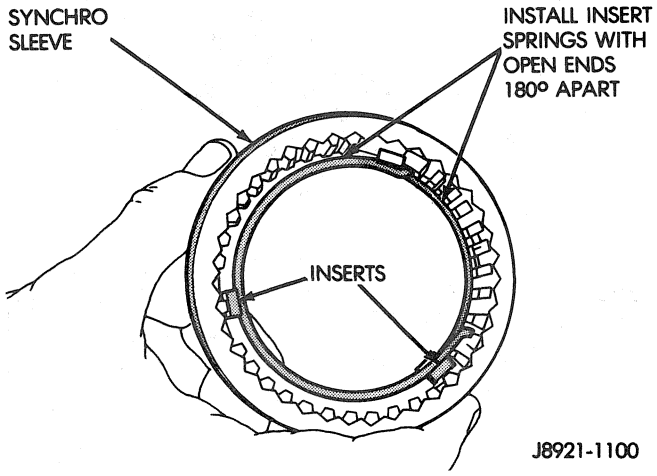
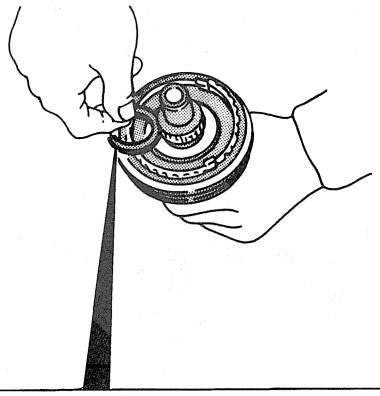


Fig. 120 Insert Spring Position

(6) Install 3–4 synchro hub and sleeve on output shaft. Press hub onto shaft if necessary.

(7) Install 3–4 synchro hub snap ring (Fig. 121). Use thickest snap ring that will fit in shaft groove.



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	1.80 - 1.85	(0.0709 - 0.0728)
B	1.85 - 1.90	(0.0728 - 0.0748)
C	1.90 - 1.95	(0.0748 - 0.0768)
D	1.95 - 2.00	(0.0768 - 0.0787)
E	2.00 - 2.05	(0.0787 - 0.0807)
F	2.05 - 2.10	(0.0807 - 0.0827)
G	2.10 - 2.15	(0.0827 - 0.0846)

J8921-1101

Fig. 121 Installing 3–4 Synchro Hub Snap Ring

(8) Verify third gear thrust clearance with feeler gauge (Fig. 122). Clearance should be 0.10 to 0.25 mm (0.004 to 0.010 in.).

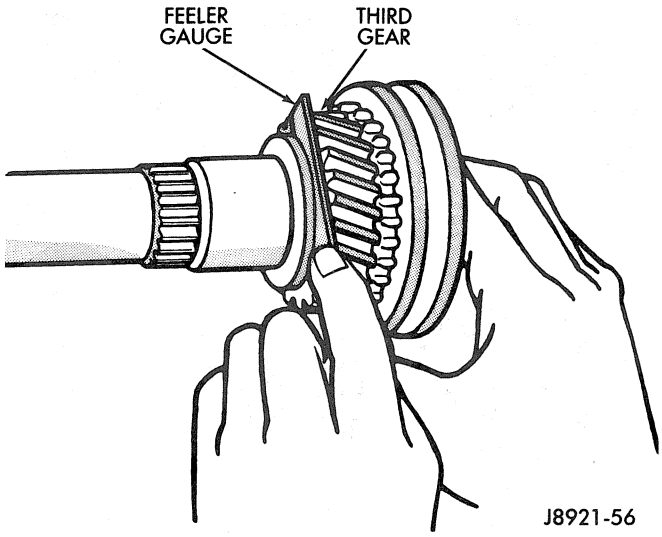


Fig. 122 Checking Third Gear Clearance

(9) Lubricate remaining output shaft gears and bearings with gear lubricant.

(10) Install second gear and needle bearing on shaft (Fig. 123).

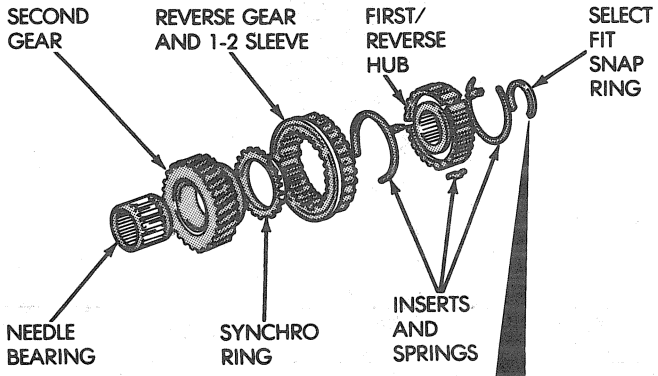
(11) Install synchro ring on second gear (Fig. 123).

(12) Assemble first/reverse hub, insert springs, inserts, reverse gear and 1–2 sleeve (Fig. 123). **Be sure spring ends are 180° apart. Note that splines in hub bore are chamfered on one side. Install hub so chamfered side faces front of output shaft.**

(13) Press assembled hub and sleeve on output shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Install selective snap ring (Fig. 123). Use thickest snap ring that will fit in output shaft groove.



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
B	2.35 - 2.40	(0.0925 - 0.0945)
C	2.40 - 2.45	(0.0945 - 0.0965)
D	2.45 - 2.50	(0.0965 - 0.0984)
E	2.50 - 2.55	(0.0984 - 0.1004)
F	2.55 - 2.60	(0.1004 - 0.1024)
G	2.60 - 2.65	(0.1024 - 0.1043)

J8921-1102

Fig. 123 Second Gear And Synchro Assembly

(15) Install synchro ring on first gear (Fig. 124).

(16) Install first gear spacer on shaft and against selective fit snap ring (Fig. 124).

(17) Install first gear and needle bearing (Fig. 124) on output shaft.

(18) Install locating pin and thrust washer on shaft (Fig. 124).

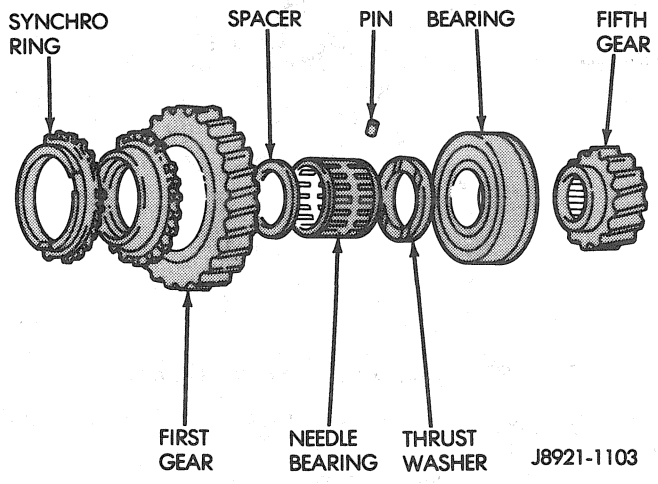


Fig. 124 First And Fifth Gear Components

(19) Press rear bearing on shaft. Position bearing snap ring groove so it is closest to end of output shaft.

(20) Check first and second gear thrust clearance with feeler gauge (Fig. 125).

- First gear clearance should be 0.10 to 0.40 mm (0.003 to 0.0197 in.)

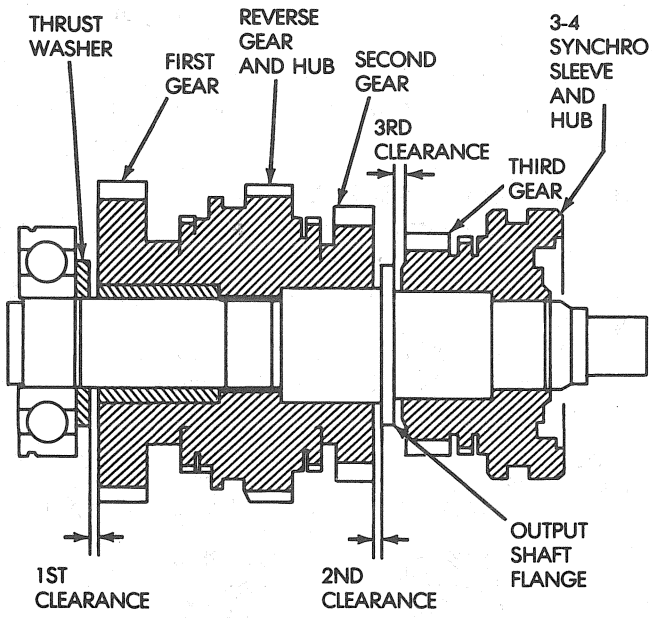
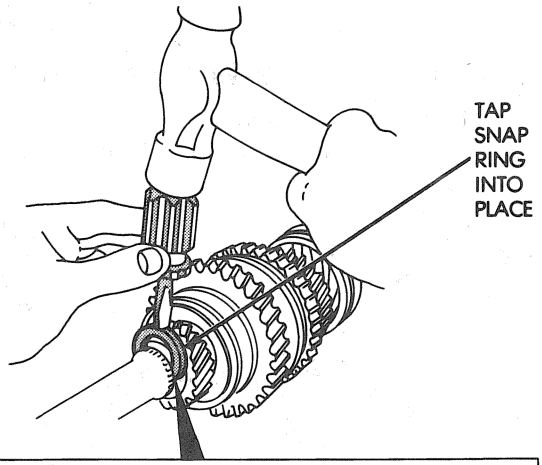


Fig. 125 Checking Output Shaft Gear Thrust Clearance

- Second gear clearance should be 0.10 to 0.30 mm (0.003 to 0.0118 in.)

(21) Press fifth gear onto output shaft. Then install select fit snap ring (Fig. 126). Use thickest snap ring that will fit in shaft groove.



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.75 - 2.80	(0.1083 - 0.1102)
B	2.80 - 2.85	(0.1002 - 0.1122)
C	2.85 - 2.90	(0.1122 - 0.1142)
D	2.90 - 2.95	(0.1142 - 0.1161)
E	2.95 - 3.00	(0.1161 - 0.1181)
F	3.00 - 3.05	(0.1181 - 0.1201)
G	3.05 - 3.10	(0.1201 - 0.1220)
H	3.10 - 3.15	(0.1220 - 0.1240)
J	3.15 - 3.20	(0.1240 - 0.1260)
K	3.20 - 3.25	(0.1260 - 0.1280)
L	3.25 - 3.30	(0.1280 - 0.1299)
M	3.30 - 3.35	(0.1299 - 0.1319)

J8921-1104

Fig. 126 Selecting Fifth Gear Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(22) Lubricate input shaft pilot bearing with petroleum jelly and install bearing in shaft (Fig. 127).

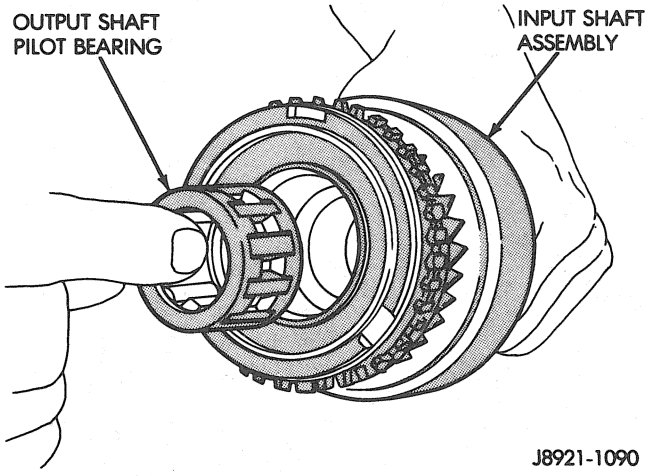


Fig. 127 Input Shaft Pilot Bearing Removal

(23) Install input shaft on output shaft (Fig. 128). Be sure output shaft hub is fully seated in pilot bearing.

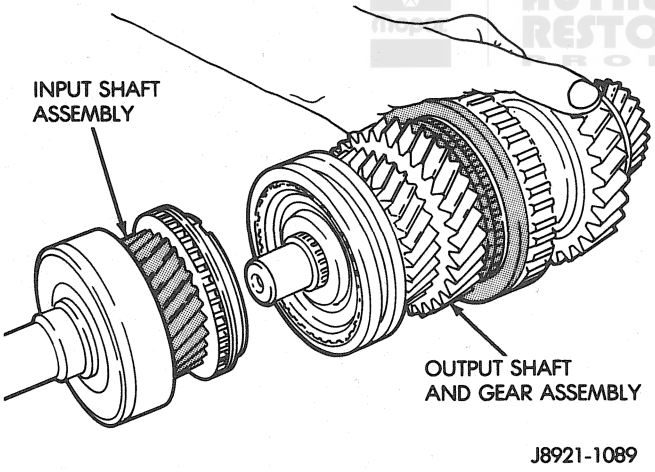


Fig. 128 Input Shaft Removal

CLEANING AND INSPECTION

AX15 TRANSMISSION

Clean the transmission components in solvent. Then dry the cases, gears, shift mechanism and shafts with compressed air. **Dry the bearings with clean, dry shop towels only. Never use compressed air on the bearings. This could damage the bearing rollers.**

Replace components that are obviously worn, cracked, chipped or damaged.

Inspect the transmission case. Replace the case if cracked or porous or if any of the bearing and gear bores are damaged.

OUTPUT SHAFT INSPECTION

Measure thickness of the output shaft flange with a micrometer (Fig. 130). Minimum allowable flange thickness is 4.70 mm (0.185 in).

If shaft flange thickness is OK but previously measured second/third gear thrust clearance was incorrect (Fig. 129), replace the necessary gear and needle bearing as an assembly.

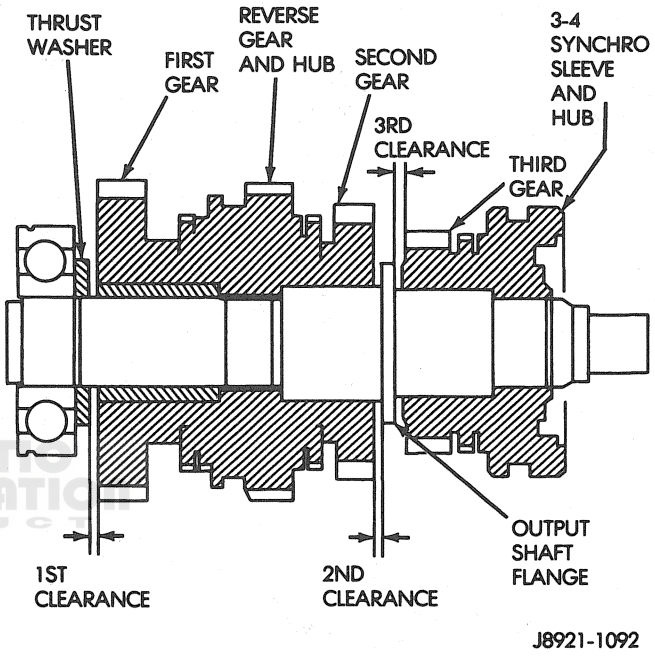


Fig. 129 Checking Output Shaft Gear Thrust Clearance

Check diameter of the first, second and third gear bearing surfaces of the output shaft (Fig. 130). Minimum allowable diameters are:

- 38.86 mm (1.529 in.) for first gear surface
- 46.86 mm (1.844 in.) for second gear surface
- 37.86 mm (1.490 in.) for third gear surface

Check output shaft runout with V–blocks and a dial indicator (Fig. 130). Maximum allowable runout is 0.06 mm (0.0024 in.).

Replace the output shaft if any surface measured fails to meet stated tolerance.

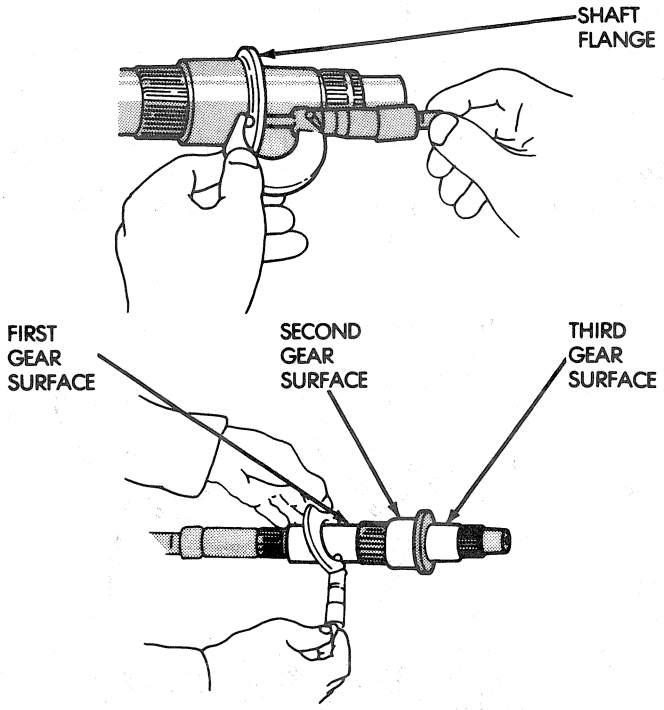
CLUSTER GEAR INSPECTION

Inspect the cluster gear teeth. Replace the gear if any teeth are worn or damaged or if the bearing surfaces are damaged.

Check diameter of the cluster gear journal with a micrometer (Fig. 131). Minimum allowable diameter is 27.860 mm (1.096 in.).

Check condition of the cluster gear front bearing. Replace the bearing if worn, noisy, or damaged.

CLEANING AND INSPECTION (Continued)



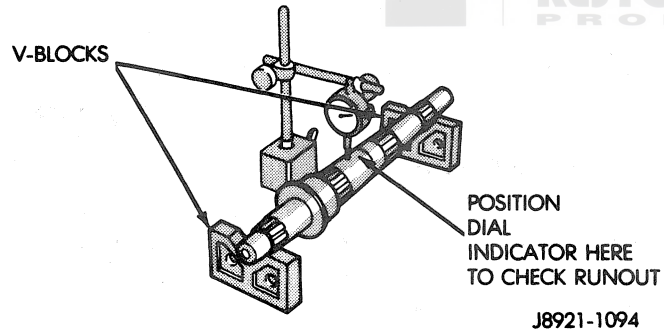


Fig. 130 Checking Output Shaft Tolerances

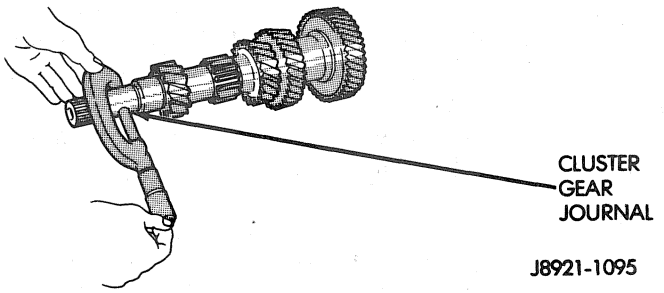


Fig. 131 Checking Cluster Gear Journal Diameter

AX15 COMPONENTS

GEARTRAIN AND SYNCHRO

Install the synchro rings on their respective gears. Rotate each ring on the gear and note synchro action. Replace any synchro ring that exhibits a lack of braking action or binds on the gear. Also replace any ring that is worn or has chipped or broken teeth.

Measure end clearance between the synchro ring and the gear with a feeler gauge (Fig. 132). Clearance should be 0.06 mm to 1.6 mm (0.024 to 0.063 in.).

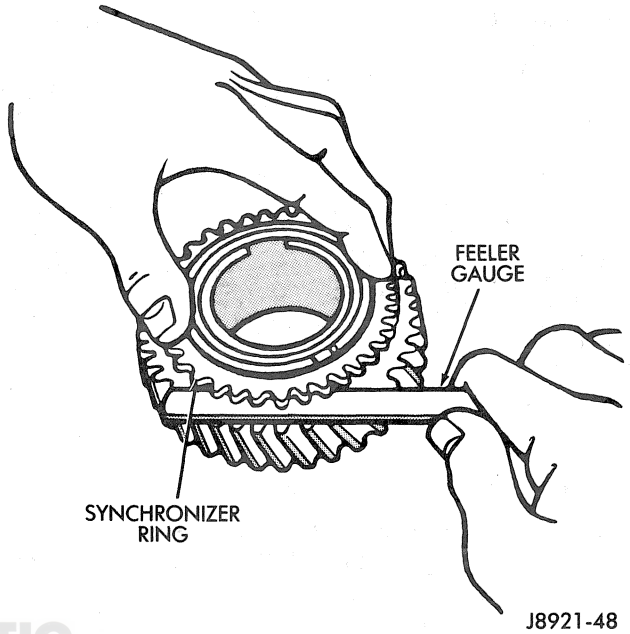


Fig. 132 Checking Synchro Ring End Clearance

Install the needle bearings in the first, second and third gears. Then install the gears on the output shaft and check shaft–to–gear clearance with a dial indicator (Fig. 133).

Maximum allowable clearance is 0.16 mm (0.0063 in.). If any gear exhibits excessive clearance, replace the gear and needle bearing.

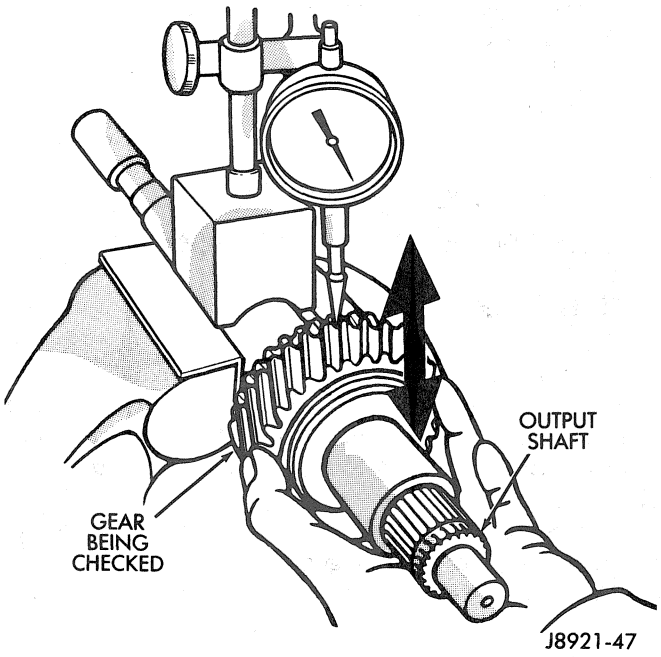


Fig. 133 Checking Gear–To–Shaft Clearance

CLEANING AND INSPECTION (Continued)

Check clearance between the shift forks and synchro sleeves with a feeler gauge (Fig. 134). Clearance should not exceed 1.0 mm (0.039 in.). Replace the synchro sleeve (and matching hub) if clearance exceeds the stated limit.

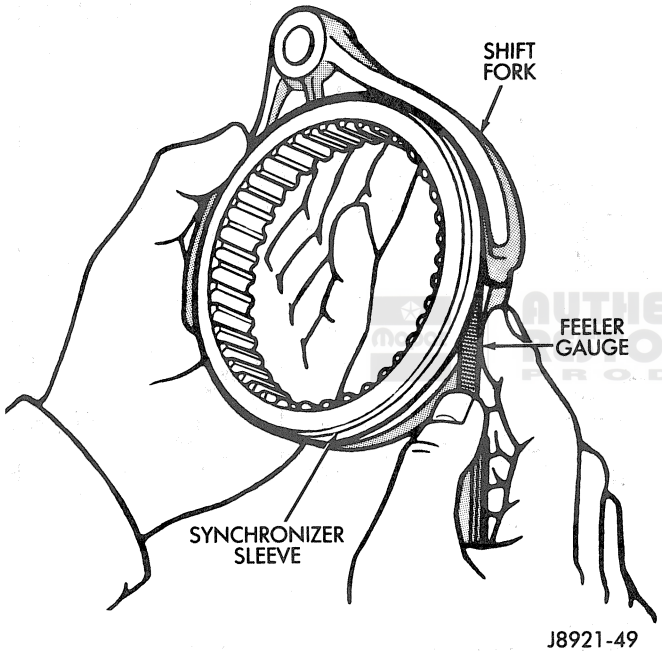


Fig. 134 Checking Shift Fork–To–Sleeve Clearance

Check condition of the reverse idler gear bushing (Fig. 135). Replace the gear if the bushing is scored or worn.

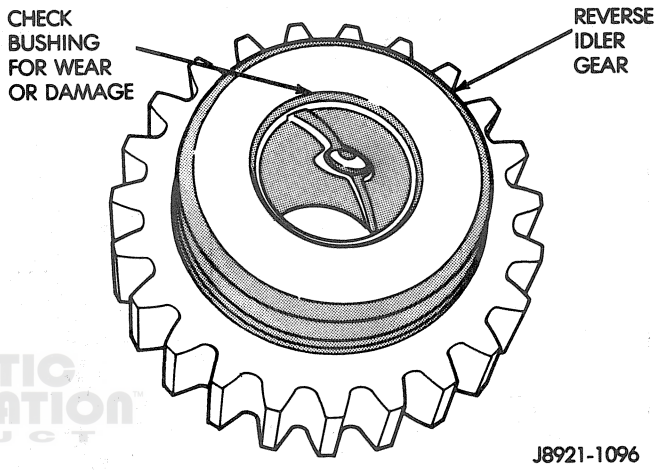


Fig. 135 Reverse Idler Gear Bushing

GEAR CASE, HOUSING AND INTERMEDIATE PLATE

Clean the case, housing and plate with solvent and dry with compressed air. Replace any component that is cracked, warped or damaged in any way.

Inspect the threads in the case, housing and plate. Minor thread damage can be repaired with steel thread inserts if necessary. However, do not attempt to repair if the cracks are evident around any threaded hole.

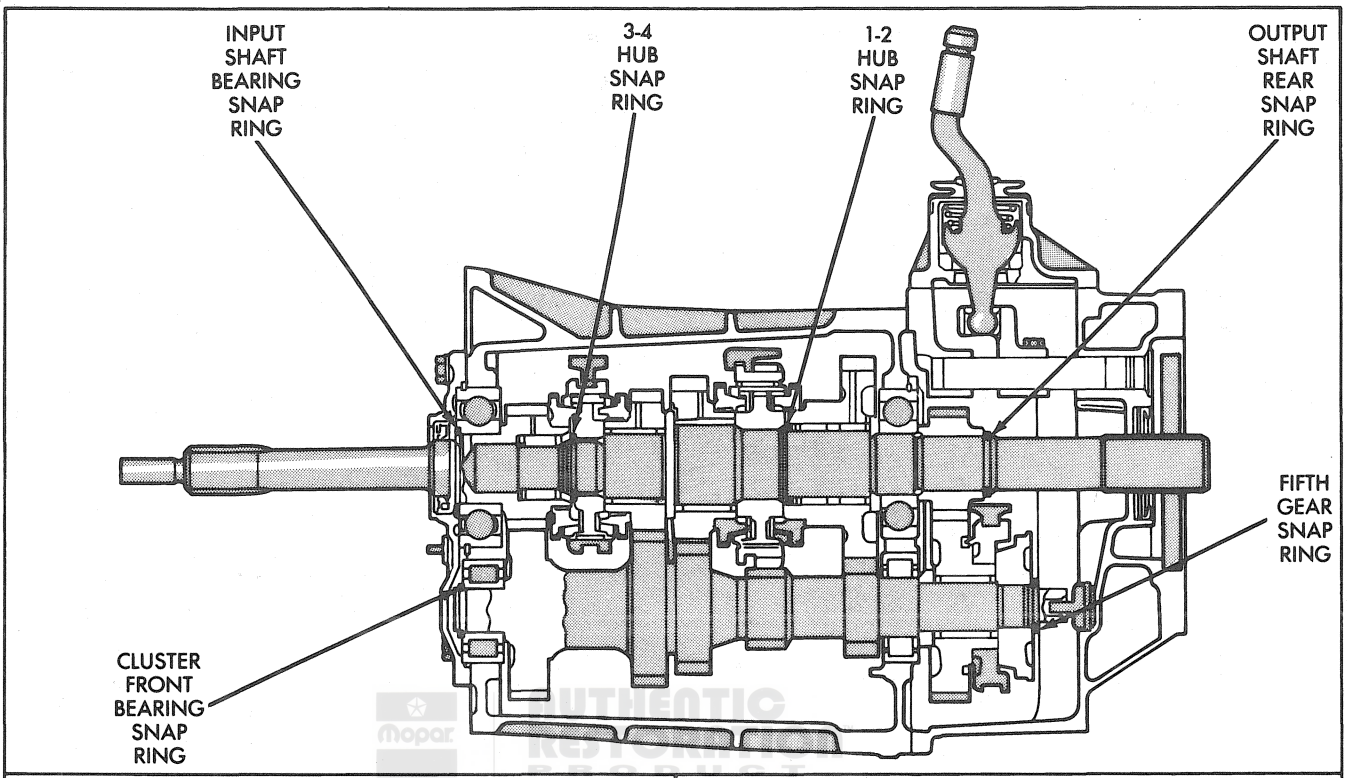
Inspect the reverse pin in the adapter/extension housing. Replace the pin if worn or damaged. Refer to the replacement procedure in the Transmission Assembly section.

SPECIFICATIONS

AX15 MANUAL TRANSMISSION

SPECIFICATIONS (Continued)

SELECTIVE SNAP RINGS



INPUT SHAFT BEARING SNAP RING

I.D. MARK	THICKNESS
A	2.10-2.15 mm
B	2.15-2.20 mm
C	2.20-2.25 mm
D	2.25-2.30 mm
E	2.30-2.35 mm
F	2.35-2.40 mm
G	2.40-2.45 mm

1-2 HUB SNAP RING

I.D. MARK	THICKNESS
B	2.35-2.40 mm
C	2.40-2.45 mm
D	2.45-2.50 mm
E	2.50-2.55 mm
F	2.55-2.60 mm
G	2.60-2.65 mm

CLUSTER FRONT BEARING SNAP RING

I.D. MARK	THICKNESS
A	2.00-2.05 mm
B	2.05-2.10 mm
C	2.10-2.15 mm
D	2.15-2.20 mm
E	2.20-2.25 mm

OUTPUT SHAFT REAR SNAP RING

I.D. MARK	THICKNESS
A	2.75-2.80 mm
B	2.80-2.85 mm
C	2.85-2.90 mm
D	2.90-2.95 mm
E	2.95-3.00 mm
F	3.00-3.05 mm
G	3.05-3.10 mm
H	3.10-3.15 mm
I	3.15-3.20 mm
J	3.20-3.25 mm
K	3.25-3.30 mm
L	3.30-3.35 mm

3-4 HUB SNAP RING

I.D. MARK	THICKNESS
A	1.80-1.85 mm
B	1.85-1.90 mm
C	1.90-1.95 mm
D	1.95-2.00 mm
E	2.00-2.05 mm
F	2.05-2.10 mm
G	2.10-2.15 mm

FIFTH GEAR SNAP RING

I.D. MARK	THICKNESS
A	2.80-2.85 mm
B	2.85-2.90 mm
C	2.90-2.95 mm
D	2.95-3.00 mm
E	3.00-3.05 mm
F	3.05-3.10 mm
G	3.10-3.15 mm
H	3.15-3.20 mm

J8921-1131

SPECIFICATIONS (Continued)

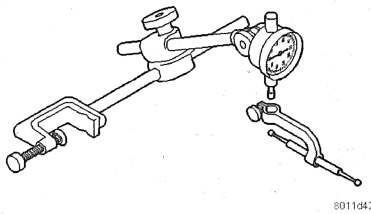
TORQUE

Description	Torque
Access Plugs	19 N•m (14 ft. lbs.)
Adapter Housing Bolts	37 N•m (27 ft. lbs.)
Backup Light Switch	37 N•m (27 ft. lbs.)
Drain and Fill Plugs	37 N•m (27 ft. lbs.)
Front Bearing Retainer Bolts	17 N•m (12 ft. lbs.)
Interlock and Detent Ball Plugs	19 N•m (14 ft. lbs.)
Propeller Shaft Clamp Screws	16-23 N•m (140-200 in. lbs.)
Rear Mount-To-Transmission Bolts	33-60 N•m (24-44 ft. lbs.)
Rear Mount Clevis Bolt/Nut	54-75 N•m (40-55 ft. lbs.)
Rear Mount-To-Crossmember Nuts	33-49 N•m (24-36 ft. lbs.)
Restrictor Pins	19 N•m (14 ft. lbs.)
Reverse Shift Arm Bracket Bolts	18 N•m (13 ft. lbs.)
Shift Arm Set Screw	38 N•m (28 ft. lbs.)
Shift Fork Set Screws	20 N•m (15 ft. lbs.)
Shift Knob Nut	20-34 N•m (15-25 ft. lbs.)
Shift Lever Floor Cover Screws	2-3 N•m (17-30 in. lbs.)
Shift Tower Bolts	18 N•m (13 ft. lbs.)
Transfer Case Mounting Nuts	30-41 N•m (22-30 ft. lbs.)

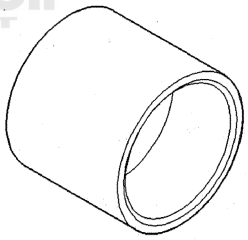
J9321-89

SPECIAL TOOLS

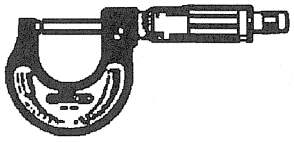
AX15



C-3339 Dial Indicator Set



C-3995-A Installer, Extension Housing Seal



C-4961 Michrometer, Two Inch

AUTOMATIC TRANSMISSION—30RH

INDEX

page

GENERAL INFORMATION
RECOMMENDED FLUID 74
TORQUE CONVERTER 74
TRANSMISSION GEAR RATIOS 74
TRANSMISSION IDENTIFICATION 74
TRANSMISSION 72
DESCRIPTION AND OPERATION
CONVERTER CLUTCH ENGAGEMENT 75
CONVERTER DRAINBACK VALVE 75
GEARSHIFT MECHANISM 74
HYDRAULIC CONTROL SYSTEM 74
DIAGNOSIS AND TESTING
AIR TESTING TRANSMISSION CLUTCH AND BAND OPERATION 81
ANALYZING ROAD TEST 78
AUTOMATIC TRANSMISSION DIAGNOSIS 75
CAUSES OF BURNED FLUID 77
CHECKING FLUID LEVEL AND CONDITION 76
CONVERTER HOUSING FLUID LEAK DIAGNOSIS 81
CONVERTER STALL TEST 80
DIAGNOSIS CHARTS 85
EFFECTS OF INCORRECT FLUID LEVEL 77
FLUID CONTAMINATION 77
HYDRAULIC PRESSURE TEST 78
OIL COOLER FLOW CHECK 77
PARK/NEUTRAL POSITION SWITCH 76
PRELIMINARY DIAGNOSIS 75
ROAD TESTING 78
STALL TEST ANALYSIS 81
SERVICE PROCEDURES
ALUMINUM THREAD REPAIR 94
CONVERTER DRAINBACK CHECK VALVE SERVICE . 94
FLUID AND FILTER REPLACEMENT 92
FLUID LEVEL CHECK 92
TRANSMISSION COOLER REVERSE FLUSHING . 94
TRANSMISSION FILL PROCEDURE 93
REMOVAL AND INSTALLATION
EXTENSION HOUSING BUSHING—2WD 96
EXTENSION HOUSING—2WD 96
GOVERNOR AND PARK GEAR 98
OUTPUT SHAFT REAR BEARING—TYPICAL . . . 97
PARK LOCK 98
PARK/NEUTRAL POSITION SWITCH 95
SPEEDOMETER SERVICE 95
TORQUE CONVERTER 102
TRANSMISSION COOLER LINE AND FITTINGS . . . 100
TRANSMISSION COOLER—AUXILLARY 100
TRANSMISSION 100
VALVE BODY 99
YOKE SEAL REPLACEMENT—2WD 96
DISASSEMBLY AND ASSEMBLY
FRONT CLUTCH 130
FRONT SERVO PISTON 126
GOVERNOR AND PARK GEAR 104
OIL PUMP AND REACTION SHAFT SUPPORT . 126
OVERRUNNING CLUTCH/LOW-REVERSE DRUM . 125
PLANETARY GEAR TRAIN/OUTPUT SHAFT . . . 134
REAR CLUTCH 131
REAR SERVO PISTON 126
TRANSMISSION 112
VALVE BODY 105
CLEANING AND INSPECTION
EXTENSION HOUSING AND PARK LOCK 140
FRONT CLUTCH 145
FRONT SERVO 144
GOVERNOR AND PARK GEAR 139
OIL PUMP AND REACTION SHAFT SUPPORT . 145
OVERRUNNING CLUTCH/LOW-REVERSE DRUM/REAR SUPPORT 144
PLANETARY GEARTRAIN 146
REAR CLUTCH 146
REAR SERVO 144
TRANSMISSION 144
VALVE BODY 140
ADJUSTMENTS
FRONT BAND ADJUSTMENT 149
PARK INTERLOCK CABLE ADJUSTMENT 147
REAR BAND ADJUSTMENT 150
SHIFT CABLE ADJUSTMENT 147
THROTTLE VALVE CABLE ADJUSTMENT 149
VALVE BODY 150
SCHEMATICS AND DIAGRAMS 151
SPECIFICATIONS
30RH AUTOMATIC TRANSMISSION 164
SPECIAL TOOLS
30RH AUTOMATIC TRANSMISSION 165

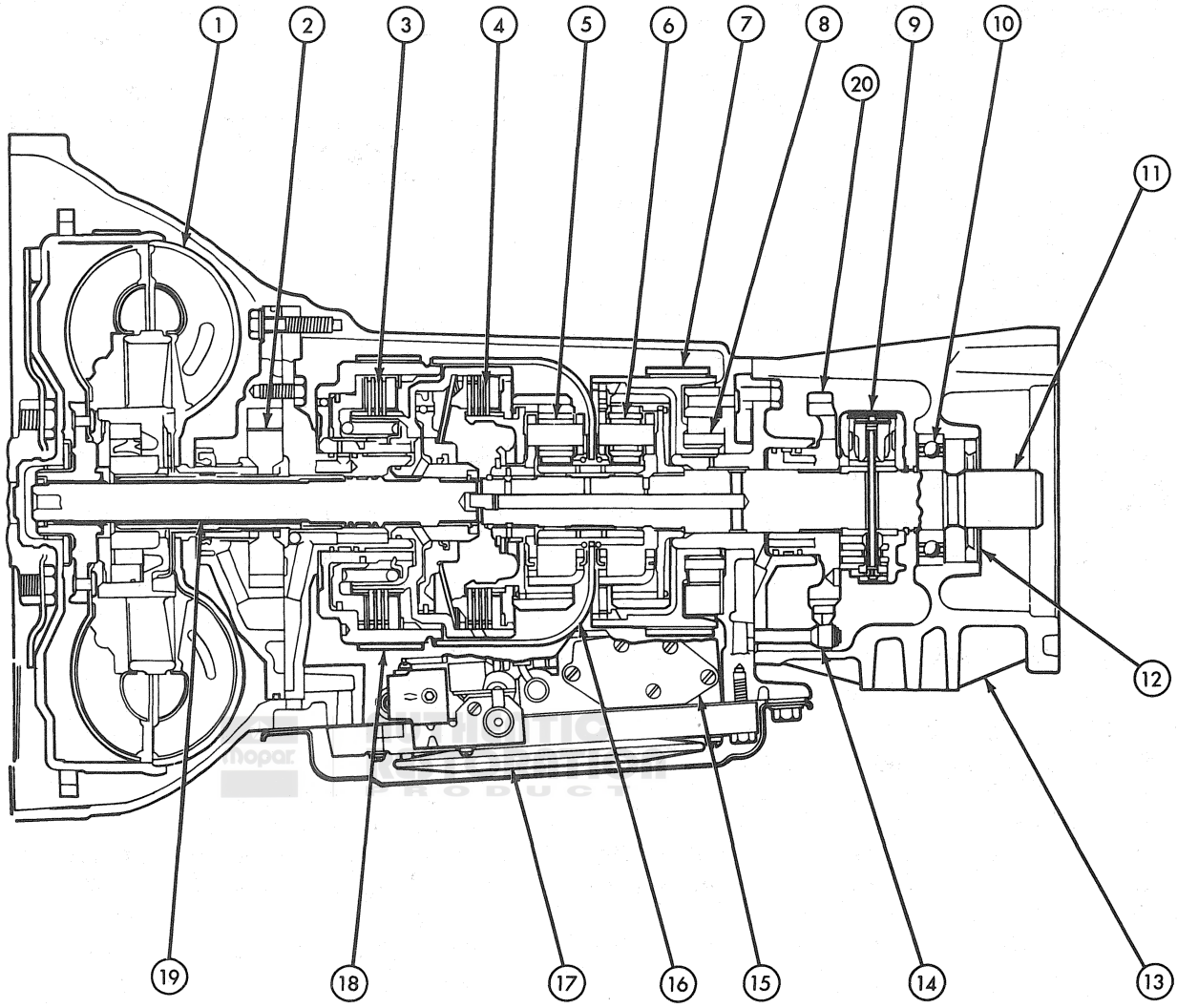
GENERAL INFORMATION

TRANSMISSION

Chrysler 30RH automatic transmission is used in XJ models. It is a 3-speed automatic transmission with a gear-type oil pump, two clutches and bands and a planetary gear system (Fig. 1).

The 30RH is used with a 2.5L engine.

GENERAL INFORMATION (Continued)



1. CONVERTER
2. OIL PUMP
3. FRONT CLUTCH
4. REAR CLUTCH
5. FRONT PLANETARY GEAR SET
6. REAR PLANETARY GEAR SET
7. LOW AND REVERSE (REAR) BAND
8. OVERRUNNING CLUTCH
9. GOVERNOR
10. BEARING
11. OUTPUT SHAFT
12. SEAL
13. ADAPTER HOUSING
14. PARK LOCK ROD
15. VALVE BODY
16. SUN GEAR DRIVING SHELL
17. OIL FILTER
18. KICK DOWN (FRONT) BAND
19. INPUT SHAFT
20. PARK GEAR

J9021-30

Fig. 1 30RH Automatic Transmission

GENERAL INFORMATION (Continued)

TRANSMISSION IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan gasket surface (Fig. 2). Refer to this information when ordering replacement parts.

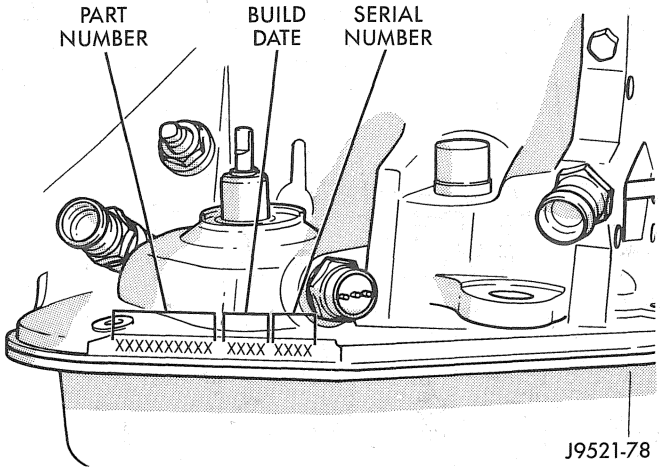


Fig. 2 Transmission Part And Serial Number Location

RECOMMENDED FLUID

Mopar ATF Plus, Type 7176 automatic transmission fluid is the recommended fluid for Chrysler automatic transmissions.

Dexron II fluid IS NOT recommended. Clutch chatter can result from the use of improper fluid. If Mopar ATF Plus is not available, Dexron II can be used as a supplement if the vehicle must be driven.

TORQUE CONVERTER

The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. Torque multiplication is created when the stator directs the hydraulic flow from the turbine to rotate the impeller in the direction the engine crankshaft is turning. The impeller transfers power to the planetary gear sets in the transmission. The transfer of power into the impeller assists torque multiplication. At low vehicle speed, the overrunning clutch rotates the stator at engine speed (during torque multiplication) and allows the stator to free wheel at high vehicle speed on deceleration. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The converter clutch engages in third gear. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid. If the fluid is contaminated, flush the fluid cooler and lines.

TRANSMISSION GEAR RATIOS

Forward gear ratios are:

- 2.74:1 (first gear)
- 1.54:1 (second gear)
- 1.00:1 (third gear)

DESCRIPTION AND OPERATION

GEARSHIFT MECHANISM

The shift mechanism is cable operated and provides six shift positions. The shift indicator is located on the console next to the gear shift. The shift positions are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual Second (2)
- Manual Low (1)

Manual low (1) range provides first gear only. Over run braking is also provided in this range. Manual second (2) range provides first and second gear only. Drive range provides first, second, and third gear ranges.

HYDRAULIC CONTROL SYSTEM

The transmission hydraulic control system performs four basic functions.

- pressure supply
- pressure regulation
- flow control and lubrication
- clutch/band application

PRESSURE SUPPLY

The oil pump develops fluid pressure for clutch/band application and for lubrication. The pump is driven by the torque converter. The converter is driven by a driveplate attached to the engine crankshaft.

Pressure Regulation

The pressure regulator valve maintains line (operating) pressure. The amount of pressure developed is controlled by throttle pressure which is dependent on the degree of throttle opening. The regulator valve is located in the valve body.

DESCRIPTION AND OPERATION (Continued)

The throttle valve determines line pressure and shift speed. Governor pressure increases in proportion to vehicle speed. The throttle valve controls upshift and downshift speeds by regulating pressure according to throttle position.

Flow Control And Lubrication

The manual valve is operated by the gearshift linkage and provides the operating range selected by the driver.

The switch valve controls line pressure to the converter clutch. The valve also directs oil to the cooling and lubrication circuits. The switch valve regulates oil pressure to the torque converter by limiting maximum oil pressure to 130 psi.

The 1-2 shift valve provide 1-2 and 2-1 shifts and the 2-3 shift valve provide 2-3 and 3-2 shifts.

The 1-2 shift control valve transmits 1-2 shift pressure to the accumulator piston. This controls kickdown band capacity on 1-2 upshifts and 3-2 downshifts.

The 2-3 valve throttle pressure plug provides 3-2 downshifts at varying throttle openings depending on vehicle speed.

The kickdown valve provides forced downshifts depending on vehicle speed. Downshifts occur when the throttle is opened beyond downshift detent position. Detent is reached just before wide open throttle position.

The limit valve determines maximum speed at which a 3-2 part throttle kickdown can be made. Some transmissions do not have the limit valve and maximum speed for a 3-2 kickdown is at the detent position.

The shuttle valve has two functions. First is fast front band release and smooth engagement during "lift foot" 2-3 upshifts. Second is to regulate front clutch release and band application during 3-2 downshifts.

The fail safe valve restricts feed to the converter clutch if front clutch pressure drops. It permits clutch engagement only in direct (third) gear and provides fast clutch release during kickdown.

Clutch/Band Application

The front/rear clutch pistons and servo pistons are actuated by line pressure. When line pressure is removed, the pistons are released by spring tension.

On 2-3 upshifts, the front servo piston is released by spring tension and hydraulic pressure. The accumulator controls hydraulic pressure on the apply side of the front servo during 1-2 upshifts and at all throttle openings.

CONVERTER CLUTCH ENGAGEMENT

Converter clutch engagement in third gear is controlled by sensor inputs to the powertrain control module. Inputs that determine clutch engagement are: coolant temperature, engine speed, vehicle speed and throttle position. The torque converter clutch is engaged by the clutch solenoid on the valve body. The clutch will engage at approximately 56 km/h (35 mph) with light throttle, after the shift to third gear.

CONVERTER DRAINBACK VALVE

The drainback valve is located in the transmission cooler outlet (pressure) line. The valve prevents fluid from draining from the converter into the cooler and lines when the vehicle is shut down for lengthy periods. Production valves have a hose nipple at one end, while the opposite end is threaded for a flare fitting. All valves have an arrow (or similar mark) to indicate direction of flow through the valve.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION DIAGNOSIS

Automatic transmission problems can be a result of poor engine performance, incorrect fluid level, incorrect linkage or cable adjustment, band or hydraulic control pressure adjustments, hydraulic system malfunctions or electrical/mechanical component malfunctions. Begin diagnosis by checking the easily accessible items such as: fluid level, condition, and linkage adjustments. A road test will determine if further diagnosis is necessary.

On vehicles with 32RH transmission, check for a diagnostic trouble code (DTC). Access the DTC by cycling the ignition key ON-OFF-ON-OFF and ON. With the ignition ON, count the number of times the malfunction indicator lamp (MIL) flashes. Three MIL flashes followed by seven indicate an open or shorted circuit in the torque converter clutch control system. Refer to the Group 8W, Wiring Diagrams for circuit information and component locations.

PRELIMINARY DIAGNOSIS

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVABLE

(1) Check fluid level and condition.

(2) Adjust throttle and gearshift linkage if complaint was based on delayed, erratic, or harsh shifts.

(3) Road test and note how transmission upshifts, downshifts and engages.

(4) Perform stall test if complaint is based on sluggish acceleration. Or, if abnormal throttle opening is needed to maintain normal speeds with a properly tuned engine.

DIAGNOSIS AND TESTING (Continued)

(5) Perform hydraulic pressure test if shift problems were noted during road test.

(6) Perform air pressure test to check clutch-band operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken, disconnected gearshift and throttle linkage.

(3) Check for cracked, leaking cooler lines, or loose, missing pressure port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged drive plate, converter, oil pump or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic pressure test to determine if problem is hydraulic or mechanical.

PARK/NEUTRAL POSITION SWITCH

The center terminal of the park/neutral position switch is the starter-circuit terminal. It provides the ground for the starter solenoid circuit through the selector lever in PARK and NEUTRAL positions only. The outer terminals on the switch are for the backup lamp circuit.

SWITCH TEST

To test the switch, remove the wiring connector. Then test for continuity between the center terminal and the transmission case. Continuity should exist only when the transmission is in PARK or NEUTRAL.

Shift the transmission into REVERSE and test continuity at the switch outer terminals (Fig. 3). Continuity should exist only when the transmission is in REVERSE. Continuity should not exist between the outer terminals and the case.

Check gearshift linkage adjustment before replacing a switch that tests bad.

CHECKING FLUID LEVEL AND CONDITION

Transmission fluid level and condition should be checked a minimum of six times per year under normal operation. If the vehicle is used for commercial operation, trailer towing, or similar high load operation, fluid level and condition should be checked weekly.

Fluid level is checked with the engine running at curb idle speed, brakes applied, transmission in Neutral, and the transmission fluid at normal operating temperature (hot).

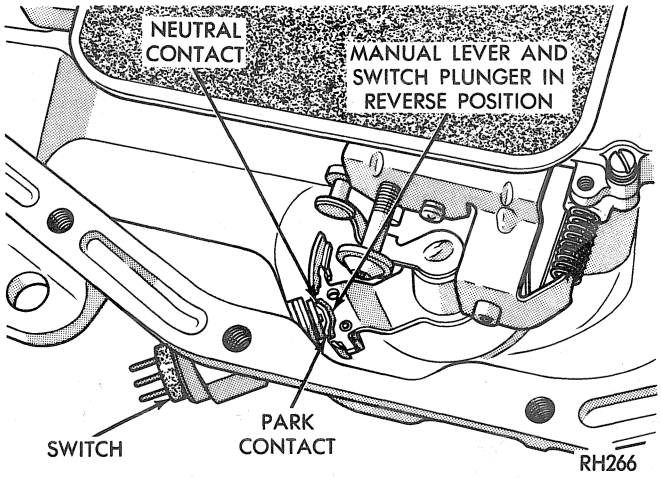


Fig. 3 Park/Neutral Switch Terminals

(1) Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82° C (180° F).

(2) Position vehicle on level surface. This is extremely important for accurate fluid level check.

(3) Start and run engine at curb idle speed.

(4) Apply parking brakes.

(5) Shift transmission momentarily into all gear ranges. Then shift transmission back to **Neutral.**

(6) Clean top of filler tube and dipstick to keep dirt from entering tube.

(7) Remove dipstick and check **fluid level** as follows:

(a) Dipstick has three indicator levels (Fig. 4) which are a MIN dot, an OK crosshatch area, and a MAX fill arrow.

(b) Correct maximum level is to MAX arrow mark. Correct acceptable level is to OK mark in crosshatch area. Incorrect level is at or below MIN dot.

CAUTION: Do not overfill the transmission. Overfilling may cause leakage out the pump vent which can be mistaken for a pump seal leak. Overfilling will also cause fluid aeration and foaming as the excess fluid is picked up and churned by the gear train. This will significantly reduce fluid life.

(c) If fluid is low, add only enough Mopar ATF Plus to restore correct level. Do not overfill.

(d) If transmission is overfilled, fluid can be removed with 1/8 to 3/16 in. diameter tubing and suction gun. Tubing will have to be adapted to nozzle of gun and be long enough to extend down fill tube and into transmission oil pan.

(8) Check **fluid condition** as follows:

DIAGNOSIS AND TESTING (Continued)

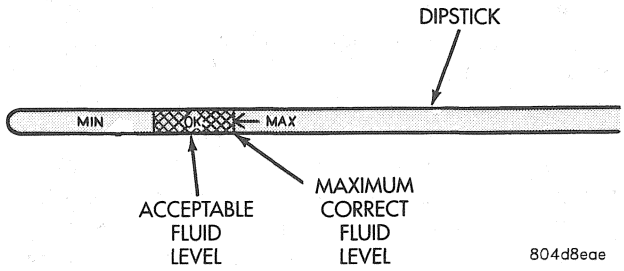


Fig. 4 Dipstick Fluid Level Marks

(a) Fluid color should range from dark red to pink and be free of particles and sludge.

(b) If fluid is orange, brown, or smells burned but shifts were OK, flow test and reverse flush cooler and lines. Then change fluid and filter and road test again to confirm proper operation.

(c) If fluid is black, dark brown, turned to sludge, contains extensive amount of metal or friction material particles, transmission will need overhaul. Main and auxiliary coolers will have to be flow tested and reverse flushed as well.

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve, clutch and servo operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNED FLUID

Burned, discolored fluid is a result of overheating which has two primary causes.

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to reverse flush cooler and lines after repair
- failure to replace contaminated converter after repair

The use of non recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission for some time, an overhaul may also be necessary; especially if shift problems had developed.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in re-contamination and a shop comeback. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

OIL COOLER FLOW CHECK

After the new or repaired transmission has been installed and filled, the oil cooler flow should be checked using the following procedure:

(1) Disconnect the **From cooler** line at the transmission and place a collecting container under the disconnected line.

(2) Run the engine at curb idle speed, with the shift selector in neutral.

(3) If the fluid flow is intermittent or takes more than 20 seconds to collect one quart, the cooler should be replaced.

DIAGNOSIS AND TESTING (Continued)

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(4) If flow is found to be within acceptable limits, reconnect the cooler line. Then fill transaxle to the proper level, using the approved type of automatic transmission fluid.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul will be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application charts (Fig. 5) provide a basis for analyzing road test results.

DRIVE ELEMENTS	Gearshift Lever Position								
	P	R	N	D			2		1
				1	2	3	1	2	
FRONT CLUTCH		•				•			
FRONT BAND (KICKDOWN)					•			•	
REAR CLUTCH				•	•	•	•	•	•
REAR BAND (LOW-REV.)		•							•
OVER-RUNNING CLUTCH				•			•		•

J9021-33

Fig. 5 Clutch And Band Application

ANALYZING ROAD TEST

Refer to the Clutch and Band Application chart (Fig. 5) and note which elements are in use in the various gear ranges.

Verify that the rear clutch is applied in all forward ranges (D, 2, 1). The transmission overrunning clutch is applied in first gear (D, 2 and 1 ranges) only. The rear band is applied in 1 and R range only.

Verify that the overdrive clutch is applied only in fourth gear and the overdrive direct clutch and overrunning clutch are applied in all ranges except fourth gear. For example: If slippage occurs in first gear in D and 2 range but not in 1 range, the transmission overrunning clutch is faulty. Similarly, if slippage occurs in any two forward gears, the rear clutch is slipping.

Applying the same method of analysis, verify that the front and rear clutches are applied simultaneously only in D range third gear. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping.

If slippage occurs during the third gear and the direct clutch were to fail, the transmission would lose both reverse gear and overrun braking in 2 position (manual second gear). If the transmission slips in any other forward gears, the transmission rear clutch is probably slipping.

This process of elimination can be used to identify a slipping unit and check operation. Proper use of the Clutch and Band Application Chart is the key.

Although road test analysis will help determine the slipping unit, the actual cause of a malfunction usually cannot be determined until hydraulic and air pressure tests are performed. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

Unless a malfunction is obvious, such as no drive in D range first gear, do not disassemble the transmission. Perform the hydraulic and air pressure tests to help the probable cause.

HYDRAULIC PRESSURE TEST

Hydraulic test pressures range from a low of one psi (6.895 kPa) governor pressure, to 300 psi (2068 kPa) at the rear servo pressure port in reverse. Use 100 psi Gauge C-3292 to check pressure at the accumulator, front servo and governor. Use 300 psi Gauge C-3293-SP to check pressure at the rear servo and overdrive port.

Pressure Test Port Locations

Pressure test ports locations are provided at the accumulator, front servo, and rear servo, governor passage, and overdrive clutch pressure passage (Fig. 6), (Fig. 7) and (Fig. 8).

An accurate tachometer and two test gauges are required for the pressure test. Test Gauge C-3292 has a 100 psi range and is used at the accumulator, governor, and front servo pressure ports. Test Gauge C-3293-SP has a 300 psi range and is used at the rear servo port and overdrive test ports where pres-

DIAGNOSIS AND TESTING (Continued)

sures are higher. In cases where two test gauges are required, the 300 psi gauge can be used at any of the other test ports.

Line pressure is checked at the accumulator port on the right side of the case. The front servo pressure port is at the right side of the case just behind the filler tube opening.

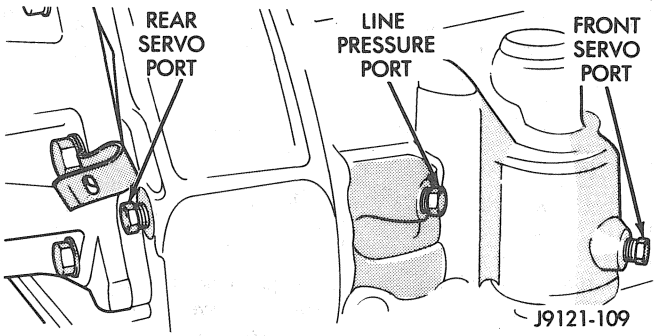


Fig. 6 Pressure Test Ports At Side Of Case

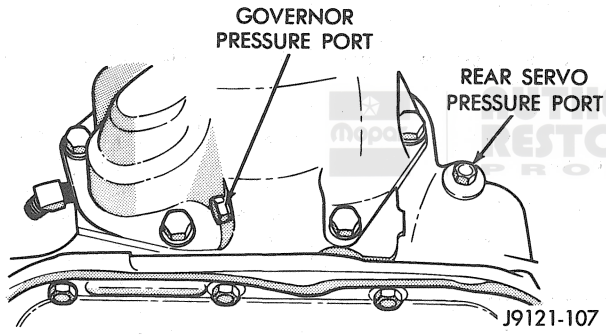


Fig. 7 Pressure Test Ports At Rear Of Case—2WD

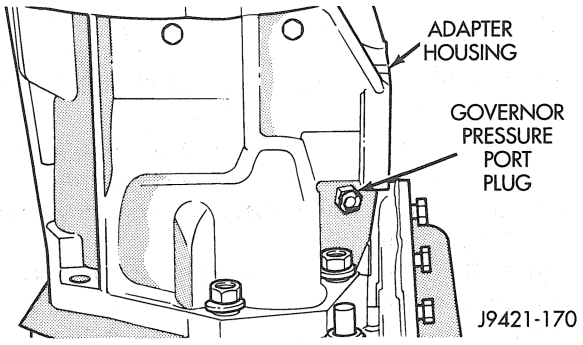


Fig. 8 Pressure Test Ports At Rear Of Case—4WD

Connect a tachometer to the engine. Position the tachometer so it can be observed from under the vehicle. Raise the vehicle on a hoist that will allow the wheels to rotate freely.

PRESSURE TEST PROCEDURE

Test One - Transmission In 1 Range

This test checks pump output, pressure regulation, and condition of the rear clutch and servo circuit. Test Gauges C-3292 and C-3293-SP are required for this test. Gauge C-3292 has a 100 psi range. Gauge C-3293-SP has a 300 psi range.

(1) Connect 100 psi Gauge C-3292 to accumulator port.

(2) Connect 300 psi Gauge C-3293-SP to rear servo port (Fig. 6) and (Fig. 7).

(3) Disconnect throttle and gearshift rods from manual and throttle levers.

(4) Start and run engine at 1000 rpm.

(5) Move shift lever (on manual lever shaft) all the way forward into 1 range.

(6) Move transmission throttle lever from full forward to full rearward position and note pressures on both gauges.

(7) Line pressure at accumulator port should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

(8) Rear servo pressure should be same as line pressure within 3 psi (20.68 kPa).

Test Two - Transmission In 2 Range

This test checks pump output and pressure regulation. Use 100 psi Test Gauge C-3292 for this test.

(1) Connect test gauge to accumulator pressure port (Fig. 6) and (Fig. 7).

(2) Start and run engine at 1000 rpm.

(3) Move shift lever on valve body manual lever shaft, one detent rearward from full forward position. This is 2 range.

(4) Move transmission throttle lever from full forward to full rearward position and read pressure at both gauges.

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

Test Three - Transmission In D Range

This test checks pressure regulation and condition of the clutch circuits. Use both pressure Test Gauges C-3292 and C-3293-SP for this test.

(1) Connect test gauges to accumulator and front servo ports (Fig. 6) and (Fig. 7). Use either test gauge at the two ports.

(2) Start and run engine at 1600 rpm for this test.

(3) Move selector lever to D range. This is two detents rearward from full forward position.

(4) Read pressures on both gauges as transmission throttle lever is moved from full forward to full rearward position.

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase as lever is moved rearward.

DIAGNOSIS AND TESTING (Continued)

(6) Front servo is pressurized only in D range and should be same as line pressure within 3 psi (21 kPa) up to downshift point.

Test Four - Transmission In Reverse

This test checks pump output, pressure regulation and the front clutch and rear servo circuits. Use 300 psi Test Gauge C-3293-SP for this test.

(1) Connect 300 psi gauge to rear servo port (Fig. 6) and (Fig. 7).

(2) Start and run engine at 1600 rpm for test.

(3) Move valve body selector lever four detents rearward from the full forward position. This is Reverse range.

(4) Move throttle lever all way forward then all way rearward and note gauge readings.

(5) Pressure should be 145 - 175 psi (1000-1207 kPa) with lever forward and increase to 230 - 280 psi (1586-1931 kPa) as lever is moved rearward.

Test Five - Governor Pressure

This test checks governor operation by measuring governor pressure response to changes in engine speed. It is usually not necessary to check governor operation unless shift speeds are incorrect or if the transmission will not downshift.

(1) Connect 100 psi Test Gauge C-3292 to governor pressure port (Fig. 6) and (Fig. 7).

(2) Move shift lever to D range.

(3) Start and run engine at curb idle speed and note pressure. At idle and with vehicle stopped, pressure should be zero to 1.5 psi maximum. If pressure exceeds this figure, governor valve or weights are sticking open.

(4) Slowly increase engine speed and observe speedometer and pressure test gauge. Governor pressure should increase in proportion to vehicle speed. Or approximately 1 psi for every 1 mph.

(5) Pressure rise should be smooth and drop back to 0 to 1.5 psi when wheels stop rotating.

(6) Compare results of pressure tests with analysis charts (Fig. 9).

CONVERTER STALL TEST

Stall testing involves determining maximum engine speed obtainable at full throttle with the rear wheels locked and the transmission in D range. This test checks the holding ability of the converter overrunning and transmission clutches. When stall testing is completed, refer to the stall speed chart and diagnosis guides.

WARNING: NEVER ALLOW ANYONE TO STAND DIRECTLY IN LINE WITH THE VEHICLE FRONT OR REAR DURING A STALL TEST. ALWAYS BLOCK THE WHEELS AND FULLY APPLY THE SERVICE AND PARKING BRAKES DURING THE TEST.

TEST CONDITION	INDICATION
Line pressure OK during any one test	Pump and regulator valve OK
Line pressure OK in R but low in D, 2, 1	Leakage in rear clutch area (servo, clutch seals, governor support seal rings on park gear)
Pressure OK in 1, 2 but low in D3 and R	Leakage in front clutch area (servo, clutch seals, retainer bore, pump seal rings)
Pressure OK in 2 but low in R and 1	Leakage in rear servo
Front servo pressure in 2	Leakage in servo (broken servo ring or cracked servo piston)
Pressure low in all positions	Clogged filter, stuck pressure regulator valve, worn or defective pump
Governor pressure too high at idle speed	Governor valve sticking open
Governor pressure low at all mph figures	Governor valve sticking closed
Lubrication pressure low at all throttle positions	Clogged drainback valve, oil cooler or lines, seal rings leaking, output shaft plugged with debris, worn bushings in pump or clutch retainer
	J9521-129

Fig. 9 Pressure Test Analysis

STALL TEST PROCEDURE

(1) Connect tachometer to engine. Position tachometer so it can be viewed from driver's seat.

(2) Check transmission fluid level. Add fluid if necessary.

(3) Drive vehicle to bring transmission fluid up to normal operating temperature. Vehicle can be driven on road, or on chassis dynamometer, if available.

(4) Block front wheels.

(5) Fully apply service and parking brakes.

(6) Open throttle completely and record maximum engine speed registered on tachometer. It takes 4-10 seconds to reach max rpm. **Once max rpm has been achieved, do not hold wide open throttle for more than 4-5 seconds.**

CAUTION: Stalling the converter causes a rapid increase in fluid temperature. To avoid fluid overheating, hold the engine at maximum rpm for no more than 5 seconds. If engine exceeds 2500 rpm during the test, release the accelerator pedal immediately; transmission clutch slippage is occurring.

DIAGNOSIS AND TESTING (Continued)

(7) If a second stall test is required, cool down fluid before proceeding. Shift into NEUTRAL and run engine at 1000 rpm for 20-30 seconds to cool fluid.
(8) Refer to Stall Test Analysis.

STALL TEST ANALYSIS

Stall Speed Too High

If the stall speed exceeds 1800-2300 rpm by more than 200 rpm, transmission clutch slippage is indicated.

Stall Speed Low

Low stall speed with a properly tuned engine indicate a torque converter overrunning clutch problem. The condition should be confirmed by road testing before to converter replacement. A stall speed 250-350 rpm below normal indicates the converter overrunning clutch is slipping. The vehicle also exhibits poor acceleration but operates normally once highway cruise speeds are reached. Torque converter replacement will be necessary.

Stall Speed Normal But Acceleration Poor

If stall speeds are normal (1800-2300 rpm) but abnormal throttle opening is required for acceleration, or to maintain cruise speed, the converter overrunning clutch is seized. The torque converter will have to be replaced.

Converter Noise During Test

A whining noise caused by fluid flow is normal during a stall test. However, loud metallic noises indicate a damaged converter. To confirm that noise is originating from the converter, operate the vehicle at light throttle in DRIVE and NEUTRAL on a hoist and listen for noise coming from the converter housing.

AIR TESTING TRANSMISSION CLUTCH AND BAND OPERATION

Air-pressure testing can be used to check transmission front/rear clutch and band operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check, after overhaul.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The servo and clutch apply passages are shown (Fig. 10).

Front Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through front clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

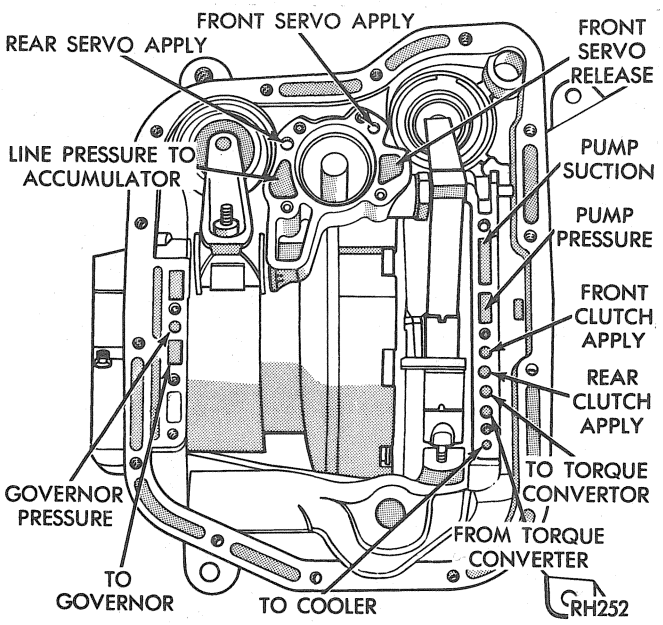


Fig. 10 Air Pressure Test Passages

Rear Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through rear clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Front Servo Air Test

Apply air pressure to the front servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

Rear Servo Air Test

Apply air pressure to the rear servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

CONVERTER HOUSING FLUID LEAK DIAGNOSIS

When diagnosing converter housing fluid leaks, two items must be established before repair.
(1) Verify that a leak condition actually exists.
(2) Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Pump seal leaks tend to move along the drive hub and onto the rear of the converter. Pump O-ring or pump body leaks follow the same path as a seal leak (Fig. 11). Pump vent or pump attaching bolt

DIAGNOSIS AND TESTING (Continued)

leaks are generally deposited on the inside of the converter housing and not on the converter itself (Fig. 11). Pump seal or gasket leaks usually travel down the inside of the converter housing. Front band lever pin plug leaks are generally deposited on the housing and not on the converter.

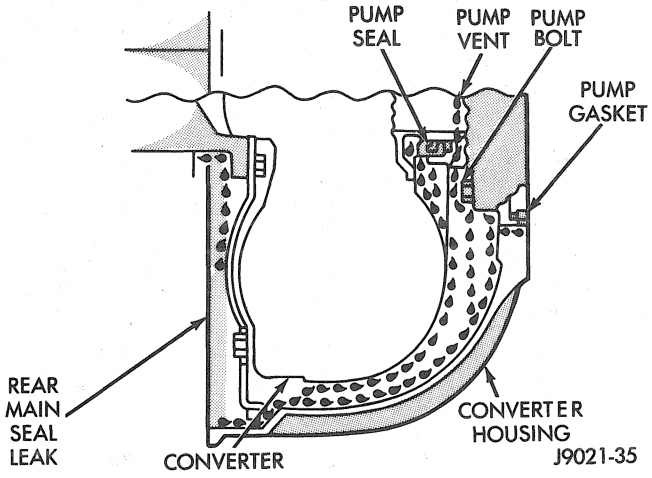


Fig. 11 Converter Housing Leak Paths

LEAK DIAGNOSIS PROCEDURE

(1) Raise rear of vehicle and allow accumulated fluid to drain out of converter housing.

(2) Check and adjust transmission fluid level.

(3) Raise vehicle. Remove converter housing dust cover and wipe as much fluid as possible from converter housing.

(4) Fabricate test probe (Fig. 12). Attach probe to converter housing with a dust shield bolt.

(5) Have a helper run engine at 2500 rpm (with transmission in Neutral) for two minutes; then stop engine.

(6) Inspect test probe and converter housing. If a leak is evident, note color of fluid. Transmission fluid is red. Engine oil ranges in color from brown to green, or to black when oil is dirty.

(7) Check probe **upper surface**. If upper surface is dry, converter and seal are OK. If probe upper surface is wet, converter and/or seal is leaking.

(8) Fluid leaking **under** the probe is coming from pump housing area. Leak could be from: pump seal and/or bushing, pump vent, kickdown lever shaft access plug, pump bolts, or porous spots in pump body or transmission case (Fig. 13).

(9) If porous spots in the transmission case or pump body are the suspected leak source, pressurize transmission as described in Leak Testing With Air Pressure.

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 13).

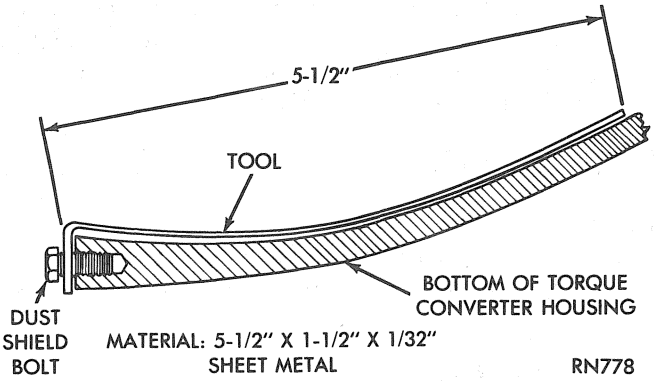


Fig. 12 Leak Test Probe

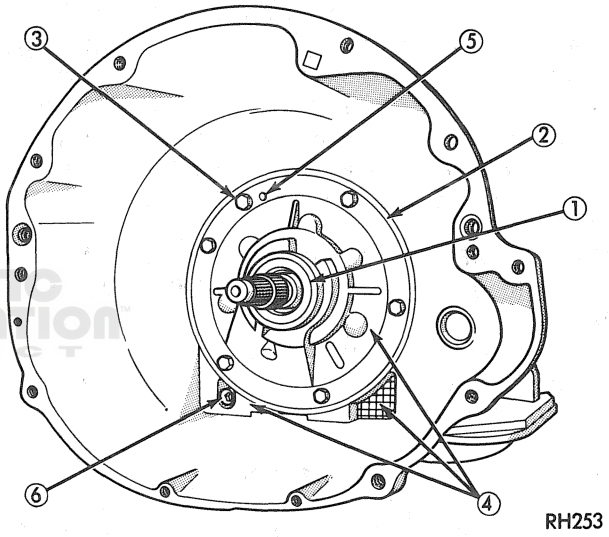


Fig. 13 Pump Area Inspection Points

(2) Leaks at the converter hub weld (Fig. 14).

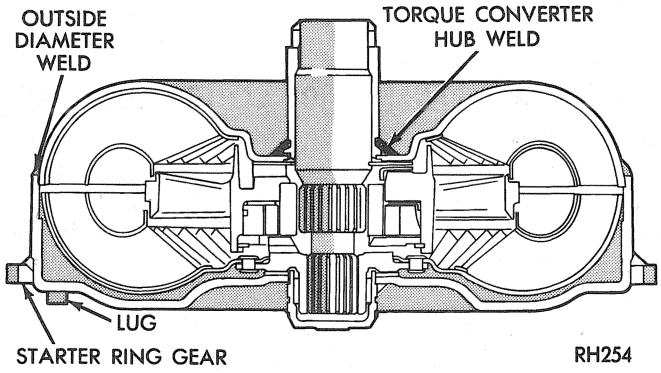


Fig. 14 Converter Leak Points—Typical

LEAK TESTING WITH AIR PRESSURE

This test involves closing off all openings and pressurizing the transmission to 8 psi with hand operated Air Pump Tool 7700.

A soapy water solution is applied to suspected leak points before and during the pressure test. Leaks will

DIAGNOSIS AND TESTING (Continued)

be indicated by the presence of air bubbles coming through the solution.

Some transmission openings such as the fill tube and front cooler line fitting can be closed off with a rubber plug or similar device. Plugs can secured with wire or duct tape.

The transmission rear output shaft opening is closed off simply by leaving the transfer case bolted in place. However, if the transfer case has been removed, a shipping plug can used to close off this opening.

The torque converter hub opening in the pump and the pump vent require special tools to close them off.

The converter hub seal cup is made from thin wall tube and a 3.17 mm (1/8 in.) thick disc (Fig. 15).

A retaining strap is needed to secure the seal cup for testing. The strap can be made from 31.75 mm (1-1/4 in.) wide stock (Fig. 16). The strap attaching hole positions are approximate only. Measure hole position on the converter housing before drilling.

The pump vent tool is made from 6.35 mm (1/4 in.) rod and 4.76 mm (3/16 in.) plate (Fig. 17).

The fabricated tools can all be made from mild steel or aluminum stock.

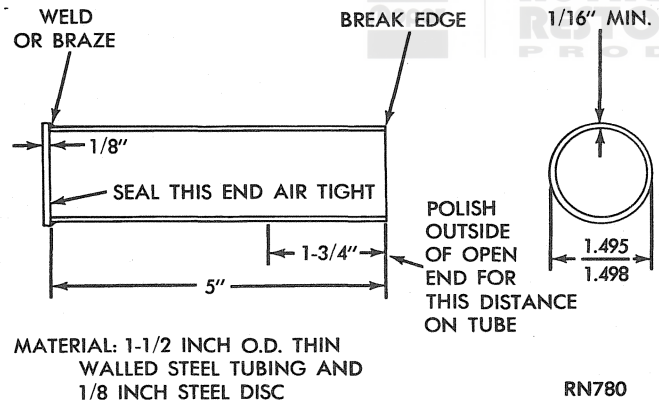


Fig. 15 Converter Hub Seal Cup

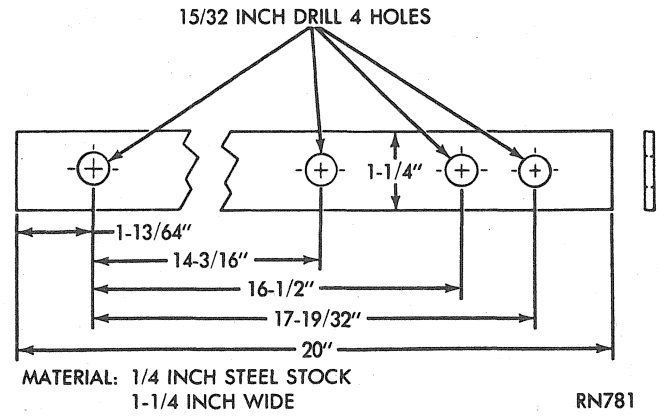


Fig. 16 Seal Cup Retaining Strap

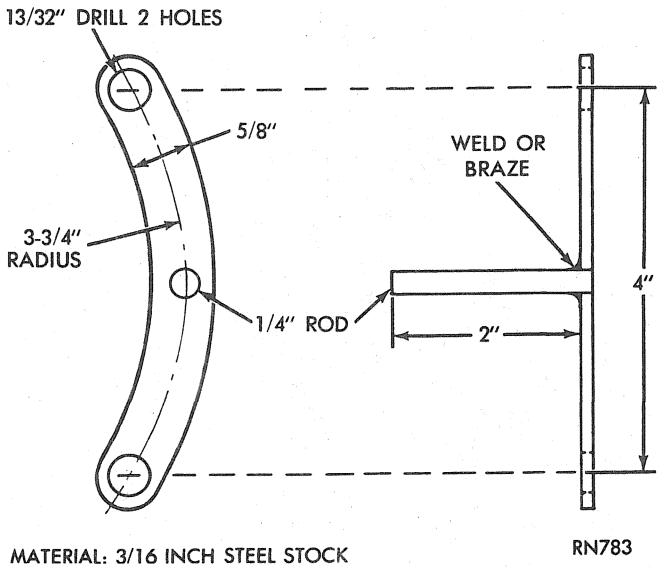


Fig. 17 Pump Vent Plug

AIR PRESSURE LEAK TEST PROCEDURE

(1) Install vent plug, converter hub seal cup and cup retaining strap (Fig. 18).

CAUTION: Be sure the surfaces of the hub seal cup are smooth and free of nicks, scratches, or burrs. Surface irregularities on the cup will damage the pump seal if not removed. Sand and/polish the cup with 400 grit sandpaper or crocus cloth to smooth the surface if necessary.

(2) Close off remaining transmission openings with rubber plugs, or stoppers or similar devices. **Do not close off rear cooler line fitting. Hand operated air pump will be attached to this fitting.**

(3) Attach Air Pump 7700 to rear cooler line fitting. Connect a length of copper tube to fitting. Then attach pump hose to tube with hose clamp (Fig. 19).

(4) Apply a thick soapy water solution to suspected leak areas.

CAUTION: The recommended test pressure is 8 psi. The maximum allowable test pressure is 10 psi. Do not exceed specified pressure.

(5) Pressurize transmission to 8 psi. with air pump.

(6) Observe suspected leak areas. Air bubbles appearing in soapy water solution indicate leak points.

(7) Remove test tools and plugs after test completion and make necessary repairs as described in Leak Correction procedure.

CONVERTER HOUSING AREA LEAK CORRECTION

(1) Remove converter.

DIAGNOSIS AND TESTING (Continued)

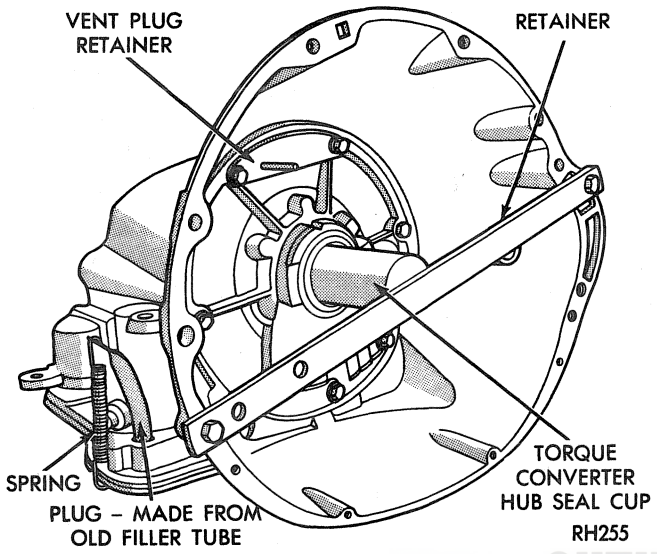


Fig. 18 Vent Plug And Hub Seal Cup Installation

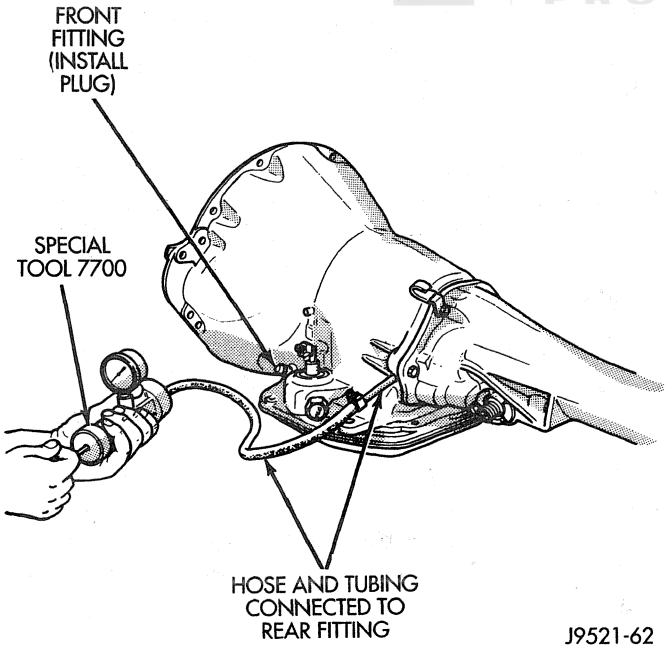


Fig. 19 Pressurizing Transmission With Tool 7700

(2) Tighten front band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out when oil pump is removed.

(3) Remove oil pump and remove pump seal. Inspect pump housing drainback and vent holes for obstructions. Clear holes with solvent and wire.

(4) Inspect pump bushing and converter hub. If bushing is scored, replace it. If converter hub is scored, either polish it with crocus cloth or replace converter if scoring is severe.

(5) Install new pump seal, O-ring, gasket, bushing. Replace oil pump if cracked, porous or damaged in any way.

(6) Loosen kickdown lever pin access plug three turns. Apply Loctite 592, or Permatex No. 2 to plug threads and tighten plug to 17 N·m (150 in. lbs.) torque.

(7) Adjust front band.

(8) Lubricate pump seal and converter hub with transmission fluid or petroleum jelly and install converter.

(9) Install transmission and converter housing dust shield.

(10) Lower vehicle.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHARTS

The diagnosis charts provide additional reference when diagnosing a transmission fault. The charts provide general information on a variety of transmission, overdrive unit and converter clutch fault conditions.

The hydraulic flow charts, in the Schematics and Diagrams section of this group, outline fluid flow and hydraulic circuitry. Circuit operation is provided for neutral, third, fourth and reverse gear ranges. Normal working pressures are also supplied for each of the gear ranges.

CONDITION	POSSIBLE CAUSES	CORRECTION
HARSH ENGAGEMENT FROM NEUTRAL TO DRIVE OR REVERSE	1. Fluid Level Low	1. Add Fluid
	2. Throttle Linkage Misadjusted	2. Adjust linkage - setting may be too long.
	3. Mount and Driveline Bolts Loose	3. Check engine mount, transmission mount, propeller shaft, rear spring to body bolts, rear control arms, crossmember and axle bolt torque. Tighten loose bolts and replace missing bolts.
	4. U-Joint Worn/Broken	4. Remove propeller shaft and replace U-Joint.
	5. Axle Backlash Incorrect	5. Check per Service Manual. Correct as needed.
	6. Hydraulic Pressure Incorrect	6. Check pressure. Remove, overhaul or adjust valve body as needed.
	7. Band Misadjusted.	7. Adjust rear band.
	8. Valve Body Check Balls Missing.	8. Inspect valve body for proper check ball installation.
	9. Axle Pinion Flange Loose.	9. Replace nut and check pinion threads before installing new nut. Replace pinion gear if threads are damaged.
	10. Clutch, band or planetary component Damaged.	10. Remove, disassemble and repair transmission as necessary.
	11. Converter Clutch (if equipped) Faulty.	11. Replace converter and flush cooler and line before installing new converter.
DELAYED ENGAGEMENT FROM NEUTRAL TO DRIVE OR REVERSE	1. Fluid Level Low. 2. Filter Clogged.	1. Correct level and check for leaks. 2. Change filter.
	3. Gearshift Linkage Misadjusted.	3. Adjust linkage and repair linkage if worn or damaged.
	5. Rear Band Misadjusted.	5. Adjust band.
	6. Valve Body Filter Plugged.	6. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary.
	7. Oil Pump Gears Worn/Damaged.	7. Remove transmission and replace oil pump.
	8. Hydraulic Pressure Incorrect.	8. Perform pressure test, remove transmission and repair as needed.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	9. Reaction Shaft Seal Rings Worn/Broken.	9. Remove transmission, remove oil pump and replace seal rings.
	10. Rear Clutch/Input Shaft, Rear Clutch Seal Rings Damaged.	10. Remove and disassemble transmission and repair as necessary.
	11. Governor Valve Stuck.	11. Remove and inspect governor components. Replace worn or damaged parts.
	12. Regulator Valve Stuck.	12. Clean.
	13. Cooler Plugged.	13. Transfer case failure can plug cooler.
NO DRIVE RANGE (REVERSE OK)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Repair or replace linkage components.
	3. Rear Clutch Burnt.	3. Remove and disassemble transmission and rear clutch and seals. Repair/replace worn or damaged parts as needed.
	4. Valve Body Malfunction.	4. Remove and disassemble valve body. Replace assembly if any valves or bores are damaged.
	5. Transmission Overrunning Clutch Broken.	5. Remove and disassemble transmission. Replace overrunning clutch.
	6. Input Shaft Seal Rings Worn/ Damaged.	6. Remove and disassemble transmission. Replace seal rings and any other worn or damaged parts.
	7. Front Planetary Failed Broken.	7. Remove and repair.
NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Inspect, adjust and reassemble linkage as needed. Replace worn/damaged parts.
	3. U-Joint/Axle/Transfer Case Broken.	3. Perform preliminary inspection procedure for vehicle that will not move. Refer to procedure in diagnosis section.
	4. Filter Plugged.	4. Remove and disassemble transmission. Repair or replace failed components as needed. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test. Flush oil. Replace cooler as necessary.
	5. Oil Pump Damaged.	5. Perform pressure test to confirm low pressure. Replace pump body assembly if necessary.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	6. Valve Body Malfunctioned.	6. Check press and inspect valve body. Replace valve body (as assembly) if any valve or bore is damaged. Clean and reassemble correctly if all parts are in good condition.
	7. Transmission Internal Component Damaged.	7. Remove and disassemble transmission. Repair or replace failed components as needed. Remove and disassemble transmission. Repair or replace failed components as needed.
	8. Park Sprag not Releasing - Check Stall Speed, Worn/Damaged/ Stuck.	8. Remove, disassemble, repair.
	9. Torque Converter Damage.	9. Inspect and replace as required.
SHIFTS DELAYED OR ERRATIC (SHIFTS ALSO HARSH AT TIMES)	1. Fluid Level Low/High.	1. Correct fluid level and check for leaks if low.
	2. Fluid Filter Clogged.	2. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test.
	3. Throttle Linkage Misadjusted.	3. Adjust linkage as described in service section.
	4. Throttle Linkage Binding.	4. Check cable for binding. Check for return to closed throttle at transmission.
	5. Gearshift Linkage/Cable Misadjusted.	5. Adjust linkage/cable as described in service section.
	6. Governor Valve Sticking.	6. Inspect, clean or repair.
	7. Governor Seal Rings Worn/ Damaged.	7. Inspect/replace.
	8. Clutch or Servo Failure.	8. Remove valve body and air test clutch, and band servo operation. Disassemble and repair transmission as needed.
	9. Front Band Misadjusted.	9. Adjust band.
	10. Pump Suction Passage Leak.	10. Check for excessive foam on dipstick after normal driving. Check for loose pump bolts, defective gasket. Replace pump assembly if needed.
NO REVERSE (D RANGES OK)	1. Gearshift Linkage/Cable Misadjusted/Damaged.	1. Repair or replace linkage parts as needed.
	2. Park Sprag Sticking.	2. Replace overdrive annulus gear.
	3. Rear Band Misadjusted/Worn.	3. Adjust band; replace.
	4. Valve Body Malfunction.	4. Remove and service valve body. Replace valve body if any valves or valve bores are worn or damaged.

AUTHENTIC RESTORATION

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	5. Rear Servo Malfunction.	5. Remove and disassemble transmission. Replace worn/ damaged servo parts as necessary.
	6. Direct Clutch in Overdrive Worn	6. Disassemble overdrive. Replace worn or damaged parts.
	7. Front Clutch Burnt.	7. Remove and disassemble transmission. Replace worn, damaged clutch parts as required.
HAS FIRST/REVERSE ONLY (NO 1-2 OR 2-3 UPSHIFT)	1. Governor Valve, Shaft, Weights or Body Damaged/Stuck.	1. Remove governor assembly and clean or repair as necessary.
	2. Valve Body Malfunction.	2. Stuck 1-2 shift valve or governor plug.
	3. Front Servo/Kickdown Band Damaged/Burned.	3. Repair/replace.
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	1. Valve Body Malfunction.	1. Remove, clean and inspect. Look for stuck 1-2 valve or governor plug.
	2. Governor Valve Sticking.	2. Remove, clean and inspect. Replace faulty parts.
NO LOW GEAR (MOVES IN 2ND OR 3RD GEAR ONLY)	1. Governor Valve Sticking.	1. Remove governor, clean, inspect and repair as required.
	2. Valve Body Malfunction.	2. Remove, clean and inspect. Look for sticking 1-2 shift valve, 2-3 shift valve, governor plug or broken springs.
	3. Front Servo Piston Cocked in Bore.	3. Inspect servo and repair as required.
	4. Front Band Linkage Malfunction	4. Inspect linkage and look for bind in linkage.
NO KICKDOWN OR NORMAL DOWNSHIFT	1. Throttle Linkage Misadjusted.	1. Adjust linkage.
	2. Accelerator Pedal Travel Restricted.	2. Floor mat under pedal, accelerator cable worn or brackets bent.
	3. Governor/Valve Body Hydraulic Pressures Too High or Too Low Due to Sticking Governor, Valve Body Malfunction or Incorrect Hydraulic Control Pressure Adjustments.	3. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	4. Valve Body Malfunction.	4. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	5. TPS Malfunction.	5. Replace sensor, check with DRB scan tool.
	6. PCM Malfunction.	6. Check with DRB II and replace if required.
	7. Valve Body Malfunction.	7. Sticking 1-2, 2-3 shift valves, governor plugs, 3-4 solenoid, 3-4 shift valve, 3-4 timing valve.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
STUCK IN LOW GEAR (WILL NOT UPSHIFT)	1. Throttle Linkage Misadjusted/ Stuck.	1. Adjust linkage and repair linkage if worn or damaged. Check for binding cable or missing return spring.
	2. Gearshift Linkage Misadjusted.	2. Adjust linkage and repair linkage if worn or damaged.
	3. Governor/Valve Body, Governor Valve Stuck Closed; Loose Output Shaft Support or Governor Housing Bolts, Leaking Seal Rings or Valve Body Problem (i.e., Stuck 1- 2 Shift Valve/Gov. Plug).	3. Check line and governor pressures to determine cause. Correct as required.
	4. Governor Component (RE Only) Electrical Fault.	4. Check operating pressures and test with DRB scan tool, repair faulty component.
	5. Front Band Out of Adjustment.	5. Adjust Band.
	6. Clutch or Servo Malfunction.	6. Air pressure check operation of clutches and bands. Repair faulty component.
CREEPS IN NEUTRAL	1. Gearshift Linkage Misadjusted.	1. Adjust linkage.
	2. Rear Clutch Dragging/Warped Welded.	2. Disassemble and repair.
	3. Valve Body Malfunction.	3. Perform hydraulic pressure test to determine cause and repair as required.
BUZZING NOISE	1. Fluid Level Low	1. Add fluid and check for leaks.
	2. Shift Cable Misassembled.	2. Route cable away from engine and bell housing.
	3. Valve Body Misassembled.	3. Remove, disassemble, inspect valve body. Reassemble correctly if necessary. Replace assembly if valves or springs are damaged. Check for loose bolts or screws.
	4. Pump Passages Leaking	4. Check pump for porous casting, scores on mating surfaces and excess rotor clearance. Repair as required. Loose pump bolts.
	5. Cooling System Cooler Plugged.	5. Flow check cooler circuit. Repair as needed.
	6.Overrunning Clutch Damaged.	6. Replace clutch.
SLIPS IN REVERSE ONLY	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Gearshift Linkage Misadjusted.	2. Adjust linkage.
	3. Rear Band Misadjusted.	3. Adjust band.
	4. Rear Band Worn.	4. Replace as required.
	5. Hydraulic Pressure Too Low.	5. Perform hydraulic pressure tests to determine cause.
	6. Rear Servo Leaking.	6. Air pressure check clutch-servo operation and repair as required.
	7. Band Linkage Binding.	7. Inspect and repair as required.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SLIPS IN FORWARD DRIVE RANGES	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Fluid Foaming.	2. Check for high oil level, bad pump gasket or seals, dirt between pump halves and loose pump bolts. Replace pump if necessary.
	3. Throttle Linkage Misadjusted.	3. Adjust linkage.
	4. Gearshift Linkage Misadjusted.	4. Adjust linkage.
	5. Rear Clutch Worn.	5. Inspect and replace as needed.
	6. Low Hydraulic Pressure Due to Worn Pump, Incorrect Control Pressure Adjustments, Valve Body Warpage or Malfunction, Sticking Governor, Leaking Seal Rings, Clutch Seals Leaking, Servo Leaks, Clogged Filter or Cooler Lines	6. Perform hydraulic and air pressure tests to determine cause.
	7. Rear Clutch Malfunction, Leaking Seals or Worn Plates.	7. Air pressure check clutch-servo operation and repair as required.
	8. Overrunning Clutch Worn, Not Holding (Slips in 1 Only).	8. Replace Clutch.
SLIPS IN LOW GEAR "D" ONLY, BUT NO IN 1 POSITION	Overrunning Clutch Faulty.	Replace overrunning clutch.
GROWLING, GRATING OR SCRAPING NOISES	1. Drive Plate Broken.	1. Replace.
	2. Torque Converter Bolts Hitting Dust Shield.	2. Dust shield bent. Replace or repair.
	3. Planetary Gear Set Broken/ Seized.	3. Check for debris in oil pan and repair as required.
	4. Overrunning Clutch Worn/Broken.	4. Inspect and check for debris in oil pan. Repair as required.
	5. Oil Pump Components Scored/ Binding.	5. Remove, inspect and repair as required.
	6. Output Shaft Bearing or Bushing Damaged.	6. Remove, inspect and repair as required.
	7. Clutch Operation Faulty.	7. Perform air pressure check and repair as required.
	8. Front and Rear Bands Misadjusted.	8. Adjust bands.
DRAGS OR LOCKS UP	1. Fluid Level Low.	1. Check and adjust level.
	2. Clutch Dragging/Failed	2. Air pressure check clutch operation and repair as required.
	3. Front or Rear Band Misadjusted.	3. Adjust bands.
	4. Case Leaks Internally.	4. Check for leakage between passages in case.
	5. Servo Band or Linkage Malfunction.	5. Air pressure check servo operation and repair as required.
	6. Overrunning Clutch Worn.	6. Remove and inspect clutch. Repair as required.
	7. Planetary Gears Broken.	7. Remove, inspect and repair as required (look for debris in oil pan).

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	8. Converter Clutch Dragging.	8. Check for plugged cooler. Perform flow check. Inspect pump for excessive side clearance. Replace pump as required.
WHINE/NOISE RELATED TO ENGINE SPEED	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Shift Cable Incorrect Routing.	2. Check shift cable for correct routing. Should no touch engine or bell housing.
TORQUE CONVERTER LOCKS UP IN SECOND AND/OR THIRD GEAR	Lockup Solenoid, Relay or Wiring Shorted/Open.	Test solenoid, relay and wiring for continuity, shorts or grounds. Replace solenoid and relay if faulty. Repair wiring and connectors as necessary.
HARSH 1-2 OR 2-3 SHIFTS	Lockup Solenoid Malfunction.	Remove valve body and replace solenoid assembly.
NO START IN PARK OR NEUTRAL	1. Gearshift Linkage/Cable Misadjusted.	1. Adjust linkage/cable.
	2. Neutral Switch Wire Open/Cut.	2. Check continuity with test lamp. Repair as required.
	3. Neutral Switch Faulty.	3. Refer to service section for test and replacement procedure.
	4. Neutral Switch Connect Faulty.	4. Connectors spread open. Repair.
	5. Valve Body Manual Lever Assembly Bent/Worn/Broken.	5. Inspect lever assembly and replace if damaged.
NO REVERSE (OR SLIPS IN REVERSE)	1. Direct Clutch Pack (front clutch) Worn.	1. Disassemble unit and rebuild clutch pack.
	2. Rear Band Misadjusted.	2. Adjust band.
	3. Front Clutch Malfunctioned/Burnt.	3. Air pressure test clutch operation. Remove and rebuild if necessary.
OIL LEAKS (ITEMS LISTED REPRESENT POSSIBLE LEAK POINTS AND SHOULD ALL BE CHECKED.	1. Speedometer Adapter Leaks.	1. Replace both adapter seals.
	2. Fluid Lines and Fittings Loose/Leaks/Damaged.	2. Tighten fittings. If leaks persist, replace fittings and lines if necessary.
	3. Filler Tube (where tube enters case) Leaks/Damaged.	3. Replace O-ring seal. Inspect tube for cracks in tube.
	4. Pressure Port Plug Loose Loose/Damaged.	4. Tighten to correct torque. Replace plug or reseal if leak persists.
	5. Pan Gasket Leaks.	5. Tighten pan screws to 150 inch pounds. If leaks persist, replace gasket. Do no over tighten screws.
	6. Valve Body Manual Lever Shaft Seal Leaks/Worn.	6. Replace shaft seal.
	7. Rear Bearing Access Plate Leaks.	7. Replace gasket. Tighten screws.
	8. Gasket Damaged or Bolts are Loose.	8. Replace bolts or gasket or tighten both.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	9. Adapter/Extension Gasket Damaged Leaks/Damaged.	9. Replace gasket.
	10. Neutral Switch Leaks/Damaged.	10. Replace switch and gasket.
	11. Converter Housing Area Leaks.	11. Check for leaks at seal caused by worn seal or burr on converter hub (cutting seal), worn bushing, missing oil return, oil in front pump housing or hole plugged. Check for leaks past O-ring seal on pump or past pump-to-case bolts; pump housing porous, oil coming out vent due to overfill or leak past front band shaft access plug.
	12. Pump Seal Leaks/Worn/ Damaged.	12. Replace seal.
	13. Torque Converter Weld Leak/Cracked Hub.	13. Replace converter.
	14. Case Porosity Leaks.	14. Replace case.

SERVICE PROCEDURES

FLUID LEVEL CHECK

Transmission fluid level should be checked monthly under normal operation. If the vehicle is used for trailer towing or similar heavy load hauling, check fluid level and condition weekly. Fluid level is checked with the engine running at curb idle speed, the transmission in NEUTRAL and the transmission fluid at normal operating temperature.

FLUID LEVEL CHECK PROCEDURE

(1) Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82°C (180°F).

(2) Position vehicle on level surface.

(3) Start and run engine at curb idle speed.

(4) Apply parking brakes.

(5) Shift transmission momentarily into all gear ranges. Then shift transmission back to Neutral.

(6) Clean top of filler tube and dipstick to keep dirt from entering tube.

(7) Remove dipstick (Fig. 20) and check fluid level as follows:

(a) Correct maximum level is to MAX arrow mark. Correct acceptable level is to OK mark in crosshatch area.

(b) Incorrect level is at or below MIN line.

(c) If fluid is low, add only enough Mopar ATF Plus to restore correct level. Do not overfill.

CAUTION: Do not overfill the transmission. Overfilling may cause leakage out the pump vent which can be mistaken for a pump seal leak. Overfilling will also cause fluid aeration and foaming as the excess fluid is picked up and churned by the gear train. This will significantly reduce fluid life.

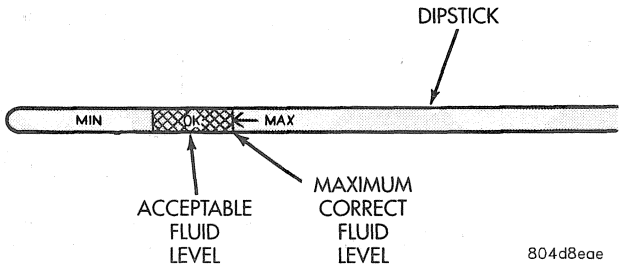


Fig. 20 Dipstick Fluid Level Marks—Typical

FLUID AND FILTER REPLACEMENT

Refer to the Maintenance Schedules in Group 0, Lubrication and Maintenance for proper service intervals. The service fluid fill after a filter change is approximately 3.8 liters (4.0 quarts).

PAN AND FILTER REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Place a large diameter shallow drain pan beneath the transmission pan.

(3) Remove bolts holding front and sides of pan to transmission (Fig. 21).

(4) Loosen bolts holding rear of pan to transmission.

(5) Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.

(6) Hold up pan and remove remaining bolt holding pan to transmission.

SERVICE PROCEDURES (Continued)

(7) While holding pan level, lower pan away from transmission.

(8) Pour remaining fluid in pan into drain pan.

(9) Remove screws holding filter to valve body (Fig. 22).

(10) Separate filter from valve body and pour fluid in filter into drain pan.

(11) Dispose used trans fluid and filter properly.

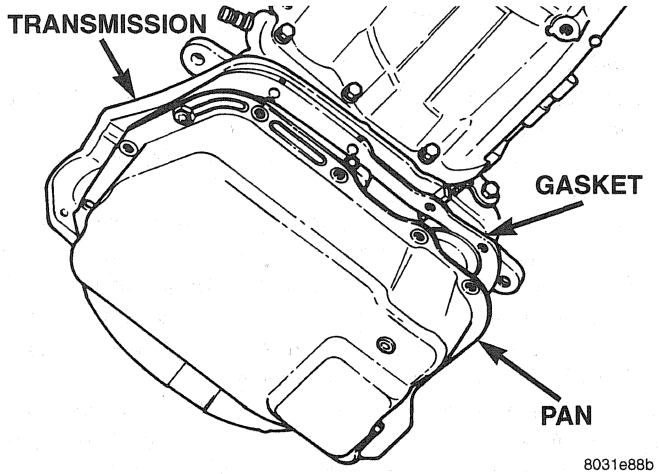


Fig. 21 Transmission Pan—Typical

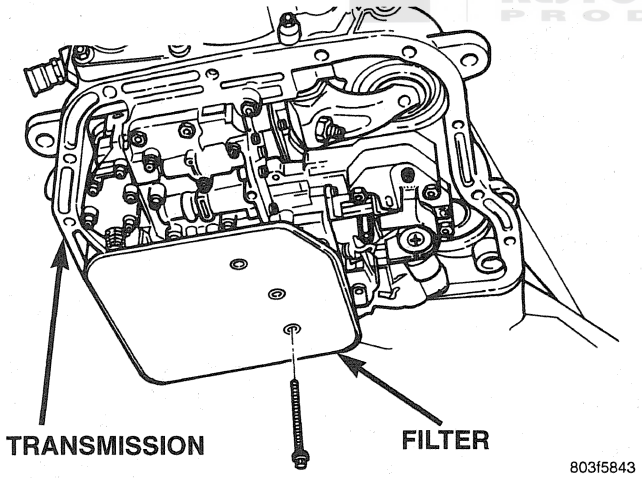


Fig. 22 Transmission Filter—Typical

INSPECTION AND CLEANING

INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal or fiber contamination. A light coating of clutch or band material on the bottom of the pan does not indicate a problem unless accompanied by slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts or debris, refer to the diagnosis section of this group.

Check the adjustment of the front and rear bands, adjust if necessary. Refer to Adjustment section of this group for proper procedure.

CLEANING

(1) Using a suitable solvent, clean pan and magnet (Fig. 23).

(2) Using a suitable gasket scraper, clean gasket material from gasket surface of transmission case and the gasket flange around the pan.

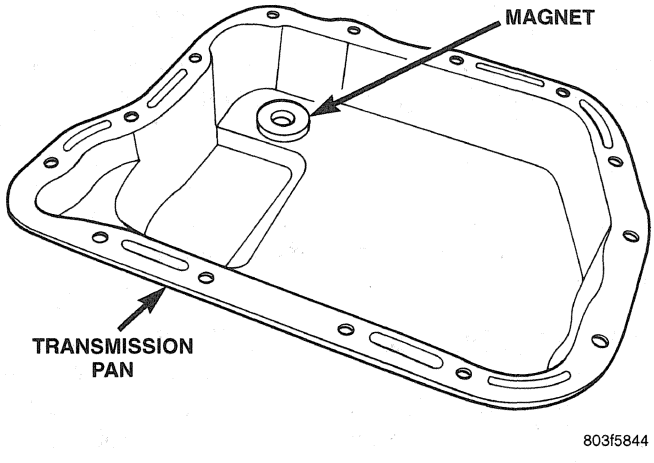


Fig. 23 Pan and Magnet

FILTER AND PAN INSTALLATION

(1) Place replacement filter in position on valve body.

(2) Install screws to hold filter to valve body (Fig. 22). Tighten screws to 4 N·m (35 in. lbs.) torque.

(3) Place new gasket in position on pan. and install pan on transmission.

(4) Place pan in position on transmission.

(5) Install screws to hold pan to transmission (Fig. 21). Tighten bolts to 17 N·m (150 in. lbs.) torque.

(6) Lower vehicle and fill transmission with Mopar ATF Plus, type 7176 fluid.

TRANSMISSION FILL PROCEDURE

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar ATF Plus to transmission:

(a) If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF Plus to transmission.

(b) If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **12 pints (6 quarts)** of ATF Plus to transmission.

(3) Apply parking brakes.

(4) Start and run engine at normal curb idle speed.

(5) Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.

SERVICE PROCEDURES (Continued)

(6) Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.**

(7) Drive vehicle until transmission fluid is at normal operating temperature.

(8) With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

(9) Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

CONVERTER DRAINBACK CHECK VALVE SERVICE

The converter drainback check valve is located in the cooler outlet (pressure) line near the radiator lower tank. The valve prevents fluid drainback when the vehicle is parked for lengthy periods. The valve check ball is spring loaded and has an opening pressure of approximately 2 psi.

The valve is serviced as an assembly; it is not repairable. Do not clean the valve if restricted, or contaminated by sludge, or debris. If the valve fails, or if a transmission malfunction occurs that generates sludge and/or clutch particles and metal shavings, the valve must be replaced.

The valve must be removed whenever the cooler and lines are reverse flushed. The valve can be flow tested when necessary. The procedure is exactly the same as for flow testing a cooler.

If the valve is restricted, installed backwards, or in the wrong line, it will cause an overheating condition and possible transmission failure.

CAUTION: The drainback valve is a one-way flow device. It must be properly oriented in terms of flow direction for the cooler to function properly. The valve must be installed in the pressure line. Otherwise flow will be blocked and would cause an overheating condition and eventual transmission failure.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transaxle case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

TRANSMISSION COOLER REVERSE FLUSHING

The flushing procedure applies to standard and auxiliary coolers alike. Although pressure equipment is preferred, reverse flushing can be performed with hand operated equipment as follows.

Flushing Procedure

(1) Remove and discard drainback valve. Install fabricated hose and fitting in place of valve.

(2) Disconnect cooler pressure and return lines at transmission (Fig. 24).

(3) Position drain pan under cooler pressure line to catch material flushed through cooler and lines.

(4) Reverse flush cooler using hand operated suction gun filled with mineral spirits. Insert gun nozzle (or hose) into cooler **return** line. Then force mineral spirits into line and through cooler.

(5) Continue reverse flushing until fluid coming out of cooler pressure line is clear. **Replace cooler if fluid cannot be pumped through.**

(6) Clear flushing materials from cooler and lines with short pulses of compressed air. Insert air gun nozzle into cooler return line and continue short air pulses until all fluid is cleared from cooler and lines.

(7) Pump one quart of fresh automatic transmission fluid through cooler and lines before reconnecting lines.

(8) Install new drainback valve in pressure line.

(9) Check and adjust transmission fluid level as described in this section.

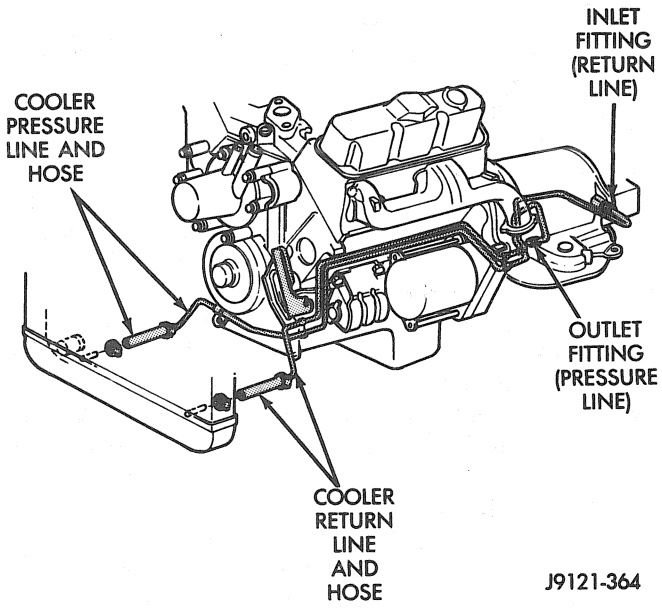


Fig. 24 Transmission Cooler Line Identification

REMOVAL AND INSTALLATION

SPEEDOMETER SERVICE

Rear axle gear ratio and tire size determine speedometer pinion requirements. If the pinion must be replaced, refer to the parts catalogue information for the correct part.

SPEEDOMETER ASSEMBLY REMOVAL

(1) Raise vehicle.
(2) Disconnect wires from vehicle speed sensor.
(3) Remove adapter clamp and screw (Fig. 25).
(4) Remove speed sensor and speedometer adapter as assembly.
(5) Remove speed sensor retaining screw and remove sensor from adapter.
(6) Remove speedometer pinion from adapter.
(7) Inspect sensor and adapter O-rings (Fig. 25). Remove and discard O-rings if worn or damaged.
(8) Inspect terminal pins in speed sensor. Clean pins with Mopar electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or pins are loose, severely corroded, or damaged.

SPEEDOMETER INSTALLATION AND INDEXING

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean for proper adapter alignment and speedometer operation.
(2) Install new O-rings on speed sensor and speedometer adapter if necessary (Fig. 25).
(3) Lubricate sensor and adapter O-rings with transmission fluid.
(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.
(5) Install speedometer pinion in adapter.
(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.
(7) Note index numbers on adapter body (Fig. 26). These numbers will correspond to number of teeth on pinion.
(8) Install speedometer assembly in housing.
(9) Rotate adapter until required range numbers are at 6 o'clock position. Be sure range index numbers correspond to number of teeth on pinion gear.
(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.
(11) Connect wires to vehicle speed sensor.
(12) Lower vehicle and top off transmission fluid level if necessary.

PARK/NEUTRAL POSITION SWITCH

Switch Replacement

(1) Raise vehicle and position drain pan under switch.
(2) Disconnect switch wires.
(3) Remove switch from case.
(4) Move shift lever to Park and Neutral positions. Verify that switch operating lever fingers are centered in switch opening in case (Fig. 27).

ITEM	TORQUE
A	2-3 N•m (15-27 in. lbs.)
B	10-12 N•m (90-110 in. lbs.)

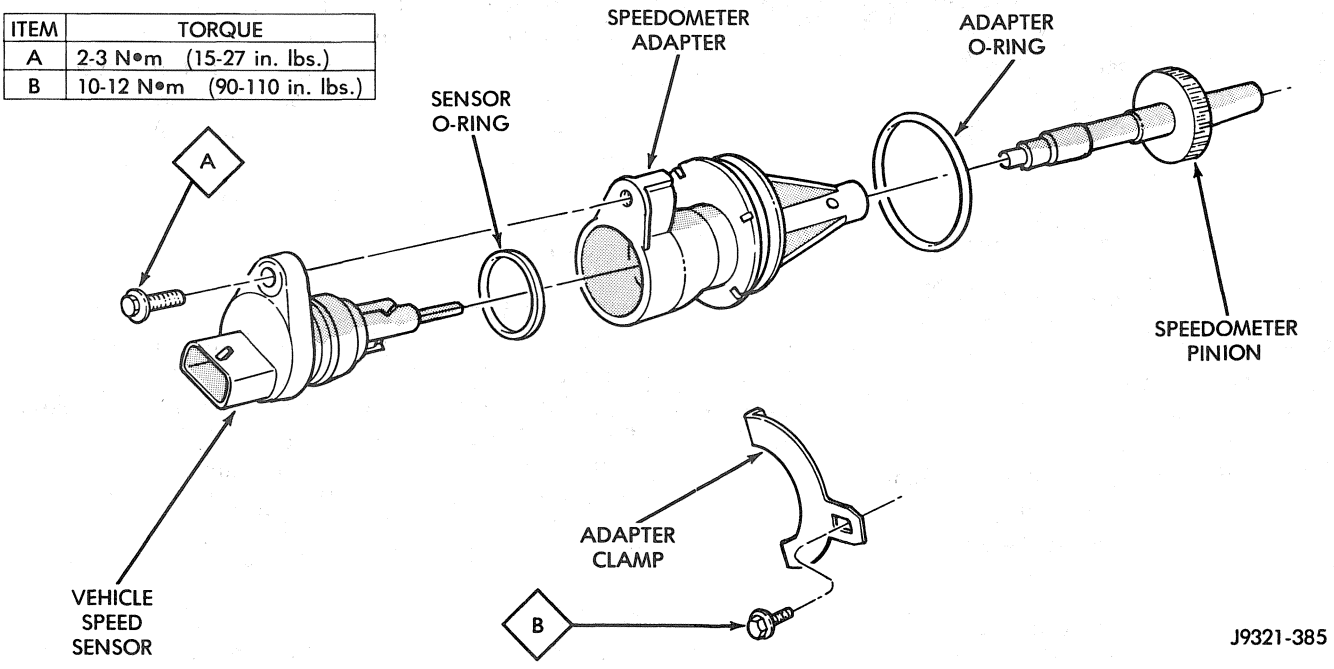


Fig. 25 Speedometer Pinion Adapter Components

REMOVAL AND INSTALLATION (Continued)

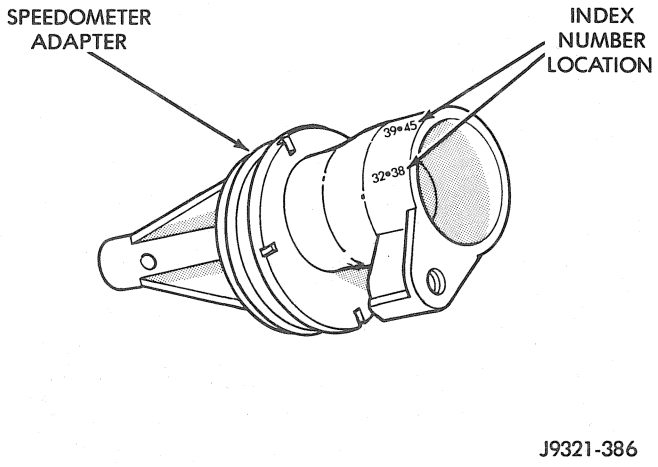


Fig. 26 Index Numbers On Speedometer Pinion Adapter

(5) Install new seal on switch and install switch in case. Tighten switch to 34 N·m (25 ft. lbs.) torque.

(6) Test continuity of new switch with 12V test lamp.

(7) Connect switch wires and lower vehicle.

(8) Top off transmission fluid level.

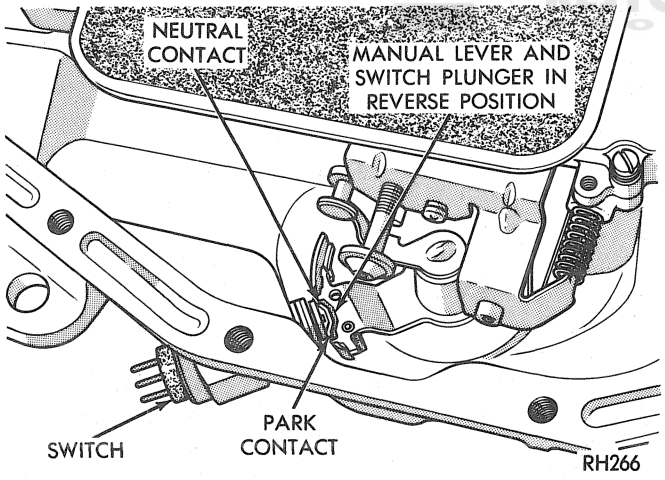


Fig. 27 Park/Neutral Position Switch

YOKE SEAL REPLACEMENT—2WD

REMOVAL

(1) Raise vehicle.

(2) Mark propeller shaft and axle yoke for alignment reference.

(3) Disconnect and remove propeller shaft.

(4) Remove old seal with Seal Remover C-3985-B (Fig. 28) from extension housing.

INSTALLATION

(1) Place seal in position on extension housing.

(2) Drive seal into extension housing with Seal Installer C-3995-A or C-3972 (Fig. 29).

(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.

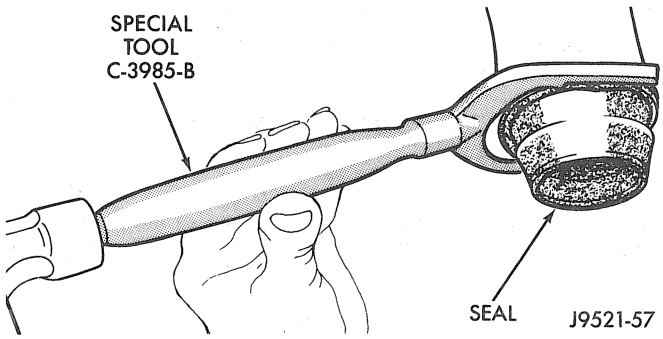


Fig. 28 Removing Extension Housing Yoke Seal

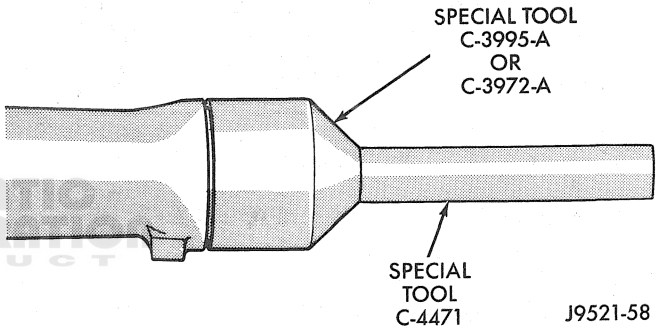


Fig. 29 Installing Extension Housing Yoke Seal

EXTENSION HOUSING BUSHING—2WD

REMOVAL

(1) Remove housing yoke seal.

(2) Remove housing bushing as follows:

(a) If extension housing was not removed, drive tapered, round pointed tool between bushing and housing to upset and collapse bushing. Then remove bushing with pry tool or vise grip pliers.

(b) If housing has been removed, drive old bushing out with Driver Handle C-4171 and Removal Tool C-4469.

INSTALLATION

(1) Align bushing oil hole with oil slot in extension housing.

(2) Tap bushing into place with driver handle and Tool C-4171 and C-4469 (Fig. 30).

(3) Install new oil seal in housing using Seal Installer C-3995-A on 32RH or C-3972 on 36RH.

EXTENSION HOUSING—2WD

REMOVAL

(1) Shift transmission into manual low (1) position.

(2) Hoist and support vehicle on safety stands.

REMOVAL AND INSTALLATION (Continued)

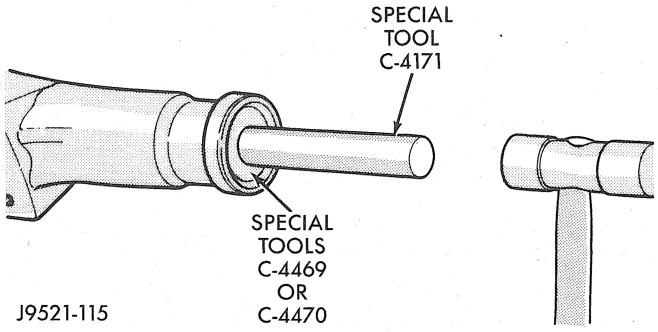


Fig. 30 Extension Housing Bushing Installation

(3) Mark propeller shaft and axle yoke for alignment reference. Then disconnect and remove shaft.
(4) Remove vehicle speed sensor, speedometer adapter and speedometer pinion.
(5) Remove bolts attaching extension housing to rear support.
(6) Using a suitable lifting device, raise transmission off rear mount.
(7) Remove rear crossmember.
(8) Remove bolts holding extension housing to transmission case.
(9) Verify that transmission is in 1 position. Park lock rod is easier to disengage/engage in this position.
(10) Remove access plate and gasket from underside of extension housing.
(11) Using a snap ring plier, spread retaining ring holding rear bearing in extension housing (Fig. 31).
(12) While spreading retaining ring, pull extension away from transmission case.
(13) Separate extension housing from vehicle.

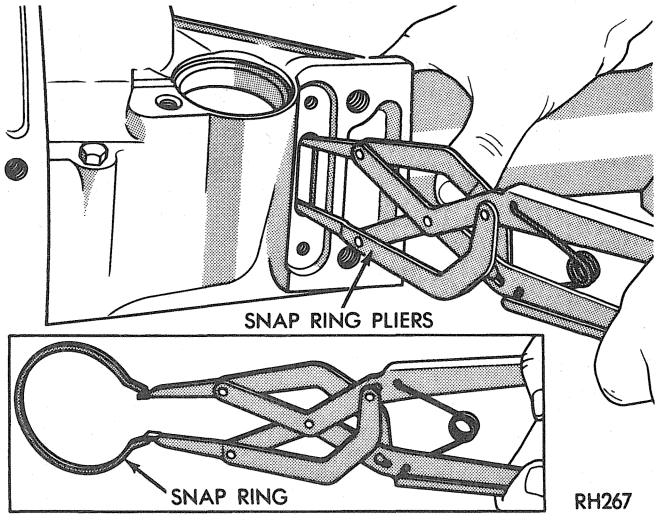


Fig. 31 Rear Bearing Retaining Ring

INSTALLATION

Before installing the extension housing, verify that all gasket sealing surfaces are clean.
(1) Position new gasket on housing. Use petroleum jelly to hold gasket in place.
(2) Install locating ring in extension housing, if removed.
(3) Slide housing onto output shaft.
(4) Insert park rod past sprag and slide housing onto shaft unlit the retaining ring contacts the rear bearing.
(5) Spread rear bearing retaining ring (Fig. 31).
(6) Push extension housing forward until fully seated against transmission case. Release locating ring and verify that it is fully seated in rear bearing.
(7) Install bolts to hold extension housing to transmission case. Tighten bolts to 43 N·m (32 ft. lbs.) torque.
(8) Install gasket and access plate on underside of extension housing.
(9) Install rear crossmember.
(10) Remove support lift from under transmission.
(11) Install bolts to hold extension housing to rear mount. Tighten bolts to 68 N·m (50 ft. lbs.) torque.
(12) Install speedometer pinion, adapter, and speed sensor.
(13) Align and install propeller shaft.
(14) Lower vehicle.
(15) Top off transmission fluid level if necessary and road test to verify repair.

OUTPUT SHAFT REAR BEARING—TYPICAL

REMOVAL

(1) Remove extension housing.
(2) Remove snap ring that retains rear bearing on output shaft (Fig. 32).
(3) Remove bearing from output shaft.

INSTALLATION

(1) (3) Install bearing on output shaft. Be sure retaining ring groove in outer circumference of bearing is toward the governor.
(2) (4) Install rear bearing retaining snap ring (Fig. 32).
(3) Install extension housing.

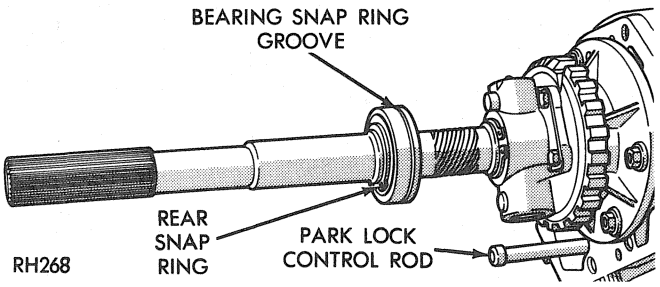


Fig. 32 Output Shaft Rear Bearing

REMOVAL AND INSTALLATION (Continued)

GOVERNOR AND PARK GEAR

REMOVAL

(1) Hoist and support vehicle on safety stands.
(2) Mark propeller shaft and axle yoke for assembly reference. Then disconnect and remove shaft.
(3) Disconnect parking brake cable at equalizer and disconnect exhaust components as necessary.
(4) Remove extension housing.
(5) Loosen but do not remove bolts that hold governor body to park gear.
(6) Rotate transmission output shaft until governor weight assembly is accessible.
(7) Remove E-clip at end of governor valve shaft.
(8) Remove governor valve and shaft from governor body (Fig. 33).
(9) Remove snap rings and washer that retain governor body and park gear assembly on output shaft (Fig. 34).
(10) Remove governor body-park gear assembly from output shaft (Fig. 35).

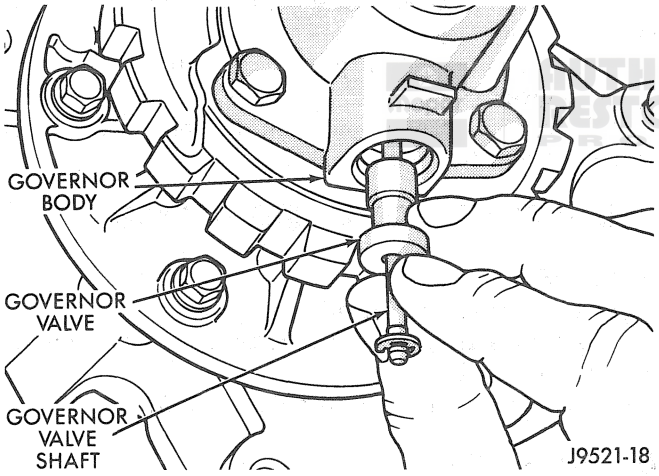


Fig. 33 Governor Valve And Shaft

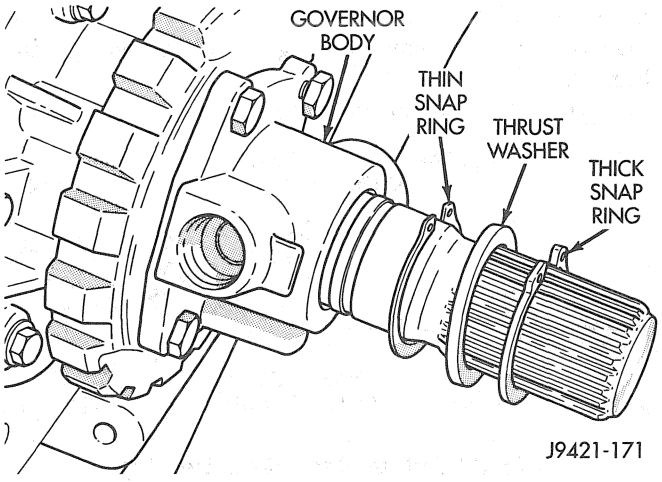


Fig. 34 Park Gear Retaining Snap Rings And Thrust Washer

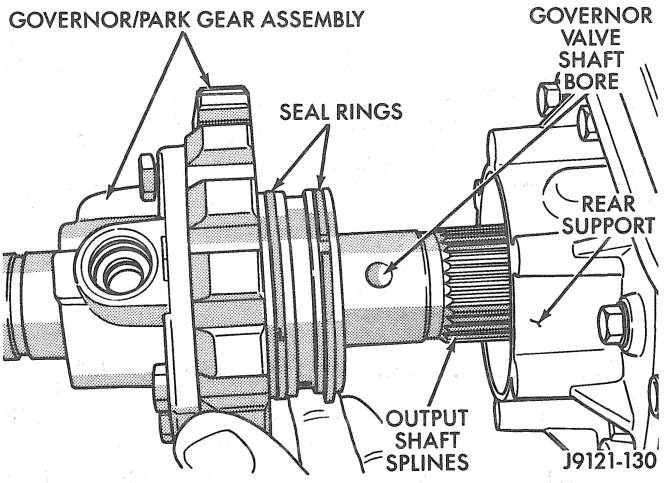


Fig. 35 Governor Body And Park Gear

INSTALLATION

(1) Install governor body-park gear snap rings and washer on output shaft as follows:
(a) On models with single snap ring, install snap ring. Be sure ring is seated in shaft.
(b) On models with thrust washer and two snap rings, install thin snap ring first. Then install thrust washer second, and thick snap ring last (Fig. 34).
(c) Verify correct position of snap rings. **Be sure flat side of each snap ring is toward governor body.**
(2) Tighten bolts that attach governor body to park gear to 11 N·m (95 in. lbs.).
(3) Install extension housing and gasket on transmission. Tighten housing bolts to 32 N·m (24 ft. lbs.).
(4) Install rear crossmember.
(5) Install speed sensor and speedometer components and connect speed sensor wires.
(6) Connect exhaust components and brake cable, if removed.
(7) Align and connect propeller shaft. Tighten shaft clamp bolts to 19 N·m (14 ft. lbs.) torque.
(8) Remove supports and lower vehicle.
(9) Check and adjust transmission fluid level.

PARK LOCK

REMOVAL

(1) Raise vehicle and remove propeller shaft.
(2) Remove extension housing. Refer to procedure in this section.
(3) Slide sprag shaft out of extension housing and remove sprag and spring (Fig. 36).
(4) Remove snap ring and slide reaction plug and pin assembly out of housing.
(5) If park rod requires service, it will be necessary to remove valve body. Refer to Valve Body Service procedures in this section.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Inspect sprag shaft for scores and free movement in housing and sprag. Inspect sprag and control rod springs for distortion and loss of tension. replace worn, damaged parts as necessary.

(2) Inspect square lug on sprag for broken edges. Check lugs on park gear for damage. Inspect knob on end of control rod for wear grooves, or being seized on rod. Replace rod if bent, if knob is worn/grooved, or it has seized on rod. Replace park gear if lugs are damaged.

(3) Install reaction plug and pin assembly in housing and secure with new snap ring (Fig. 36).

(4) Position sprag and spring in housing and insert sprag shaft. Be sure square lug on sprag is toward park gear. Also be sure spring is positioned so it moves sprag away from gear.

(5) Install extension housing as described in this section.

(6) Install propeller shaft and lower vehicle.

(7) Check transmission fluid level. Add fluid if necessary.

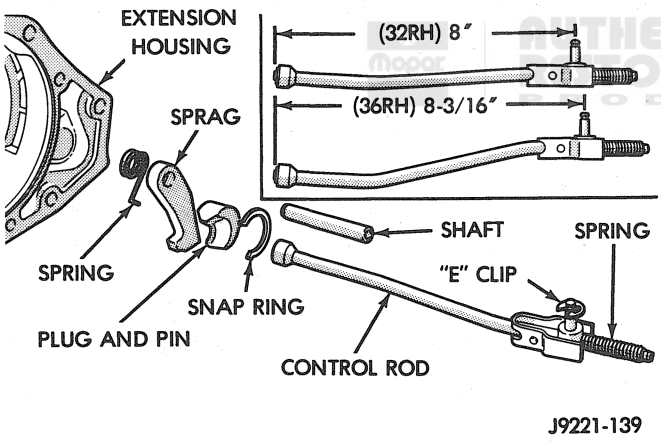


Fig. 36 Park Lock

VALVE BODY

The valve body can be removed for service without having to remove the entire transmission assembly.

The valve body can be disassembled for cleaning and inspection of the individual components. Refer to the procedures in the appropriate transmission overhaul section.

The only serviceable valve body components are the:

- manual lever
- manual lever washer/seal/E-clip and shaft seal
- lever detent ball and spring
- throttle lever
- fluid filter
- switch valve, spring and adjusting screw bracket
- park rod and E-clip
- converter clutch solenoid

The remaining valve body components are serviced only as part of a complete valve body assembly.

REMOVAL

(1) Raise vehicle.

(2) Remove oil pan and drain fluid.

(3) Loosen clamp bolts and remove throttle and manual valve levers from manual lever shaft.

(4) Remove park/neutral position switch.

(5) Remove filter from valve body.

(6) Disconnect solenoid wire from case connector.

(7) Remove valve body attaching screws.

(8) Lower valve body enough to remove accumulator piston and piston spring (Fig. 37).

(9) Pull valve body forward to disengage park rod.

(10) Push manual lever shaft and solenoid case connector out of transmission case.

(11) Lower valve body, rotate it away from case, pull park lock rod out of sprag, and remove valve body (Fig. 38).

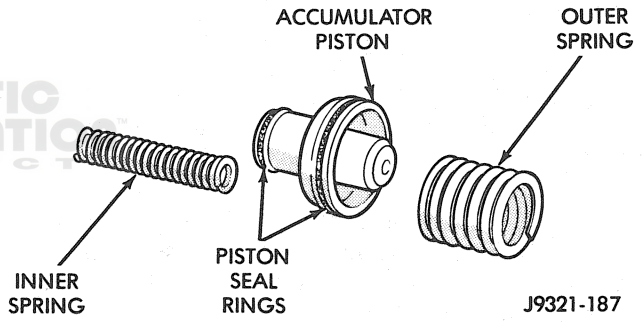


Fig. 37 Accumulator Piston And Springs

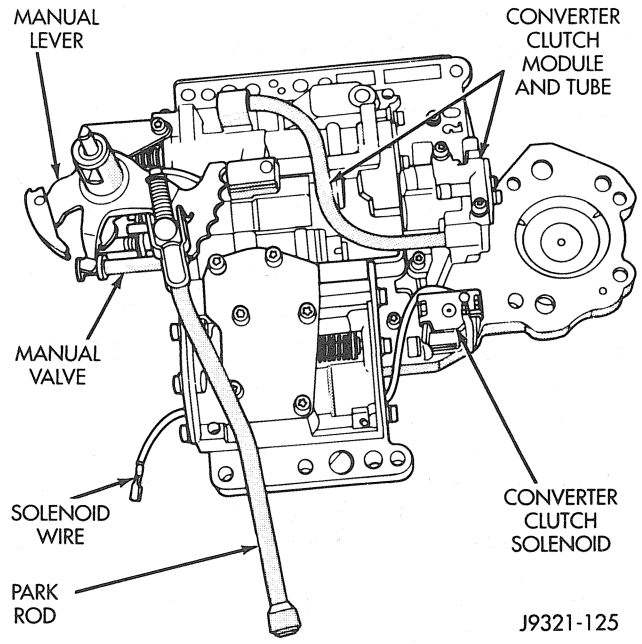


Fig. 38 Valve Body

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Verify that park/neutral position switch has **NOT** been installed. Valve body cannot be installed with switch in place. Remove switch if necessary.

(2) Install new seals on accumulator piston if necessary, and install piston in case. Use small amount of petroleum jelly to hold piston in place.

(3) Place valve body manual lever in low (1 position) to ease inserting park rod into sprag.

(4) Use screwdriver to push park sprag into engagement with park gear. This makes clearance for knob on lock rod to move past sprag when valve body is installed. Rotate output shaft to verify sprag engagement.

(5) Position accumulator spring between accumulator piston and valve body.

(6) Position valve body on transmission and work knob on park lock rod past sprag. Be sure accumulator piston and spring remain in position.

(7) Hold valve body in position and install valve body attaching screws finger tight.

(8) Install park/neutral position switch.

(9) Tighten valve body attaching screws alternately and evenly to 11 N·m (100 in. lbs.) torque.

(10) Install new fluid filter on valve body. Install and tighten filter screws to 4 N·m (35 in. lbs.) torque.

(11) Connect solenoid wire to case connector.

(12) Install manual and throttle levers on throttle lever shaft. Tighten lever clamp screws and check for free operation. Shaft and levers must operate freely without any bind.

(13) Install oil pan and new gasket. Tighten pan bolts to 17 N·m (150 in. lbs.) torque. Install gasket dry; do not use sealer.

(14) Connect park/neutral position switch and converter clutch solenoid wires.

(15) Install speedometer pinion gear, adapter and speed sensor.

(16) Lower vehicle.

(17) Fill transmission with Mopar ATF Plus, Type 7176 fluid.

(18) Adjust gearshift and throttle cable if necessary.

TRANSMISSION COOLER LINE AND FITTINGS

The transmission cooler lines are attached with quick connect fittings.

COOLER LINE AND FITTING SERVICE

The cooler lines and fittings are NOT serviceable. Damaged fittings or cooler lines are to be replaced as assemblies.

Fittings swedged into cooler line hoses are serviced only as part of the entire cooler line.

DISCONNECTING COOLER LINES

(1) If fitting and cooler line are covered with dirt, mud, or grease, clean fitting and cooler line with Mopar spray type carburetor or brake cleaner.

(2) Disengage retainer on fitting and pull cooler line out of fitting.

(3) Cover open ends of cooler lines and fittings to prevent dirt entry.

(4) Inspect condition of fitting. Replace transmission fitting as an assembly if fitting body or retainer clip is damaged. Replace cooler line as assembly, if fitting swedged into cooler line hose, is damaged.

CONNECTING COOLER LINES

(1) If transmission or radiator fittings require replacement, apply Mopar Lock N' Seal, or Loctite 242 to fitting threads before installation.

(2) Wipe off cooler line and fitting with clean, dry cloth.

(3) Insert cooler line into fitting. Then push line inward until retainer secures line. A snap or click will be heard and felt through the line when the retainer seats behind the cooler line flange.

(4) **Pull outward on cooler lines to verify that they are properly secured.**

TRANSMISSION COOLER—AUXILLARY

REMOVAL

(1) Release hood latch and open hood.

(2) Drain cooling system and remove radiator.

(3) Place a suitable pan under cooler line couplings.

(4) Disengage cooler lines from auxillary transmission cooler.

(5) Remove screws holding cooler to radiator closure panel.

(6) Separate auxillary transmission cooler from vehicle.

INSTALLATION

(1) Place auxillary transmission cooler in position on vehicle.

(2) Install screws to hold cooler to radiator closure panel.

(3) Engage cooler lines into auxillary transmission cooler.

(4) Install radiator and fill cooling system.

(5) If necessary, add transmission fluid.

(6) Close hood and road test vehicle to verify repair.

TRANSMISSION

REMOVAL

(1) Remove fan shroud attaching bolts.

REMOVAL AND INSTALLATION (Continued)

(2) Disconnect transmission fill tube at upper bracket.
(3) Raise vehicle.
(4) Remove inspection cover from converter housing and remove skid plate for access, if necessary.
(5) Remove transmission fill tube and fill tube O-ring.
(6) Remove starter motor.
(7) Mark propeller shafts and axle yokes for alignment reference.
(8) Disconnect propeller shafts at yokes. Secure shafts to frame rails with wire.
(9) Disconnect exhaust pipes at exhaust manifolds, if necessary.
(10) Drain transfer case lubricant, if transfer case will also be serviced.
(11) Disconnect vehicle speed sensor wires.
(12) Disconnect transfer case shift linkage.
(13) Disconnect gearshift cable/linkage and throttle valve cable at transmission levers.
(14) Disconnect transfer case vent hose. Then disconnect indicator switch wires.
(15) Remove wire harness from clips on transfer case.
(16) Remove transfer case attaching nuts and remove transfer case. Use transmission jack or helper to support and remove transfer case.
(17) Disconnect park/neutral position switch wires.
(18) Disconnect and remove crankshaft position sensor (Fig. 39).

CAUTION: The crankshaft position sensor can be damaged during transmission removal (or installation) if the sensor is still bolted to the engine block. To avoid damage, remove the sensor before removing the transmission.

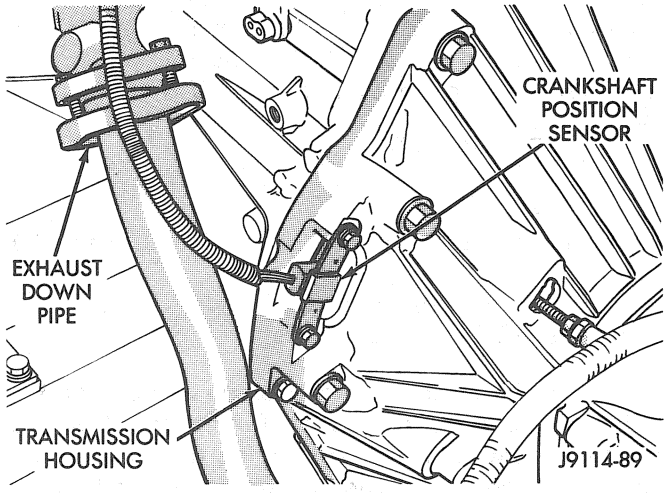


Fig. 39 Crankshaft Position Sensor

(19) Remove wire harnesses from clips/tie straps on transmission.
(20) Remove converter housing access cover and mark drive plate and converter for alignment reference.
(21) Remove bolts attaching converter to drive plate.
(22) Support engine with support stand.
(23) Support transmission with transmission jack. Secure transmission to jack with safety chain.
(24) Remove bolts/nuts attaching cushion and torque arm bracket to skid plate (Fig. 40).

ITEM	TORQUE
A	41-68 N·m (30-50 ft. lbs.)

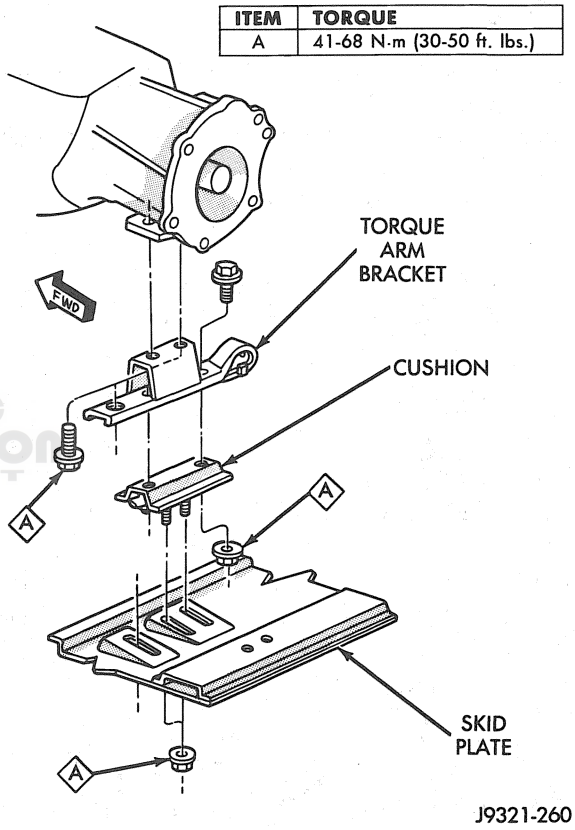


Fig. 40 Transmission Rear Mount

(25) Remove skid plate, or rear crossmember, if equipped.
(26) Lower transmission slightly and disconnect cooler lines at transmission.
(27) Remove bolts attaching transmission converter housing to engine block.
(28) Move transmission and converter rearward until clear of crankshaft.
(29) Hold converter in position and lower transmission until converter housing clears engine.
(30) Remove converter from transmission.
(31) Following components can now be serviced if necessary:

- torque converter
- torque converter drive plate
- oil pump seal
- engine rear core hole plugs
- engine rear oil galley plugs

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

CAUTION: If the transmission was repaired to correct a problem that generated sludge and debris, the fluid cooler and lines must be reverse flushed and the torque converter and drainback valve replaced. Sludge and metal or friction particles must be removed from the cooler system before reinstalling the transmission. This avoids re-contaminating the repaired transmission. Failure to flush the system will result in repeat failure and a shop comeback.

(1) Lubricate converter drive hub and pump seal with Mopar ATF Plus transmission fluid. Then install converter. Turn converter back and forth to align drive slots in converter hub with pump gear lugs. Be sure converter is fully seated in pump (Fig. 41).

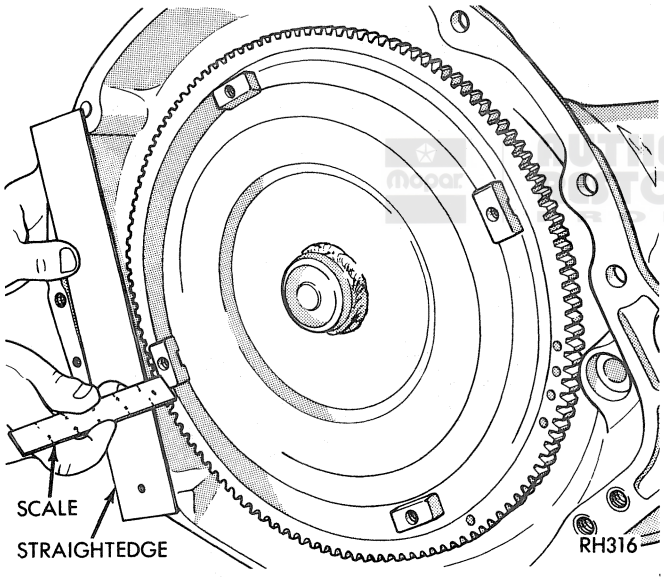


Fig. 41 Checking Torque Converter Seating

(2) Temporarily secure converter with C-clamp or metal strap attached across converter housing.

(3) Position transmission on jack and secure it with safety chains.

(4) Raise transmission and align converter with drive plate.

(5) Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.

(6) Install two transmission attaching bolts. Tighten bolts just enough to hold transmission converter housing in place on block.

(7) Install torque converter attaching bolts. Tighten bolts to following torque.

- 54 N·m (40 ft. lbs.) with 9.5 in. 3-lug converter
- 74 N·m (55 ft. lbs.) with 9.5 in. 4-lug converter
- 74 N·m (55 ft. lbs.) with 10.0 in. 4-lug converter
- 31 N·m (270 in. lbs.) with 10.75 in. 4-lug converter

(8) Install and tighten remaining bolts that attach transmission converter housing to engine block (Fig. 42).

CAUTION: Be sure the converter housing is fully seated on the engine block dowels before tightening any bolts.

(9) Install crankshaft position sensor.

(10) Install transmission fill tube and O-ring.

(11) Connect transmission cooler lines to fittings. Refer to (Fig. 43) for cooler line identification.

(12) Install transfer case on transmission. Tighten attaching nuts to 47 N·m (35 ft. lbs.) torque if case has 3/8 studs, or 35 N·m (26 ft. lbs.) if case has 5/16 studs.

(13) Install rear crossmember and attach transmission rear support to crossmember.

(14) Remove transmission jack.

(15) Connect vehicle speed sensor wires.

(16) Install inspection cover on converter housing.

(17) Install exhaust pipes and support brackets, if removed.

(18) Install starter motor.

(19) Connect wires to park/neutral position switch.

(20) Connect gearshift and linkage and throttle cable.

(21) Connect transfer case shift linkage.

(22) Connect propeller shafts to transfer case yokes.

(23) Connect front exhaust pipes and catalytic converter support bracket bolts (if removed).

(24) Install skid plate, rear cushion and bracket, if removed.

(25) Fill transfer case to bottom edge of fill plug hole with Mopar Dexron II.

(26) Lower vehicle and fill transmission to correct level with ATF Plus, type 7176 fluid.

(27) Install fan shroud and bolts (if removed).

TORQUE CONVERTER

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition.

The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

REMOVAL AND INSTALLATION (Continued)

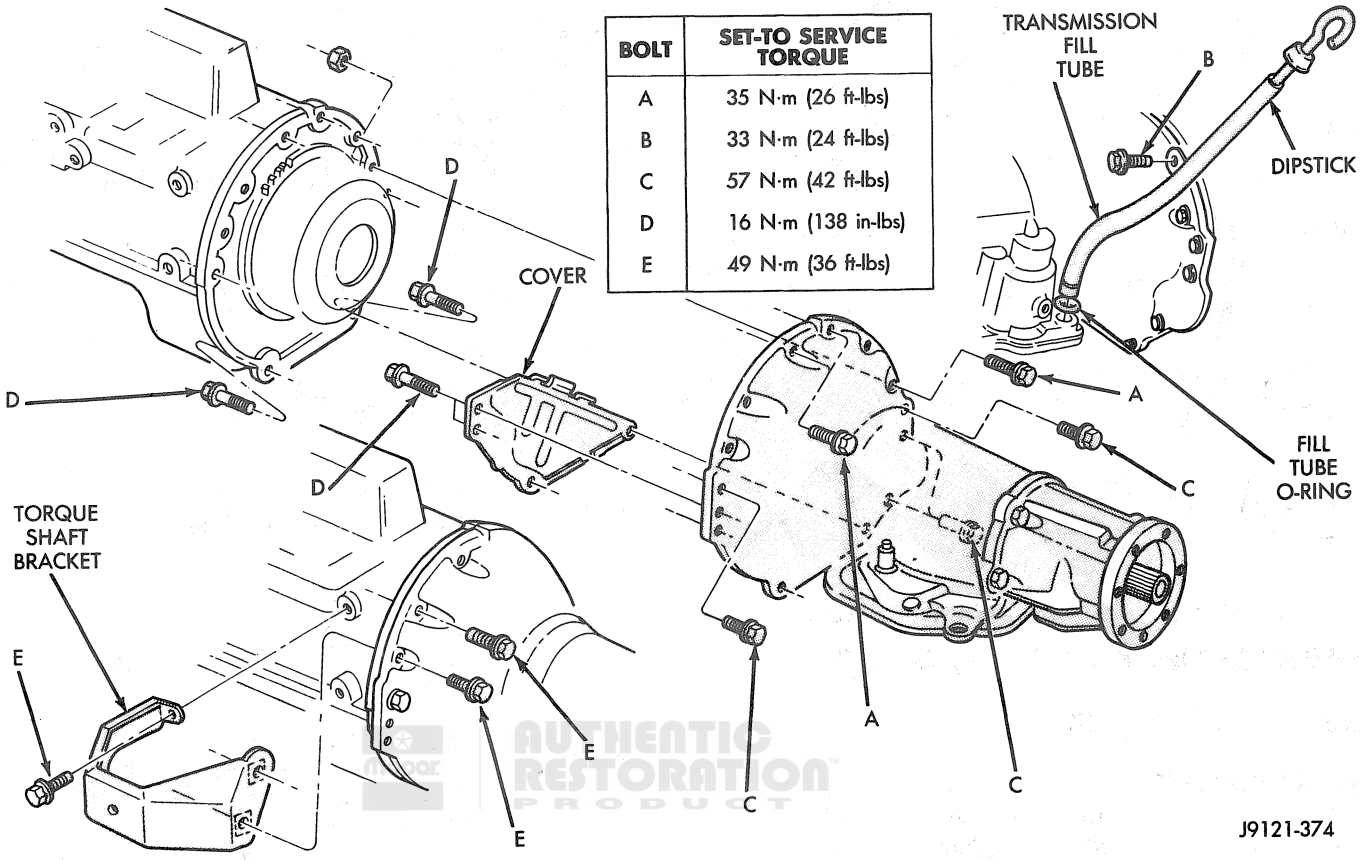


Fig. 42 Transmission Attachment

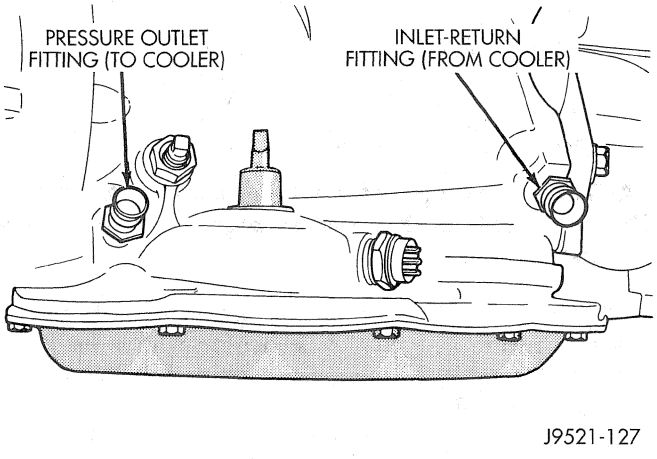


Fig. 43 Transmission Cooler Line Location And Identification

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

(1) Lubricate converter hub and oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, Rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 44). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle.

(9) Fill the transmission with the recommended fluid.

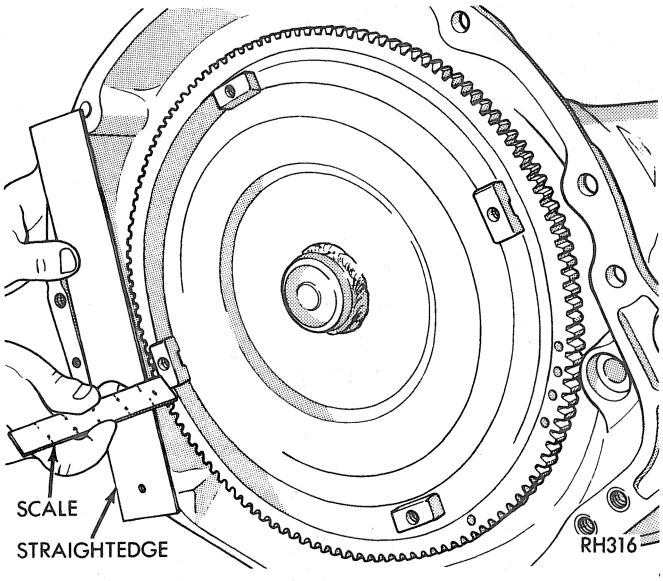


Fig. 44 Checking Torque Converter Seating

DISASSEMBLY AND ASSEMBLY

GOVERNOR AND PARK GEAR

DISASSEMBLY

(1) Remove bolts attaching governor body to park gear and separate body from gear.

(2) Remove cone shaped filter from park gear (Fig. 45).

(3) Remove snap ring and retainer washer that secure governor weight assembly in body. Use Tool C-3915 to remove snap ring (Fig. 46).

(4) Remove governor weight assembly from governor body bore.

(5) Slide intermediate and inner weight from outer weight.

(6) Position intermediate weight on suitable size socket (Fig. 47).

(7) Push inner weight downward with nut driver. Then remove inner weight snap ring with Miller Plier Tool 6823 (Fig. 47).

(8) Remove inner weight and spring from intermediate weight.

ASSEMBLY

(1) Lubricate governor components with Mopar ATF Plus transmission fluid before assembly.

(2) Install new seal rings on park gear hub only if original rings are damaged, or worn. Install ring with interlock ends first and ring with plain ends last. Slip each ring on hub and seat them in grooves. Verify that rear ring ends are securely interlocked before proceeding.

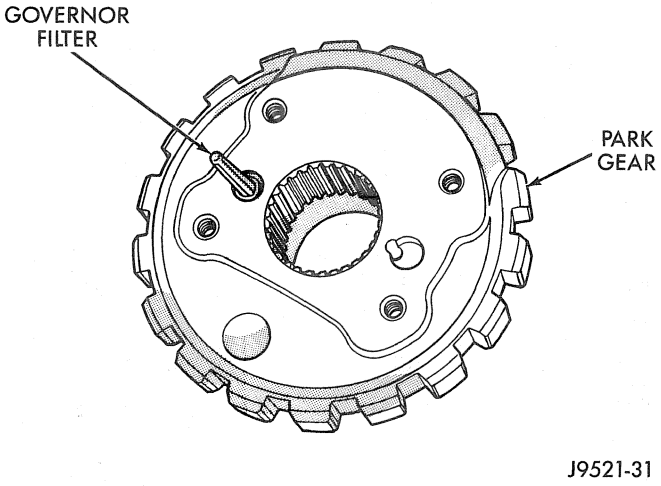


Fig. 45 Governor Filter

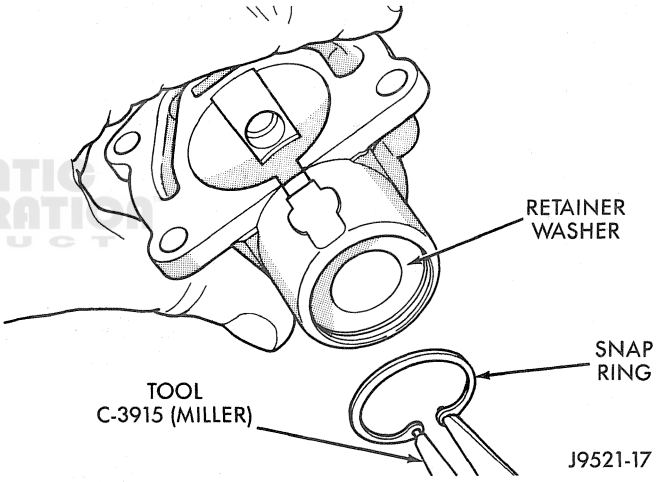


Fig. 46 Governor Weight Snap Ring And Washer

CAUTION: Exercise care when installing the rings. They are easily broken if overspread or twisted during installation.

(3) Insert filter screen in park gear. Note that gear has one filter bore that is concentric and one that has a notch in it. Filter goes in bore that is concentric as shown (Fig. 45).

(4) Position governor body on park gear. Be sure filter is properly aligned in body recess.

(5) Install governor body bolts. Do not fully tighten bolts at this time.

(6) Assemble governor weight components (Fig. 48). Then install weight assembly in governor body. **Be sure inner weight snap ring is fully seated intermediate weight before proceeding.**

(7) Install retainer washer and snap ring that secure weight assembly in governor body.

(8) Align and install park gear/governor assembly on output shaft. **Be sure hole in output shaft for governor valve shaft is aligned with governor**

DISASSEMBLY AND ASSEMBLY (Continued)

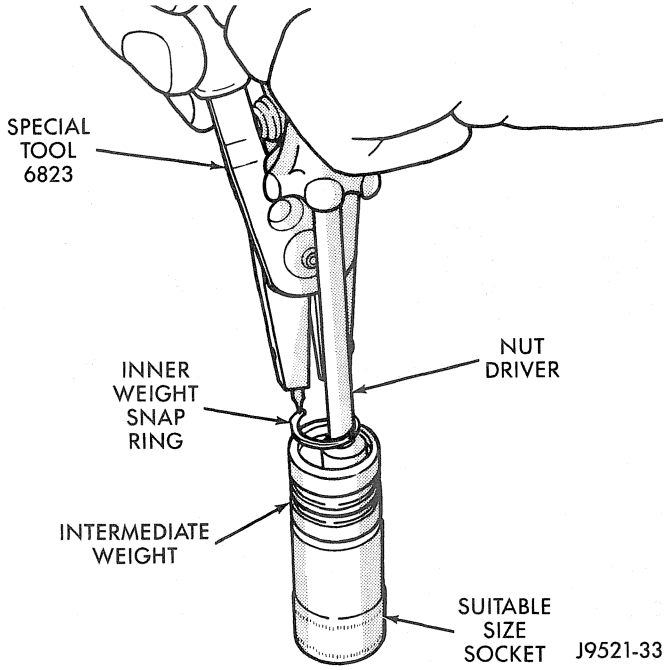


Fig. 47 Inner Weight Snap Ring

valve bore in governor body. Valve shaft will bind if misalignment occurs. Remove and reposition governor body if necessary.

(9) Verify that shaft bore in governor body and output shaft are aligned.

(10) Verify that governor valve will be indexed with spotface in output shaft. Reposition valve, shaft and body if necessary.

(11) Install an E-clip on one end of governor valve shaft. Be sure rounded side of E-clip is facing out (away from weight).

(12) Insert governor valve shaft through governor weight. Be sure shaft slides freely in bore.

(13) Install governor valve on shaft and in governor body bore.

(14) Install remaining E-clip on governor valve shaft. Be sure rounded side of E-clip is facing out (away from valve).

VALVE BODY

Remove the valve body from the transmission, refer to the Removal and Installation procedures section of this group.

DISASSEMBLE

CAUTION: Do not clamp any part of the valve body assembly (Fig. 49) in a vise. This practice will distort the valve body and transfer plate resulting in valve bind. Slide valves and plugs out carefully. Do not use force at any time. The valves and valve body will be damaged if force is used. Also tag or mark the valve body springs for reference as they are removed. Do not allow them to become intermixed.

(1) Remove screws attaching adjusting screw bracket to valve body and transfer plate. Hold bracket firmly against spring force while removing last screw.

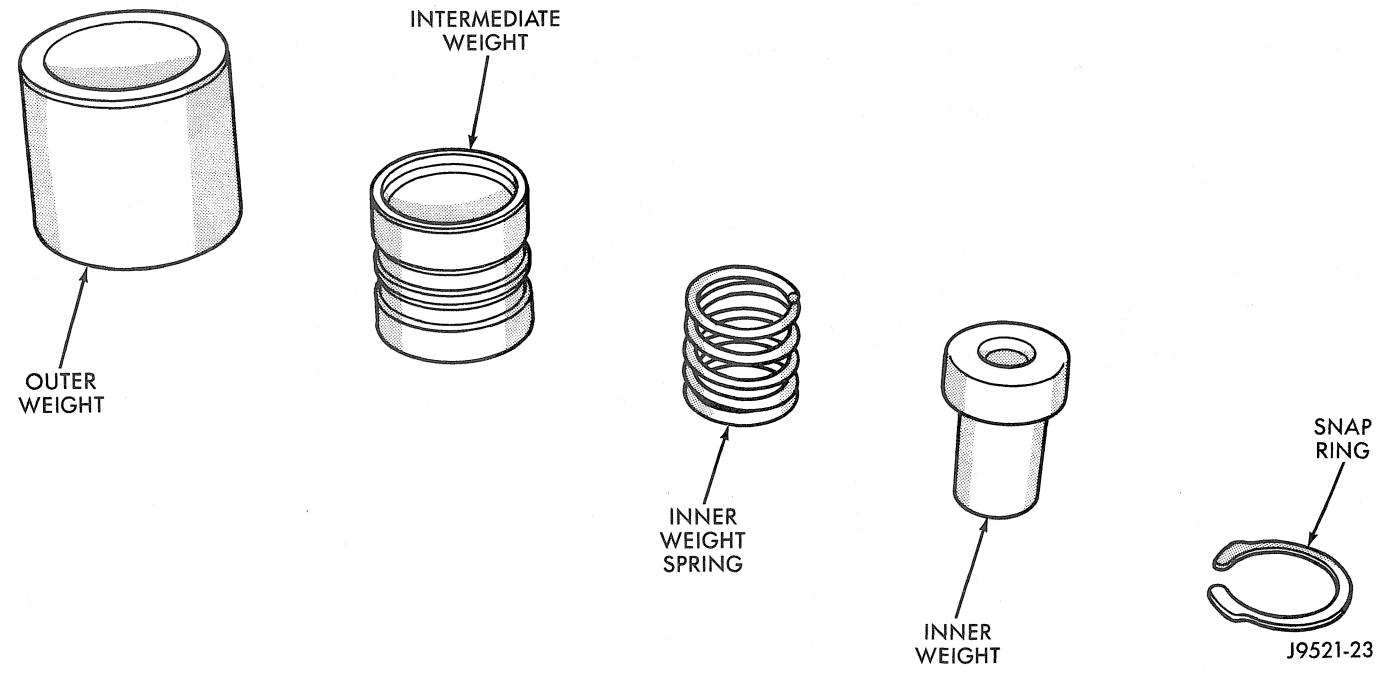


Fig. 48 Governor Weights

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Remove adjusting screw bracket, line pressure adjusting screw, pressure regulator spring and switch valve spring (Fig. 50). **Do not remove throttle pressure adjusting screw from bracket and do not disturb adjusting screw settings during removal.**

(3) Secure detent ball and spring in housing with retainer tool 6583 (Fig. 51).

(4) Remove manual shaft E-clip and washer (Fig. 52).

(5) Pull manual shaft and park rod assembly upward out of valve body and off throttle lever (Fig. 52).

(6) Remove Retainer Tool 6583. Then remove and retain detent ball and spring.

(7) Remove throttle lever (Fig. 52).

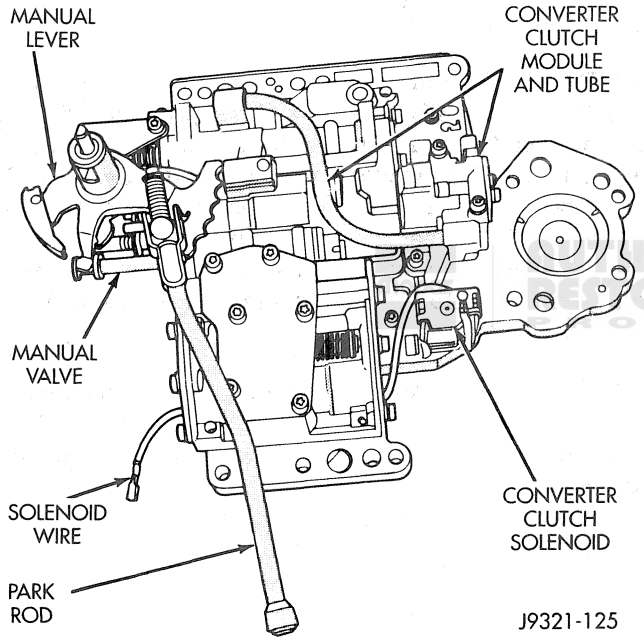


Fig. 49 Valve Body Assembly

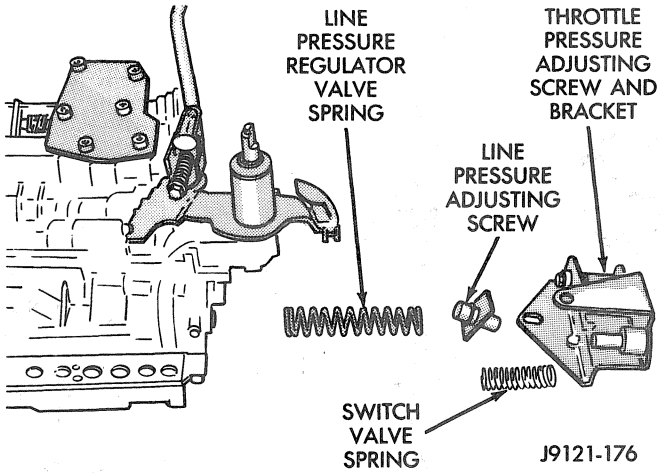


Fig. 50 Adjusting Screw Bracket And Spring Removal

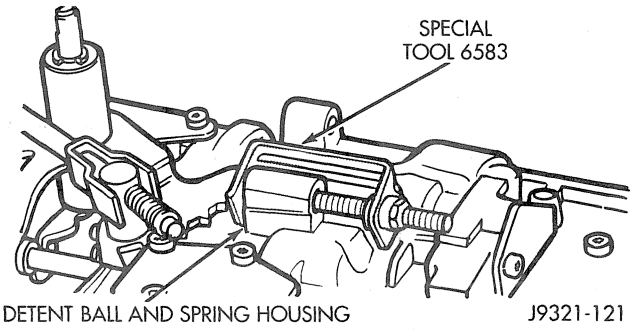


Fig. 51 Securing Detent Ball And Spring With Retainer Tool

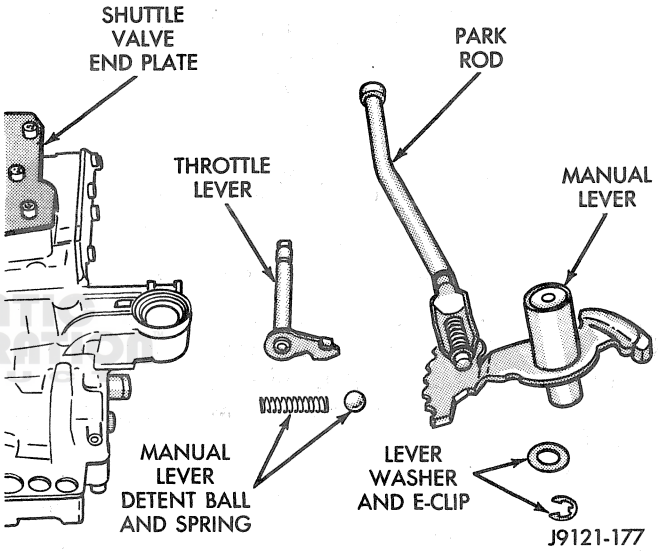


Fig. 52 Removing Manual And Throttle Levers

(8) Remove park rod E-clip and separate rod from manual lever (Fig. 53).

(9) Remove screws attaching converter clutch module to valve body and remove module and connecting tube (Fig. 54).

(10) Turn valve body over so transfer plate is facing upward (Fig. 55). With valve body in this position, valve body check balls will remain in place and not fall out when transfer plate is removed.

(11) Remove screws attaching transfer plate to valve body (Fig. 55).

(12) Remove transfer plate and separator plate from valve body. Note position of filter and clutch solenoid for reference (Fig. 56). Remove valve body check balls. Note that check balls will be steel on very early production models, or plastic on later production models.

(13) Position transfer plate on bench so separator plate, filter and lockup solenoid are facing up. This will avoid having rear clutch and rear servo check balls fall out when plates are separated.

(14) Remove screws attaching separator plate to transfer plate.

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Remove converter clutch solenoid from separator plate (Fig. 57). A T25 torx bit is required to remove solenoid attaching screw.

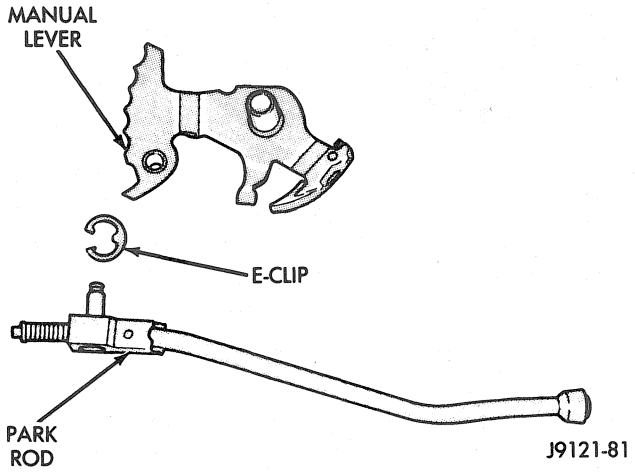


Fig. 53 Park Rod Removal

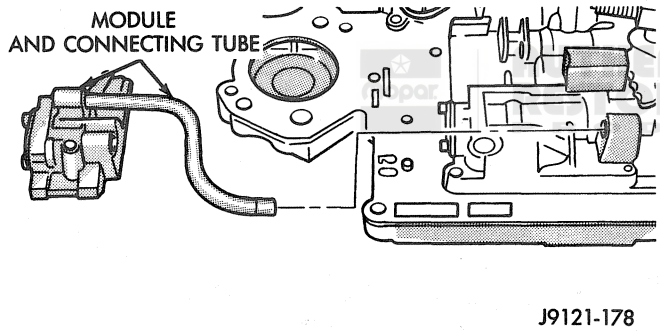


Fig. 54 Clutch Module And Connecting Tube Removal/Installation

(16) Note position of filter, solenoid and rear clutch/rear servo check balls for assembly reference (Fig. 58). Clutch and servo check balls will be steel on some early models and plastic on later production models.

(17) Remove shuttle valve end plate (Fig. 59).

(18) Remove shuttle valve E-clip and remove secondary spring and spring guides from end of valve (Fig. 59).

(19) Remove governor valve end plate (Fig. 60).

(20) Remove switch valve and pressure regulator valve from valve body (Fig. 60).

(21) Remove throttle valve and spring, kickdown valve and detent and manual valve from valve body (Fig. 60).

(22) Remove 1-2 and 2-3 shift valve governor plugs from valve body (Fig. 60).

(23) Remove shuttle valve throttle plug, primary spring and shuttle valve from valve body (Fig. 60).

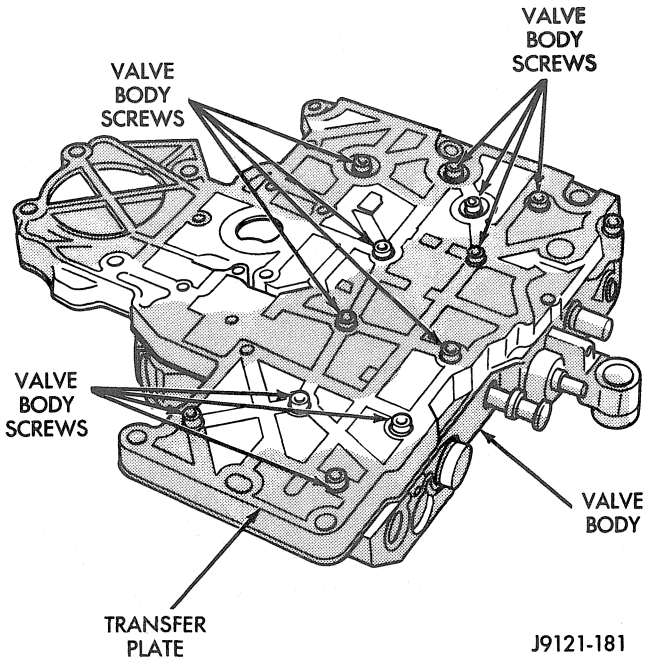


Fig. 55 Valve Body-To-Transfer Plate Screw Locations

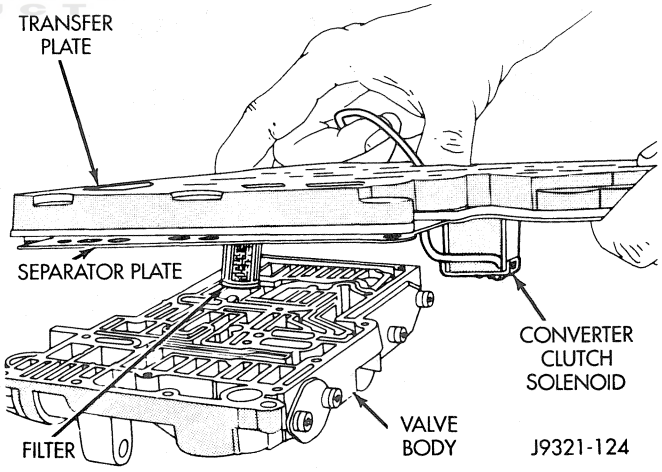


Fig. 56 Transfer Plate Removal/Installation

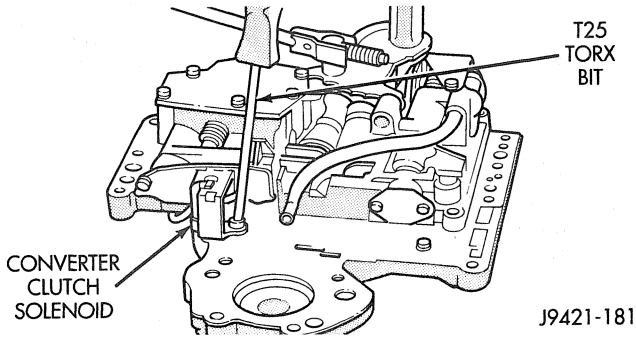


Fig. 57 Converter Clutch Solenoid Removal

DISASSEMBLY AND ASSEMBLY (Continued)

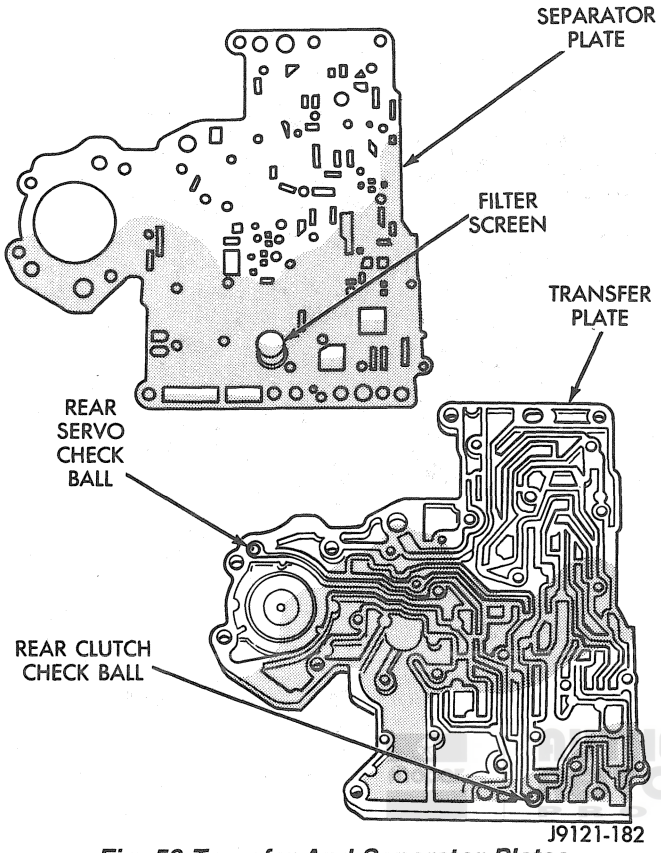


Fig. 58 Transfer And Separator Plates

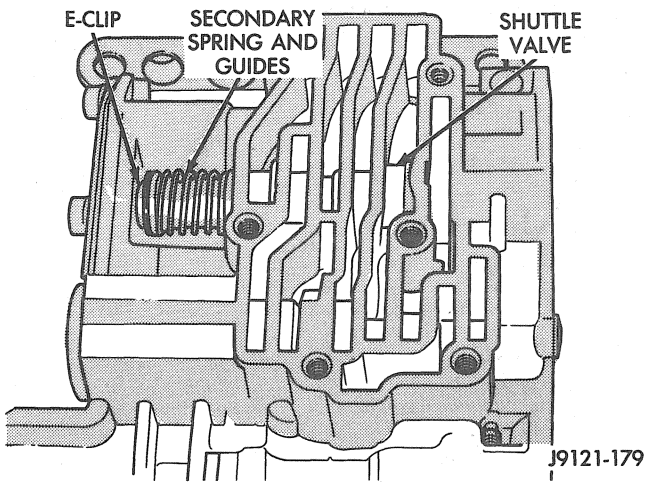


Fig. 59 Shuttle Valve E-Clip And Secondary Spring Location

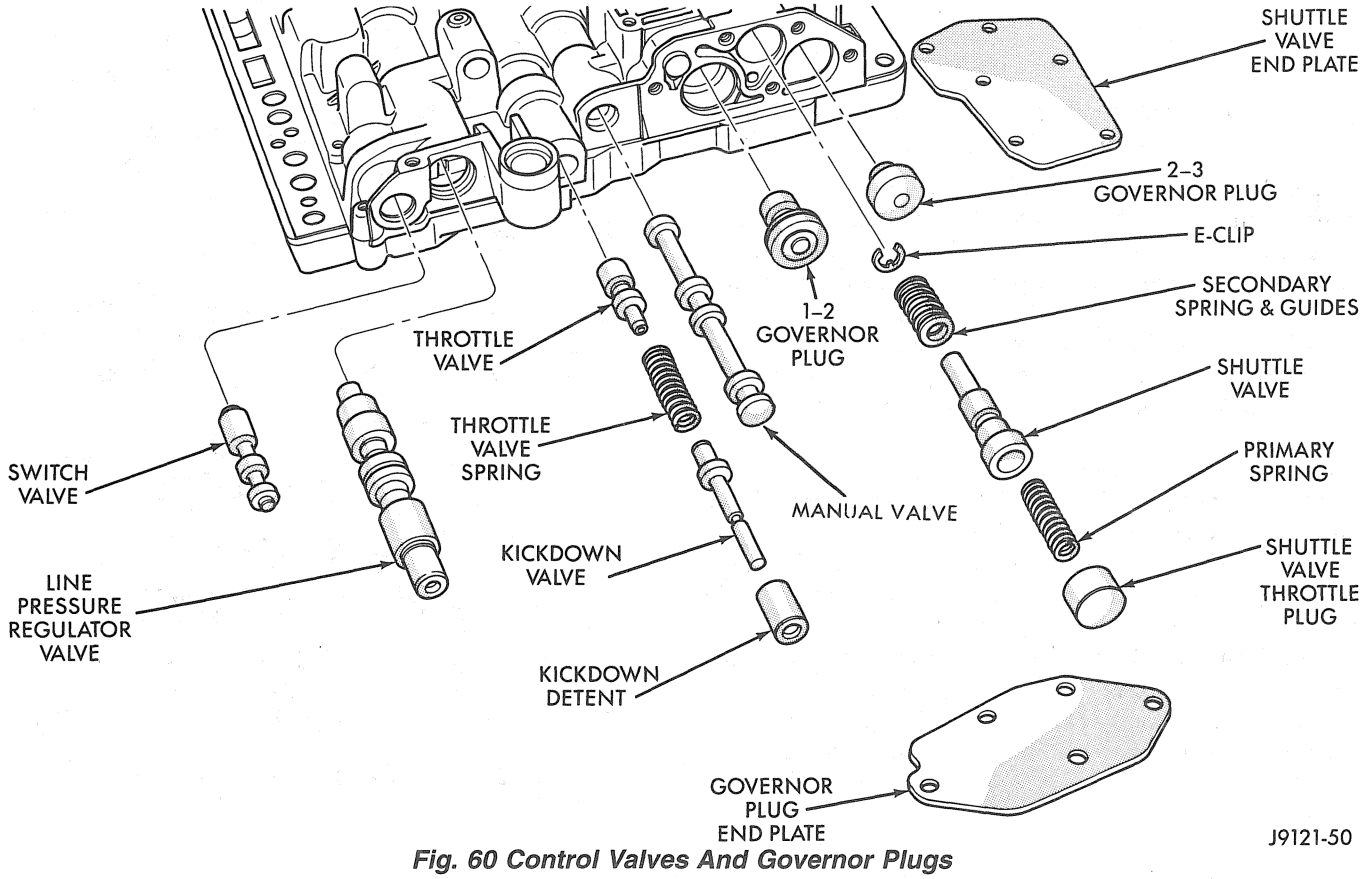


Fig. 60 Control Valves And Governor Plugs

DISASSEMBLY AND ASSEMBLY (Continued)

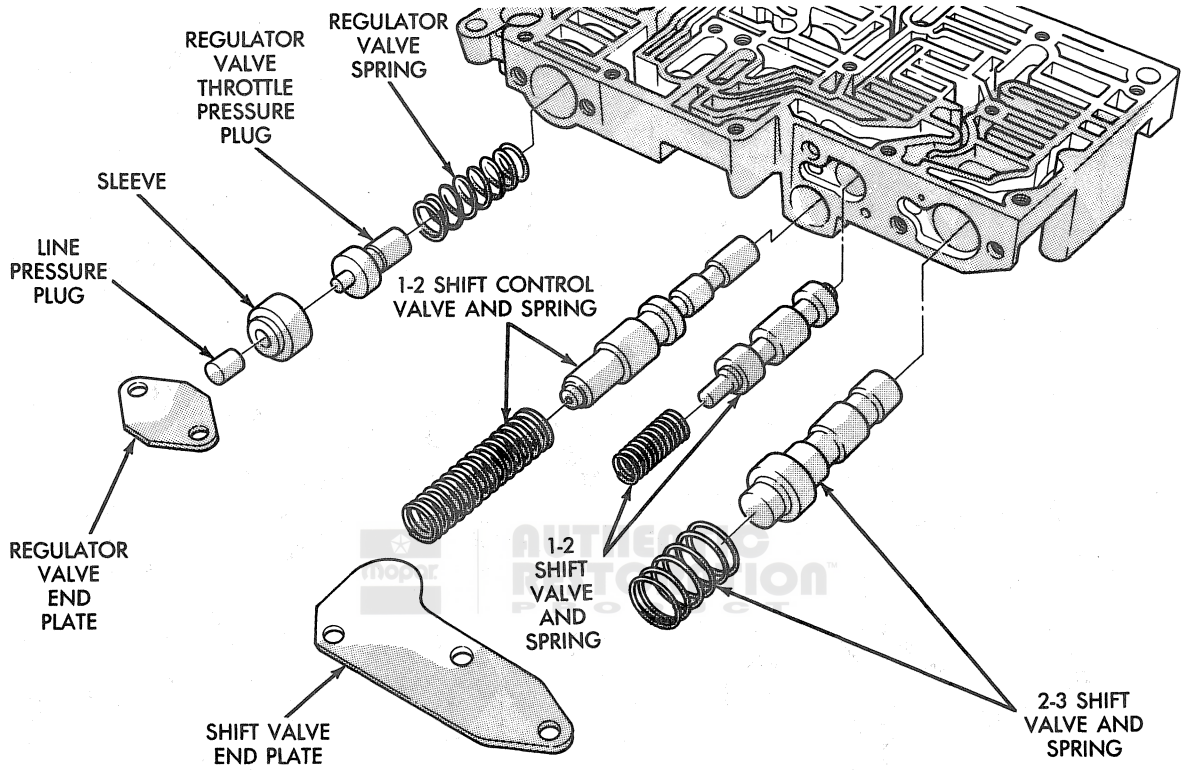


Fig. 61 Shift Valves And Pressure Regulator Plugs

(24) Remove 1-2 shift control valve and spring from valve body (Fig. 61).

(25) Remove 2-3 shift valve and spring from valve body (Fig. 61).

(26) Remove 1-2 shift valve and spring from valve body (Fig. 61).

(27) Remove regulator valve end plate (Fig. 61).

(28) Remove regulator valve line pressure plug, pressure plug sleeve, throttle pressure plug and spring (Fig. 61).

ASSEMBLE VALVE BODY—30RH

CAUTION: Do not force valves or plugs into place during reassembly. If the valve body bores, valves and plugs are free of distortion or burrs, the valve body components should all slide into place easily. In addition, do not overtighten the transfer plate and valve body screws during reassembly. Overtightening can distort the valve body resulting in valve sticking, cross leakage and unsatisfactory operation. Tighten valve body screws to recommended torque only.

(1) Lubricate valve body bores, valves and plugs with Mopar ATF Plus transmission fluid.

(2) Insert rear clutch and rear servo check balls in transfer plate (Fig. 62).

(3) Install filter screen in separator plate (Fig. 62).

(4) Align and install separator plate on transfer plate. Verify check ball position before installing separator plate on transfer plate.

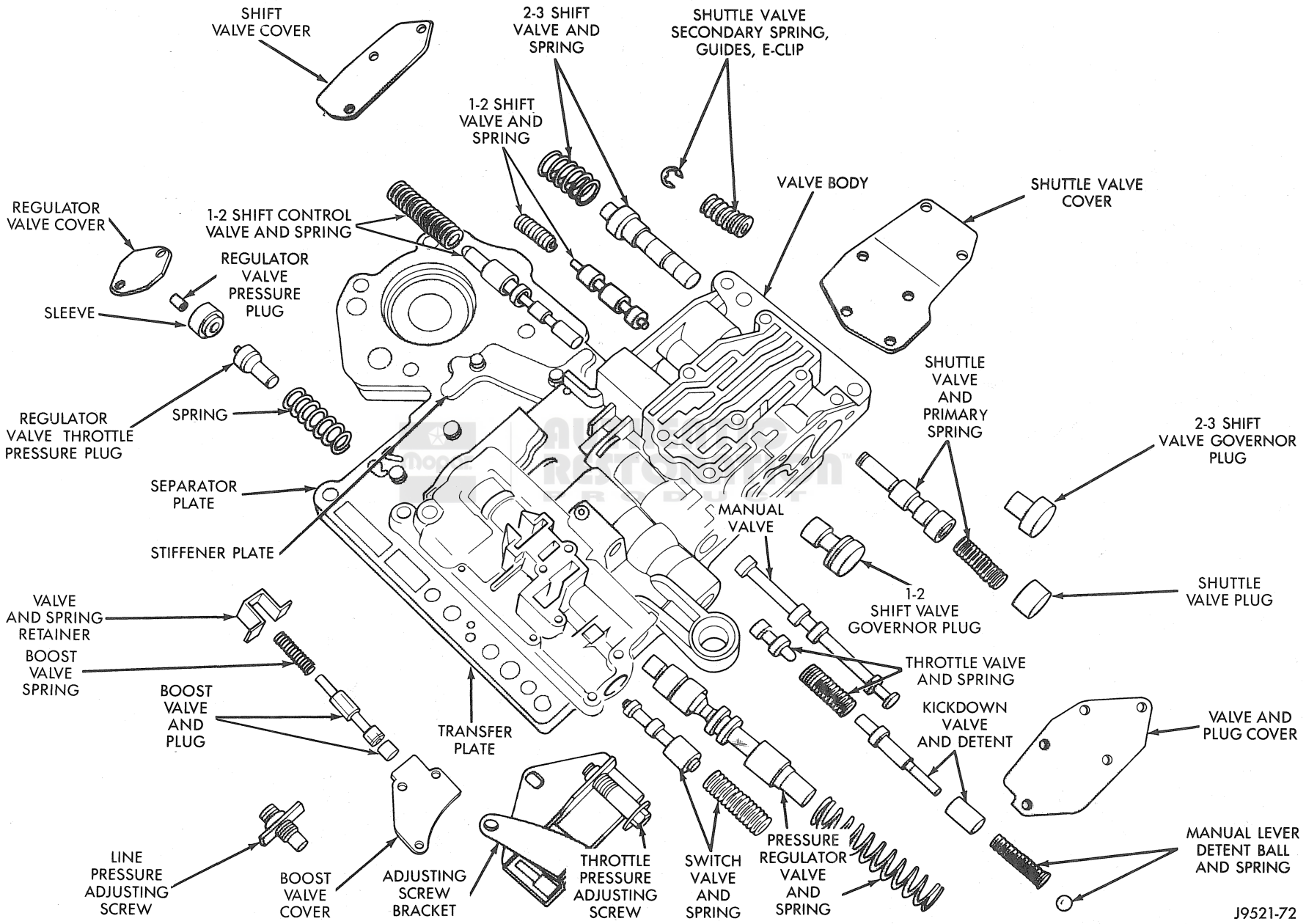


Fig. 62 Valve Body Components

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Install new O-ring on converter clutch solenoid and insert solenoid in separator plate (Fig. 63). Then secure solenoid in position with attaching screw. Tighten screw to 4 N·m 35 in. lbs.) torque.

(6) Position valve body so internal passages and check ball seats are facing upward. Then install check balls in valve body (Fig. 64). There are a total of seven check balls; The one large check ball is approximately 11/32 inch in diameter. The remaining check balls are approximately 1/4 inch in diameter. Note that check balls will be steel on some very early production models and plastic on later production models.

(7) Align and install assembled transfer and separator plates on valve body. Install and tighten valve body screws alternately in a diagonal pattern to 4 N·m (35 in. lbs.) torque.

(8) Assemble and install lockup module and components on valve body (Fig. 65).

(9) Assemble regulator valve line pressure plug, sleeve, throttle plug and spring (Fig. 62). Insert assembly in valve body and install end plate. Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

(10) Install 1-2 and 2-3 shift valves and springs (Fig. 62).

(11) Install 1-2 shift control valve and spring (Fig. 62).

(12) Install shuttle valve as follows:

(a) Insert shuttle valve in bore.

(b) Insert plastic guides in shuttle valve secondary spring.

(c) Install spring on end of valve.

(d) Hold shuttle valve in place. Then compress secondary spring and install E-clip in groove at end of valve.

(e) Verify that spring and E-clip are properly seated before proceeding.

(13) Install shuttle valve cover plate. Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

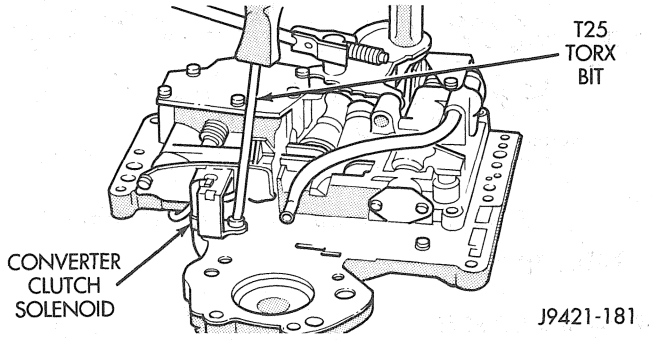


Fig. 63 Installing Converter Clutch Solenoid—30RH

(14) Install 1-2 and 2-3 valve governor plugs in valve body (Fig. 62). Then install shuttle valve primary spring and throttle plug.

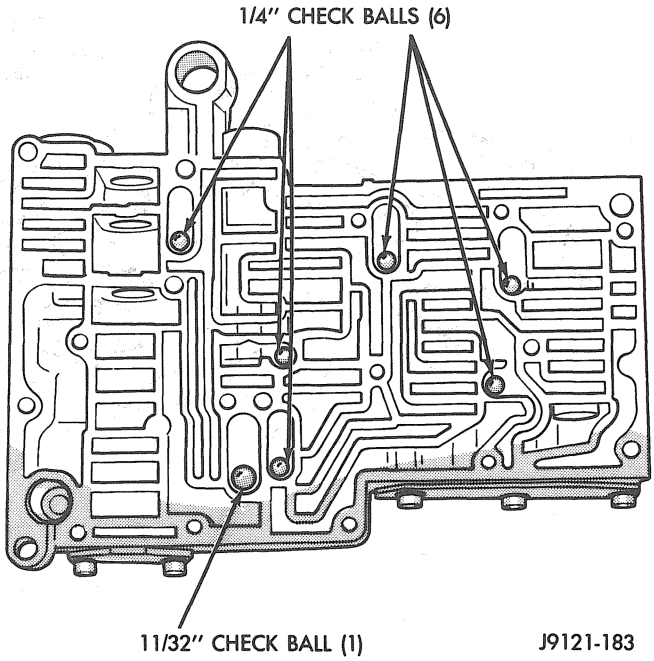


Fig. 64 Correct Position Of Valve Body Check Balls

(15) Align and install governor plug end plate on valve body and install end plate screws. Tighten screws to 4 N·m (35 in. lbs.) torque.

(16) Install manual valve (Fig. 62).

(17) Install throttle valve and spring. Then install kickdown valve and detent (Fig. 62).

(18) Install pressure regulator valve and switch valve in valve body.

(19) Install manual lever detent spring in housing. Place detent ball on end of spring and push ball and spring into housing. Secure ball and spring with Detent Retainer 6583 (Fig. 66).

(20) Insert line pressure adjusting screw in adjusting screw bracket.

(21) Install spring on end of line pressure regulator valve.

(22) Install switch valve spring on tang at end of adjusting screw bracket.

(23) Position adjusting screw bracket on valve body. Align valve springs and press bracket into place. Install short, upper bracket screws first and long bottom screw last. Verify that valve springs and bracket are properly aligned. Then tighten all three bracket screws to 4 N·m (35 in. lbs.) torque.

(24) Install module and connecting tube. Be sure long end of tube goes to module. Tighten module screws to 4 N·m (35 in. lbs.) torque.

(25) Install throttle lever in valve body. Then install manual lever over throttle lever and start manual lever into valve body.

(26) Align manual lever detent with detent ball and align lever arm with manual valve. Hold throttle

DISASSEMBLY AND ASSEMBLY (Continued)

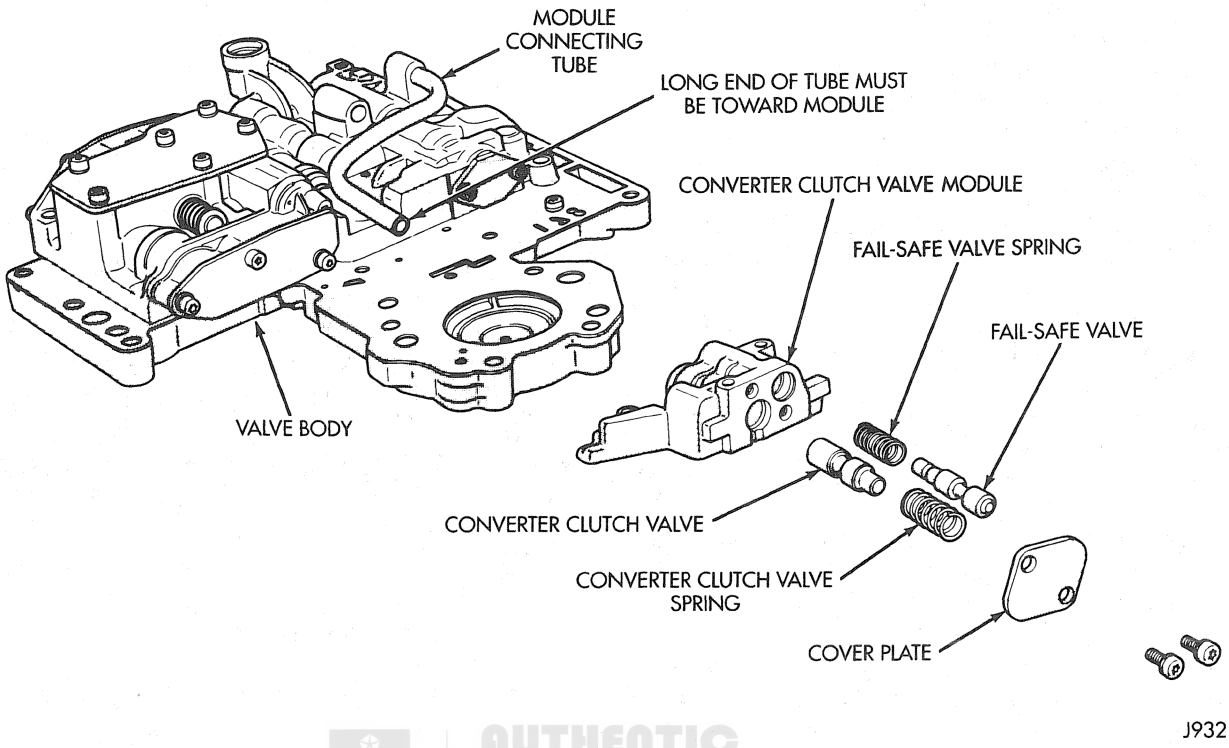


Fig. 65 Converter Clutch Module Components

lever upward. Then press down on manual lever until lever is fully seated.

(27) Install manual lever seal, washer and retaining E-clip.

(28) Lubricate shaft of manual lever with light coat of petroleum jelly. This will help protect seal lip when manual shaft seal is installed.

(29) Verify that throttle lever is aligned with end of kickdown valve stem and that manual lever arm is engaged in manual valve (Fig. 67).

(30) If line pressure and/or throttle pressure adjustment screw settings were not disturbed, continue with overhaul or reassembly. However, if adjustment screw settings **were** moved or changed, readjust as described in Valve Body Control Pressure Adjustment procedure.

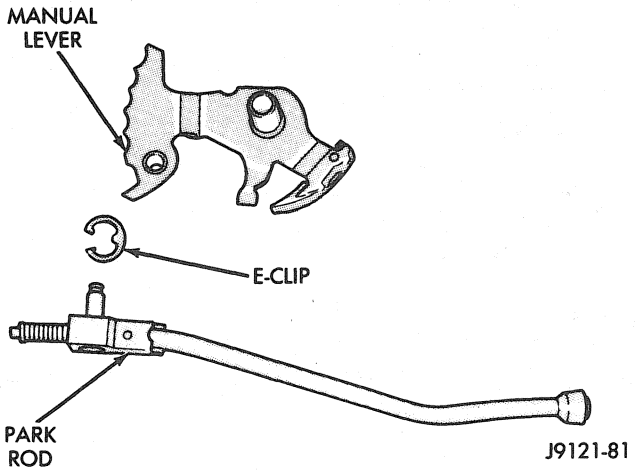


Fig. 66 Park Rod Install

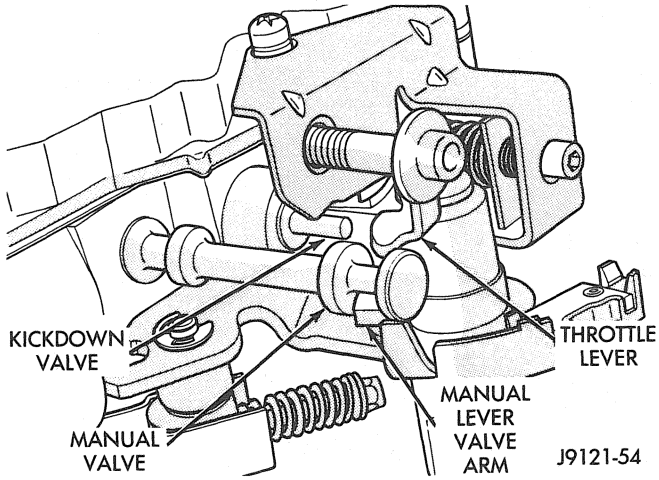


Fig. 67 Manual And Throttle Lever Alignment

TRANSMISSION

DISASSEMBLE

(1) Drain fluid from transmission.

(2) Remove transmission from vehicle.

(3) Install a suitable tail shaft housing plug to avoid contaminating internal components with cleaning solvents.

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Clean exterior of transmission with suitable solvent or pressure washer.

(5) Remove torque converter from front of transmission.

(6) Remove throttle and shift levers from valve body manual shaft and throttle lever shaft.

(7) Mount transmission in repair stand C-3750-B or similar type stand (Fig. 68).

(8) Remove extension housing.

(9) Remove fluid pan.

(10) Remove park/neutral position switch and seal (Fig. 69).

(11) Remove valve body.

(12) Remove accumulator spring and piston (Fig. 70).

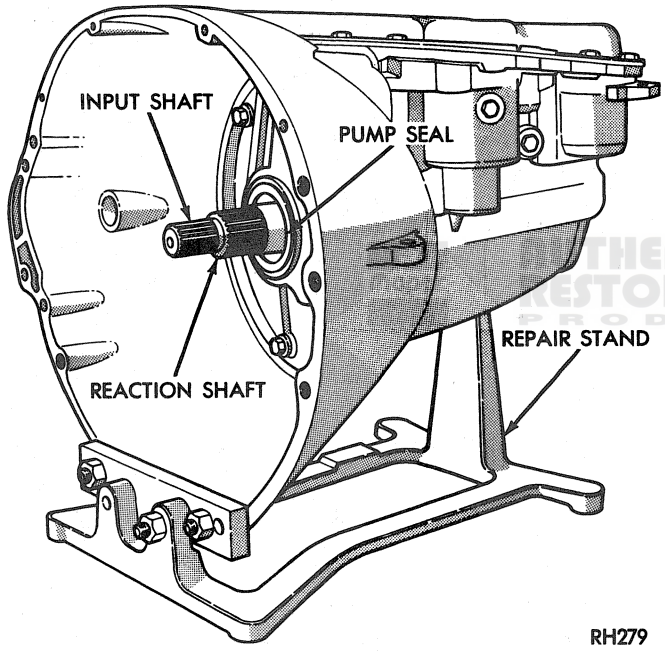


Fig. 68 Repair Stand

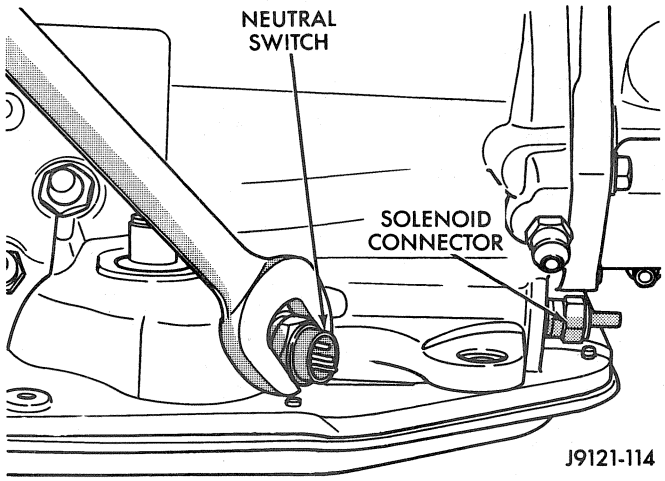


Fig. 69 Park/Neutral Position Switch

(13) Remove front band reaction pin access plug (Fig. 71). Plug is accessible through converter housing. Use 1/4 inch drive extension to remove plug as shown.

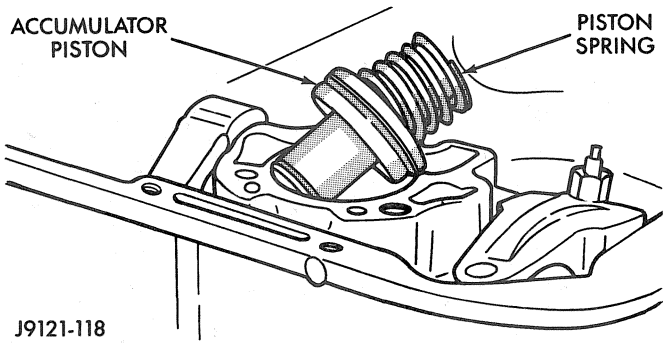


Fig. 70 Accumulator Piston And Spring

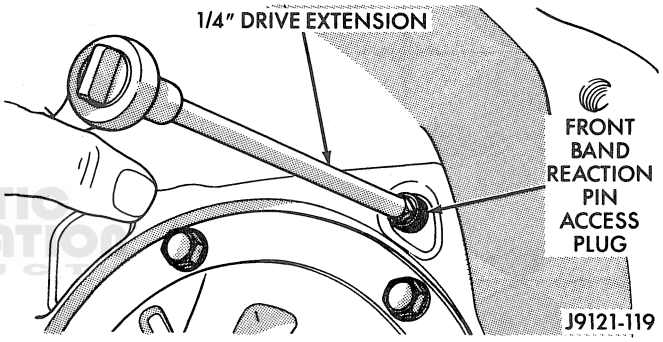


Fig. 71 Front Band Reaction Pin Access Plug

(14) Loosen front band adjusting screw lock nut (Fig. 72) 4-5 turns. Then tighten band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out with pump and possibly damaging clutch or pump components.

(15) Remove oil pump bolts.

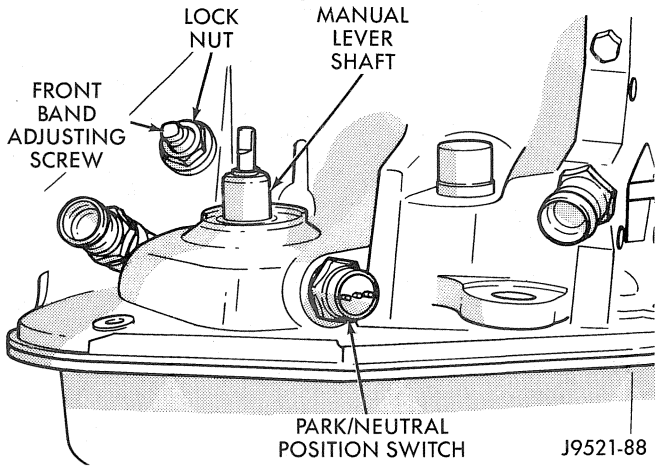


Fig. 72 Front Band Adjusting Screw Lock Nut

DISASSEMBLY AND ASSEMBLY (Continued)

(16) Thread bolts of Slide Hammer Tools C-3752 into threaded holes in pump body flange (Fig. 73).

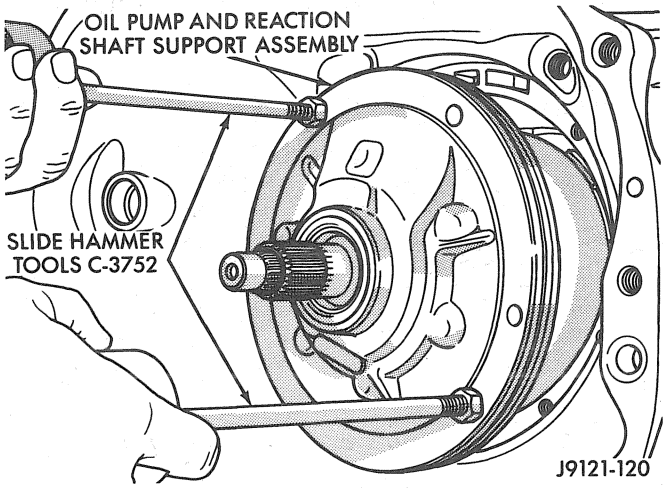


Fig. 73 Oil Pump/Reaction Shaft Support

(17) Bump slide hammer weights outward to remove pump and reaction shaft support assembly from case (Fig. 73).

(18) Loosen front band adjusting screw until band is completely loose.

(19) Squeeze front band together and remove band strut (Fig. 74).

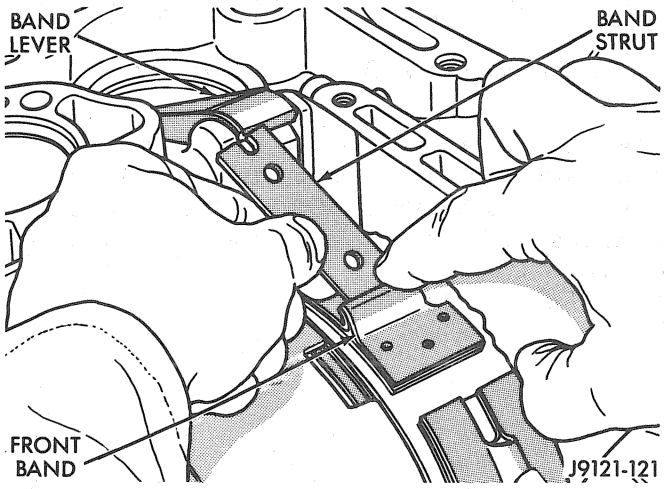


Fig. 74 Front Band Strut

(20) Remove front band reaction pin with pencil magnet. Pin is accessible from converter housing side of case (Fig. 75).

(21) Remove front band lever (Fig. 76).

(22) Slide front band rearward and onto driving shell. Band will not be removed until after front/rear clutch removal.

(23) Remove front and rear clutch units as assembly. Grasp input shaft, hold clutch units together and remove them from case (Fig. 77).

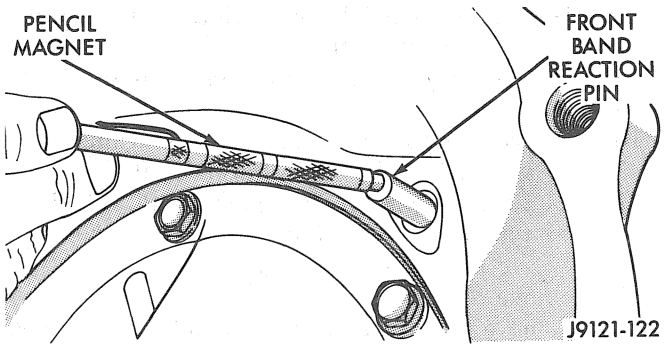


Fig. 75 Front Band Reaction Pin

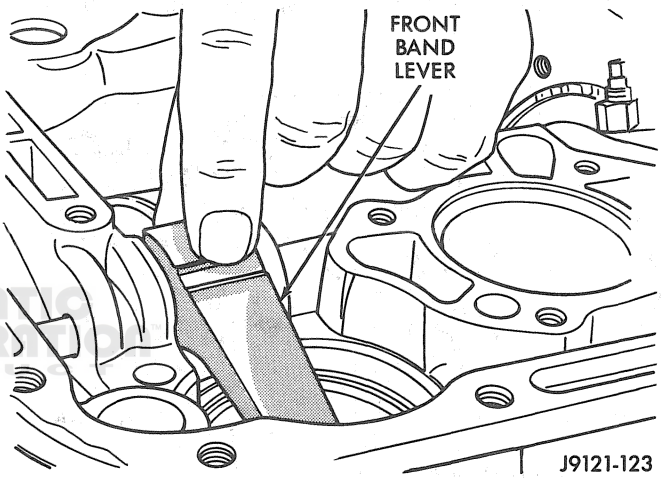


Fig. 76 Front Band Lever

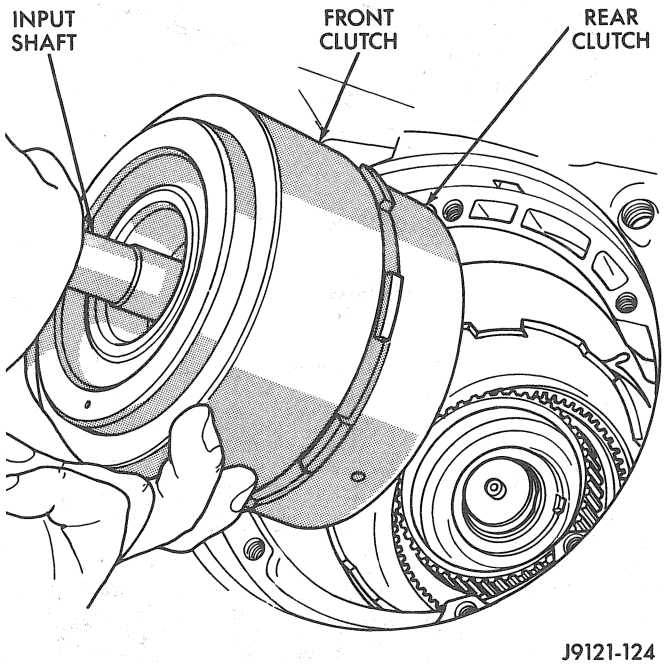


Fig. 77 Front/Rear Clutch Assemblies

DISASSEMBLY AND ASSEMBLY (Continued)

(24) Lift front clutch off rear clutch (Fig. 78). Set clutch units aside for overhaul.

(25) Remove output shaft thrust washer from output shaft (or from rear clutch hub).

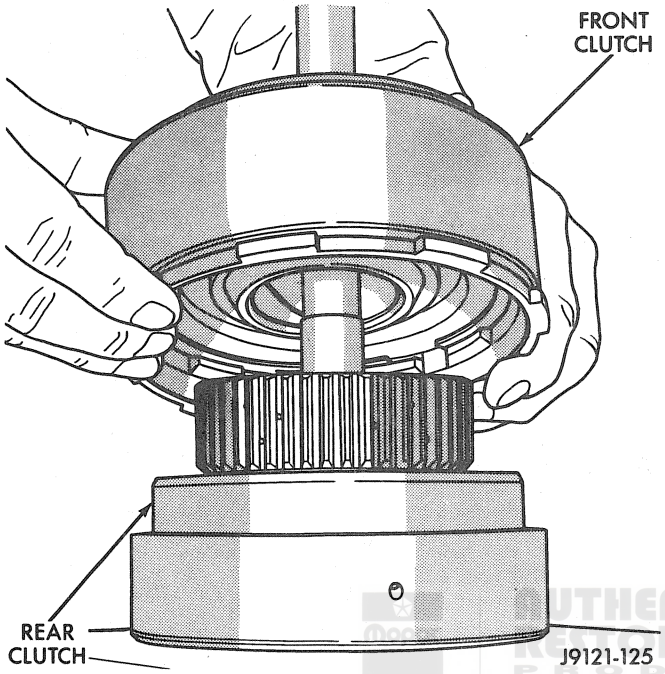


Fig. 78 Separating Front Clutch From Rear Clutch

(26) Remove output shaft thrust plate from output shaft hub (Fig. 79).

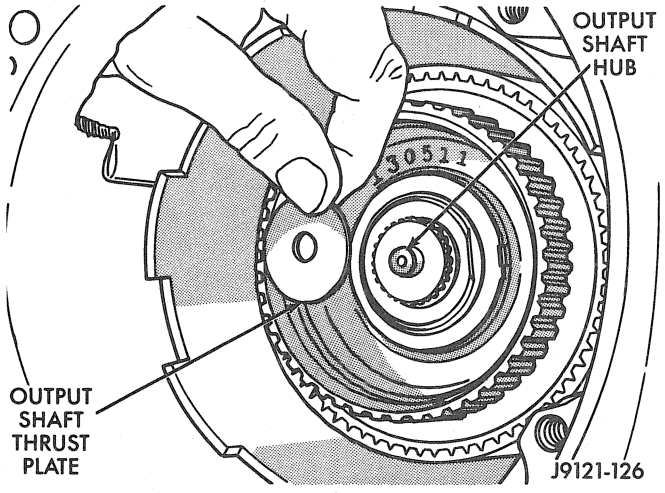


Fig. 79 Output Shaft Thrust Plate

(27) Slide front band off driving shell (Fig. 80) and remove band from case.

(28) Remove governor body and park gear from output shaft.

(29) Remove output shaft and planetary geartrain as assembly (Fig. 81). Support geartrain with both hands during removal. Do not allow machined surfaces on output shaft to become nicked or scratched.

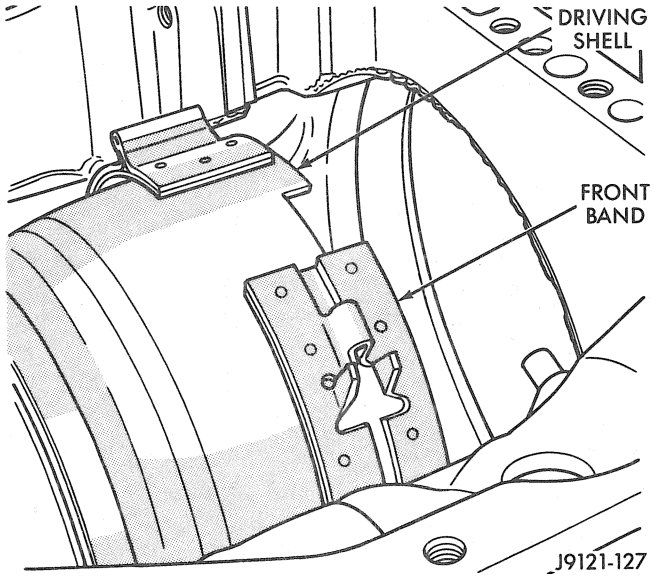


Fig. 80 Front Band

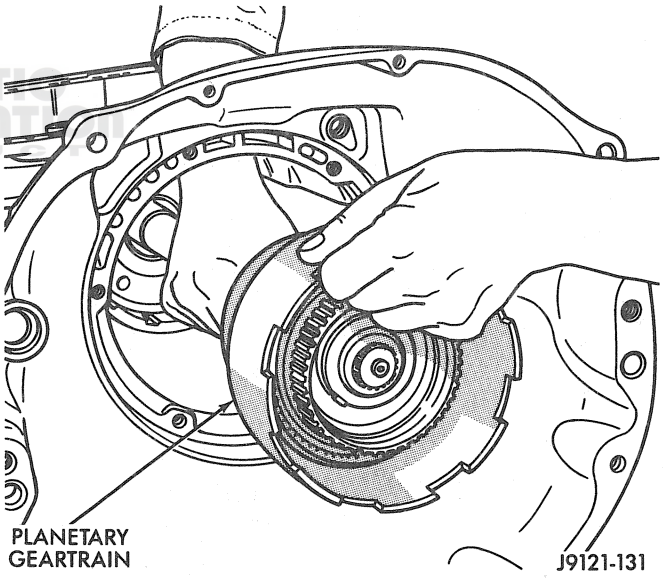


Fig. 81 Planetary Geartrain

(30) Loosen rear band adjusting screw 4-5 turns (Fig. 82).

(31) Remove snap ring that secures low-reverse drum to rear support hub, however do not remove drum at this time (Fig. 83).

(32) Remove rear band upper and lower reaction pins with parallel jaw snap ring pliers (Fig. 84). Spread plier jaws in pin bore to grip pin. Then twist and pull pins to remove them as shown.

(33) Remove rear band lever and strut.

(34) Mark position of rear support for assembly reference (Fig. 85). Use scriber or center punch to mark case and support.

DISASSEMBLY AND ASSEMBLY (Continued)

(35) Remove rear support bolts and remove support from low-reverse drum and case (Fig. 86). Keep rear support bolts together for assembly reference.

(36) Remove bolts attaching overrunning clutch cam to case (Fig. 87).

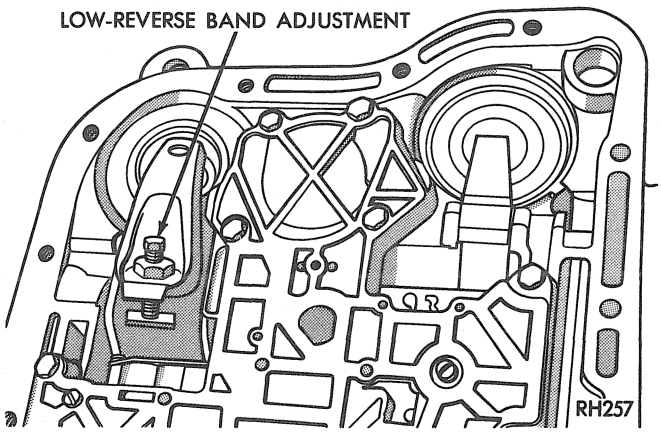


Fig. 82 Rear Band Adjustment Screw Location—Typical

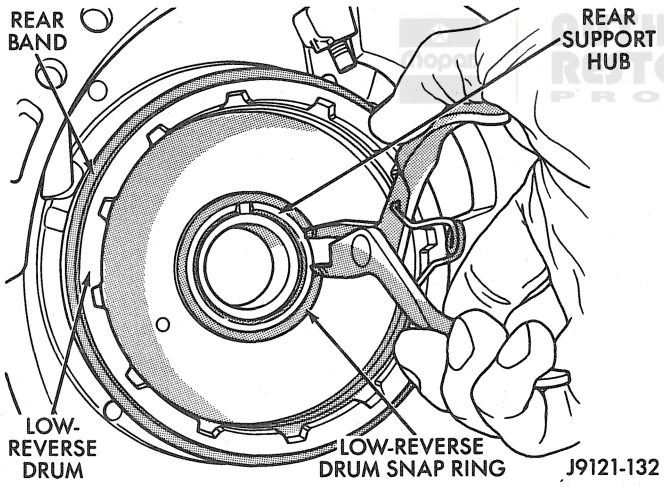


Fig. 83 Low-Reverse Drum Snap Ring

(37) Remove low-reverse drum and overrunning clutch as assembly. Slide drum and clutch through rear band and out of case. Set drum and clutch assembly aside for cleaning and inspection.

(38) Remove rear band from case.

(39) Compress front servo rod guide about 1/8 in. with large C-clamp and Tool C-4470, or Spring Compressor Tool C-3422-B (Fig. 88).

(40) Remove front servo rod guide snap ring (Fig. 88). **Exercise caution when removing snap ring. Servo bore can be scratched or nicked if care is not exercised.**

(41) Remove compressor tools and remove front servo rod guide, spring and servo piston.

(42) Compress rear servo spring retainer about 1/16 in. with C-clamp and Tool C-4470 or SP-5560

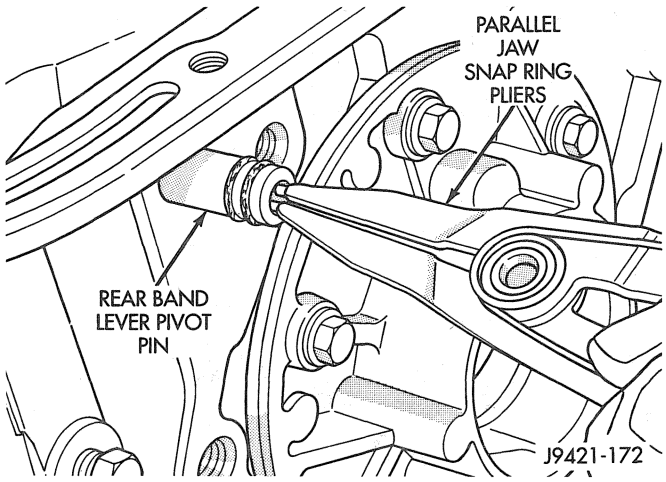


Fig. 84 Rear Band Pivot And Reaction Pins

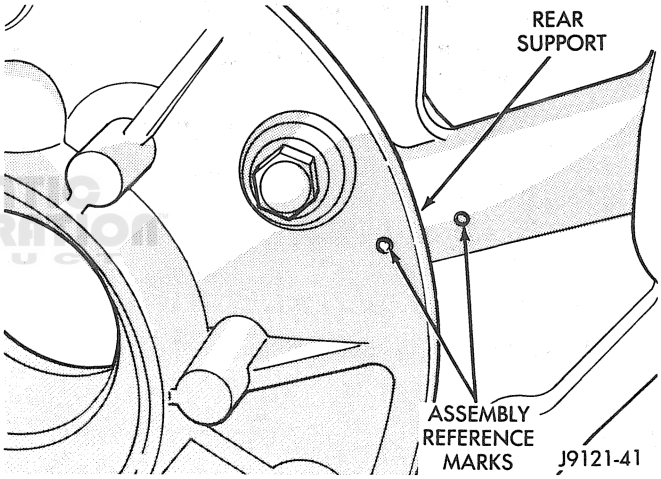


Fig. 85 Marking Rear Support To Aid Assembly

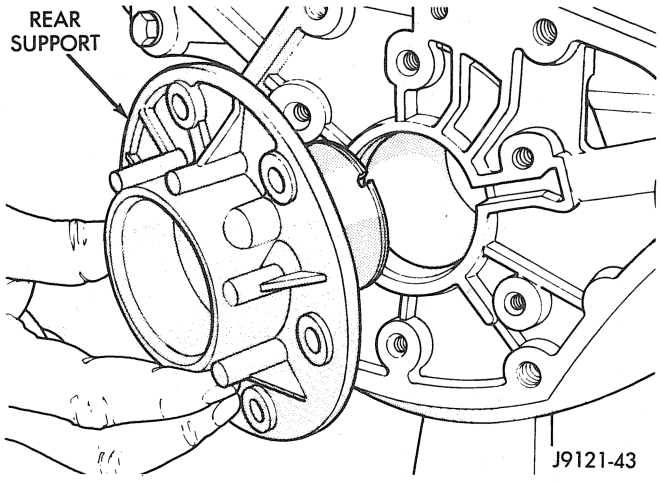


Fig. 86 Rear Support

(Fig. 89). Valve Spring Compressor C-3422-B can also be used to compress spring retainer.

DISASSEMBLY AND ASSEMBLY (Continued)

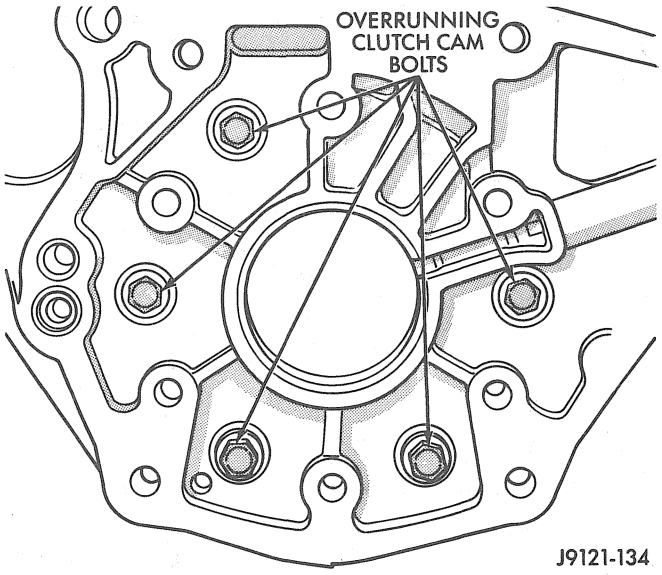


Fig. 87 Overrunning Clutch Cam Bolt Locations

(43) Remove rear servo spring retainer snap ring. Then remove compressor tools and remove rear servo spring and piston.

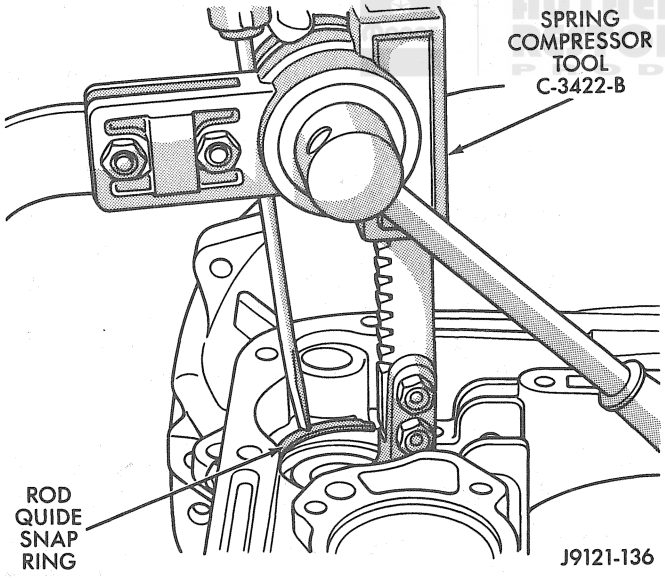


Fig. 88 Compressing Front Servo Rod Guide

TRANSMISSION ASSEMBLE

SERVO INSTALLATION

(1) Install rear servo piston, spring and spring retainer. Compress rear servo spring and retainer with Compressor Tool C-3422-B (Fig. 89) or a large C-clamp.

(2) Install front servo piston, spring and rod guide. Compress front servo rod guide with Valve Spring Compressor C-3422-B and install servo snap ring (Fig. 88).

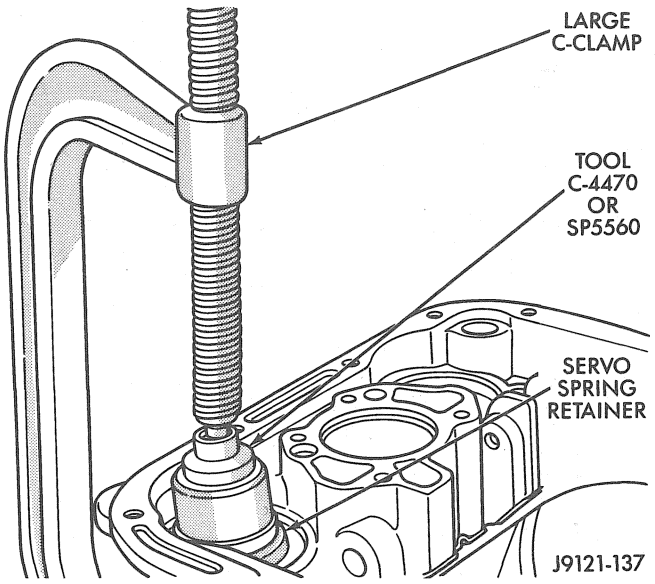


Fig. 89 Compressing Rear Servo Spring

OVERRUNNING CLUTCH INSTALLATION

(1) Examine bolt holes in overrunning clutch cam. Note that one hole is **not threaded** (Fig. 90). This hole must align with blank area in clutch cam bolt circle (Fig. 91).

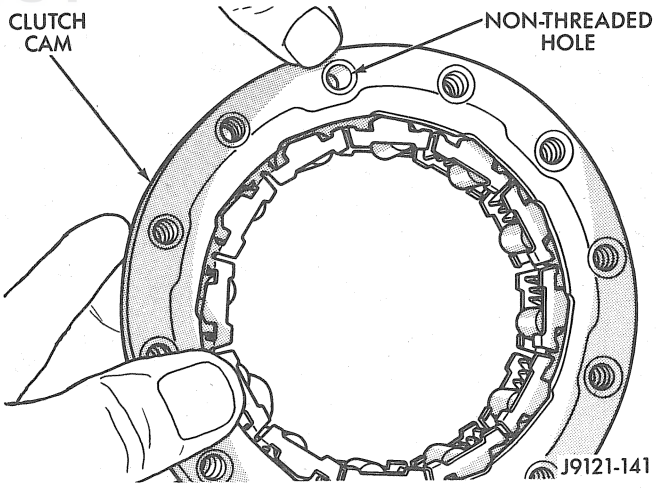


Fig. 90 Location Of Non-Threaded Hole In Clutch Cam

(2) Mark location of non threaded hole in clutch cam and blank area of case with paint stripe (Fig. 92).

(3) Align and install overrunning clutch cam in case (Fig. 92). **Be sure cam is correctly installed. Bolt holes in cam are slightly countersunk on one side. This side of cam faces rearward (toward rear support).**

(4) Partially install overrunning clutch in cam (Fig. 92).

(5) Verify that non threaded hole in clutch cam is properly aligned (Fig. 92). Check alignment by

DISASSEMBLY AND ASSEMBLY (Continued)

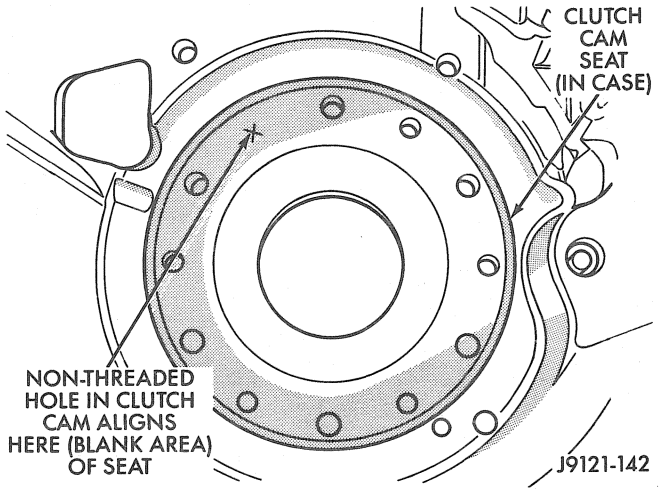


Fig. 91 Location Of Blank Area In Clutch Cam Seat Of Case

threading a clutch cam bolt into each hole. Adjust cam position if necessary before proceeding.

(6) Seat overrunning clutch in clutch cam after verifying correct cam alignment.

(7) Install overrunning clutch cam bolts. **Clutch cam bolts are shorter than rear support bolts.** Tighten cam bolts to 17 N·m (150 in. lbs. or 13 ft. lbs.) torque.

(8) Lubricate overrunning clutch rollers, springs and cam with ATF Plus transmission fluid.

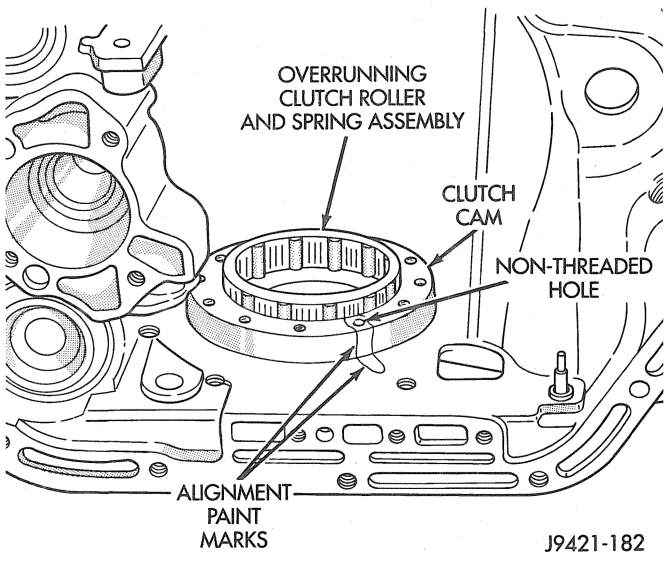


Fig. 92 Overrunning Clutch Cam Alignment

Rear Band, Low-Reverse Drum And Rear Support Installation

The 30RH transmission has a single wrap band and a pivot pin (Fig. 93). The band lever pivots against a lug on the band. The reaction pin functions as the stop, or locating mechanism for the band lower lug.

(1) Assemble band and link. Verify that notch in one side of link is toward band (Fig. 93).

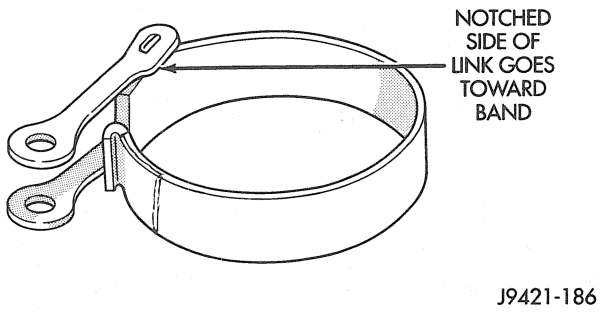


Fig. 93 Rear Band

(2) Position band and link in case (Fig. 94).

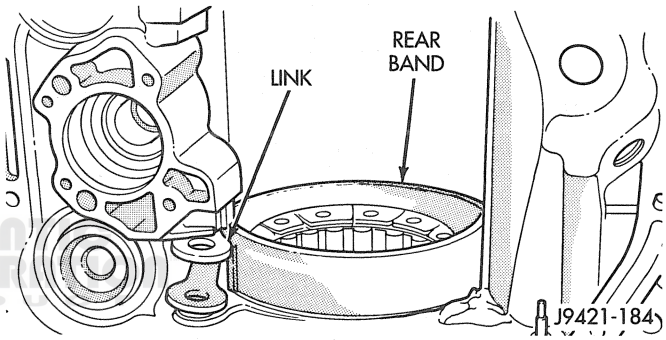


Fig. 94 Rear Band Positioned In Case

(3) Slide low-reverse drum through band (Fig. 95). Tilt drum slightly and start clutch race into overrunning clutch rollers.

(4) Rotate drum clockwise and push drum inward until race is seated in overrunning clutch.

(5) Install rear band lever and pivot pin. Verify lever pivot pin is fully seated in the case.

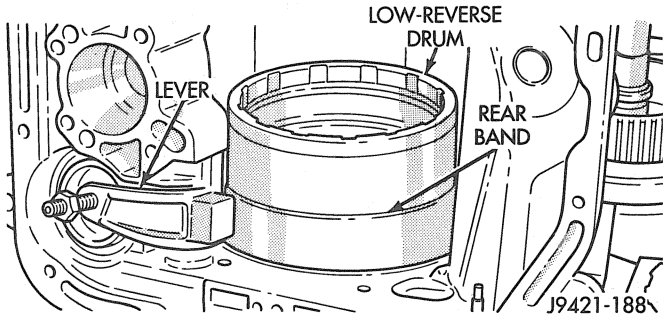


Fig. 95 Low-reverse Drum and Band Lever Installation

(6) Hold low-reverse drum in position and install rear support (Fig. 96).

(7) Align support with punch marks made during disassembly.

(8) Install and tighten rear support bolts to 17 N·m (150 in. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

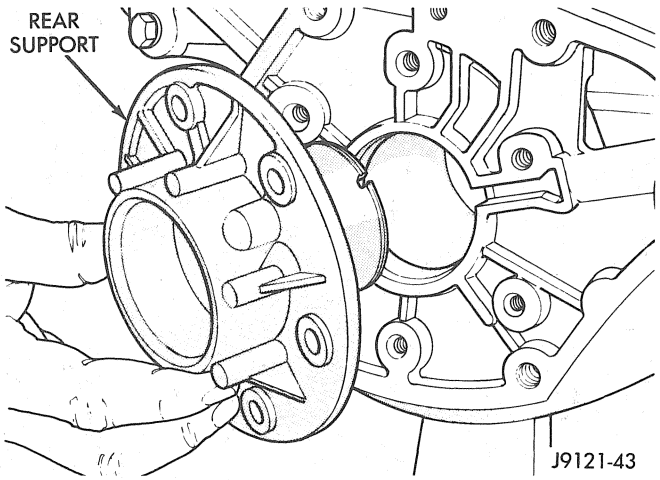


Fig. 96 Rear Support

(9) Install snap ring that retains low-reverse drum to hub of rear support (Fig. 97).

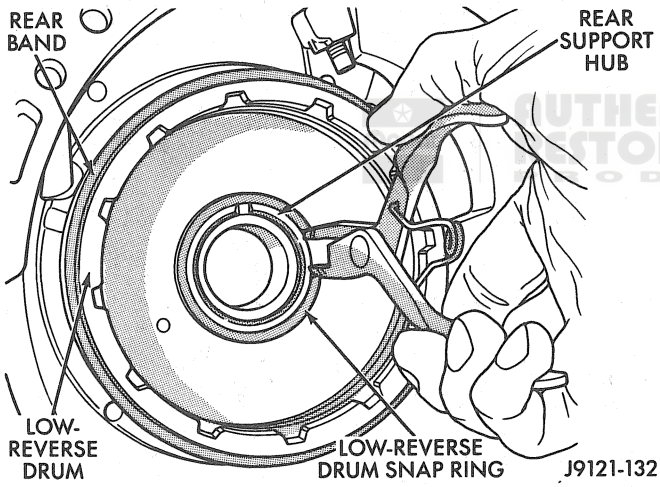


Fig. 97 Low-Reverse Drum Snap Ring

PLANETARY GEARTRAIN AND OUTPUT SHAFT INSTALLATION

(1) Lubricate output shaft, rear support bore and low-reverse drum hub with transmission fluid.

(2) Install assembled output shaft and planetary geartrain in case (Fig. 98).

(3) Align drive lugs on rear planetary gear with slots in low-reverse drum (Fig. 99). Then seat planetary assembly in drum.

GOVERNOR AND PARK GEAR INSTALLATION

(1) Lubricate governor components and park gear seal rings with Mopar ATF Plus.

(2) Install governor filter in park gear and install governor body on gear. Align governor body on gear using marks made at disassembly.

(3) Install new seal rings on hub of park gear if necessary. Be sure ring with hooked ends is properly connected.

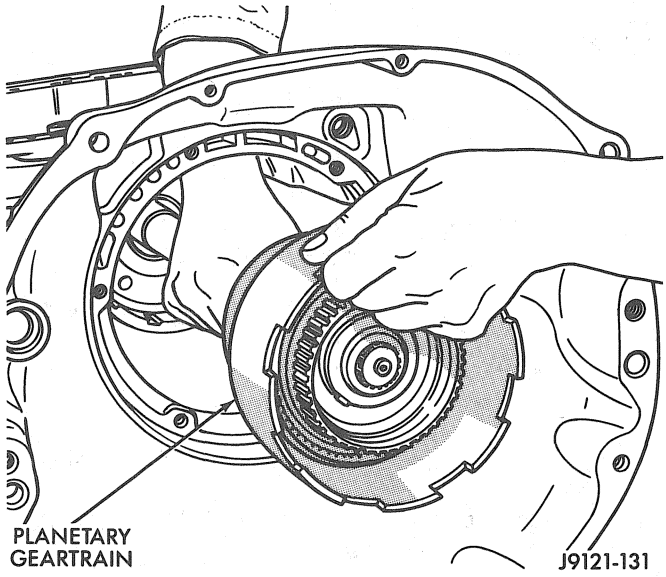


Fig. 98 Output Shaft And Planetary Geartrain

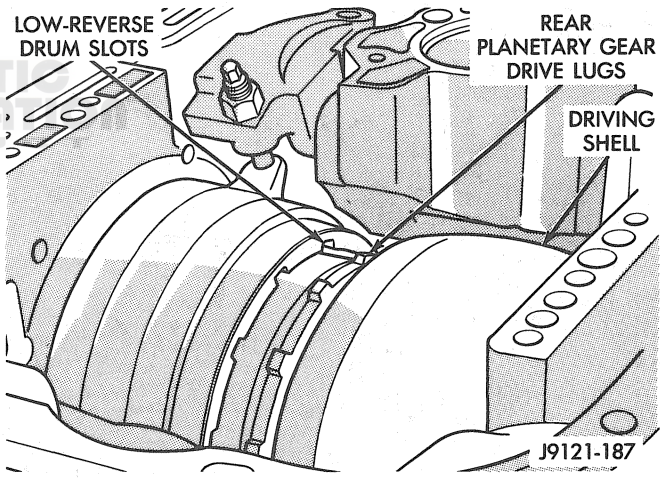


Fig. 99 Aligning/Seating Rear Planetary In Low-Reverse Drum

(4) Align and install governor/park gear assembly on output shaft as follows:

(a) **Note that output shaft in current transmission is spotfaced for governor valve end clearance (Fig. 100). Shaft must be indexed so that small end of governor valve will seat in this spotface. Install governor body and park as follows to ensure proper alignment and operation.**

(b) Rotate output shaft until spotface (at governor valve shaft hole) is facing upward (Fig. 100).

(c) Position valve bore in governor body over spotface on output shaft. Then align valve shaft holes in governor body and output shaft.

(d) Align splines in output shaft and park gear hub.

DISASSEMBLY AND ASSEMBLY (Continued)

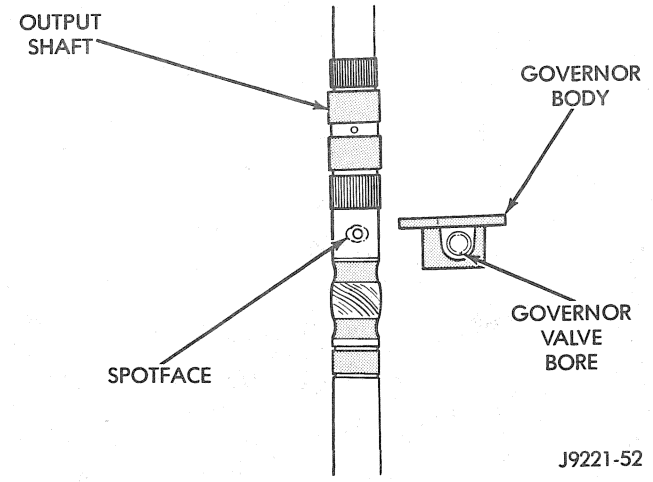


Fig. 100 Governor Valve And Output Shaft Spotface Alignment

(e) Carefully push assembly into place in rear support (Fig. 101).

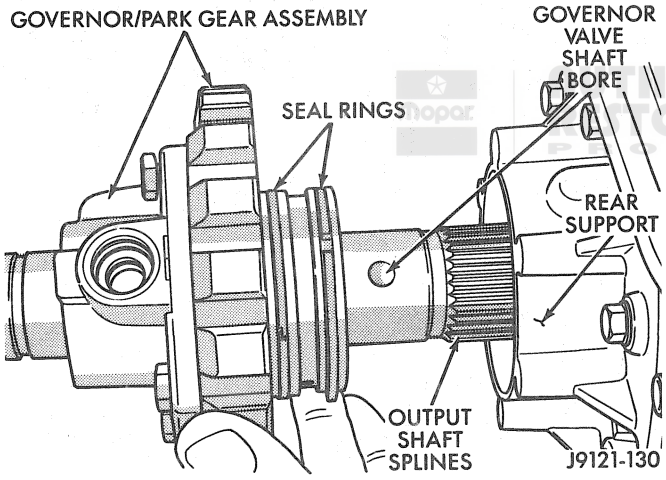


Fig. 101 Governor Body And Park Gear

(f) Verify that governor valve shaft holes in output shaft and governor body are still in alignment. Reposition governor body and park gear if alignment is not correct.

(g) Tighten bolts attaching governor body to park gear to 11 N·m (95 in. lbs.) torque.

(5) Install first E-clip on governor valve shaft. Then install governor valve and shaft in governor body (Fig. 102). **Be sure valve shaft moves freely in valve and in output shaft. If valve shaft binds, governor/park gear is misaligned.**

(6) Rotate output shaft until opposite end of governor valve shaft is facing upward. Then install remaining E-clip on governor valve shaft (Fig. 103). **Be very sure both E-clips are firmly seated on shaft.**

(7) Install governor body-park gear retaining snap rings and washer on output shaft as follows:

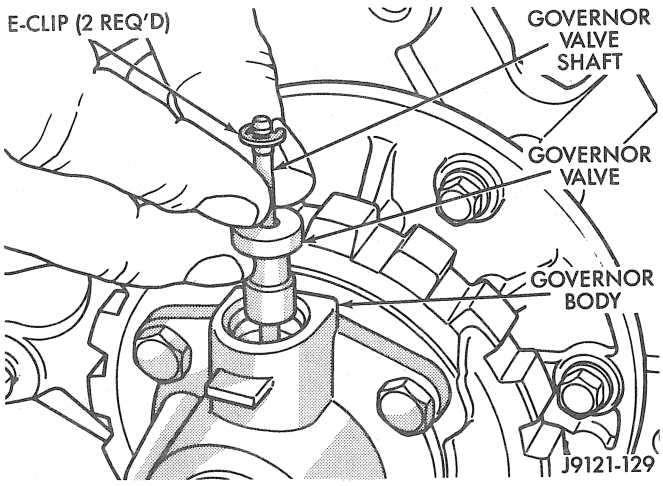


Fig. 102 Governor Valve And Shaft

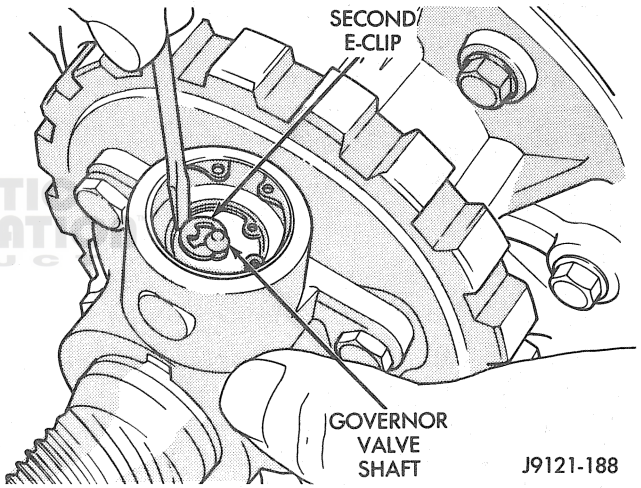


Fig. 103 Securing Governor Valve Shaft With New E-Clip

(a) On models with single snap ring, install snap ring. Be sure ring is seated in shaft.

(b) On models with thrust washer and two snap rings, install thin snap ring first. Then install thrust washer second, and thick snap ring last (Fig. 104).

(c) Verify correct position of snap rings. **Be sure flat side of each snap ring is toward governor body.**

(8) Tighten bolts that attach governor body to park gear to 11 N·m (95 in. lbs.).

FRONT/REAR CLUTCH INSTALLATION

(1) Install output shaft thrust plate on shaft hub (Fig. 105). Use petroleum jelly to hold thrust plate in place.

(2) Check input shaft seal rings (Fig. 106). Verify that diagonal-cut ends of Teflon™ seal ring are properly joined and ends of metal ring are correctly

DISASSEMBLY AND ASSEMBLY (Continued)

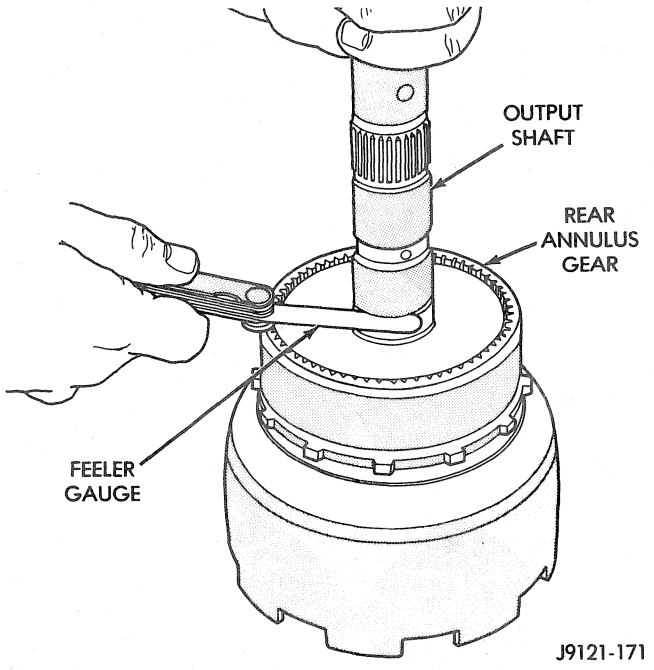


Fig. 104 Governor Body/Park Gear Retaining Snap Rings And Thrust Washer Position

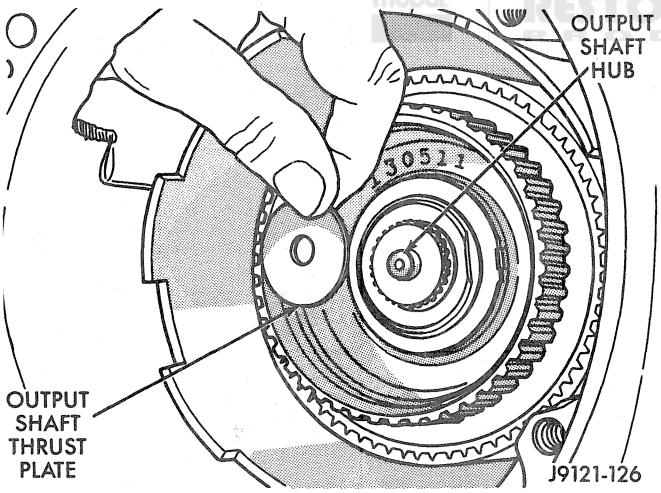


Fig. 105 Output Shaft Thrust Plate

hooked together. Also be sure rings are installed in sequence shown.

(3) Check rear clutch thrust washer. Use additional petroleum jelly to hold washer in place if necessary.

(4) Align clutch discs in front clutch and install front clutch on rear clutch (Fig. 107). Rotate front clutch retainer back and forth until completely seated on rear clutch.

(5) Coat output shaft thrust washer with petroleum jelly. Then install washer in rear clutch hub (Fig. 108). Use enough petroleum jelly to hold washer in place. **Be sure grooved side of washer faces rearward (toward output shaft) as shown. Also note that washer only fits one way in clutch hub.**

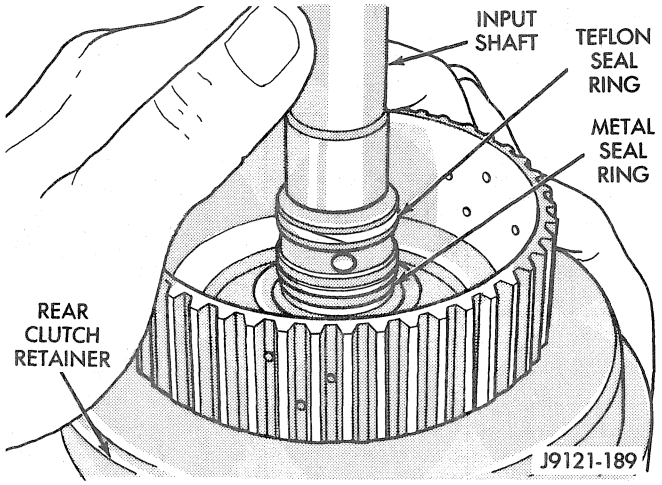


Fig. 106 Input Shaft Seal Ring Location

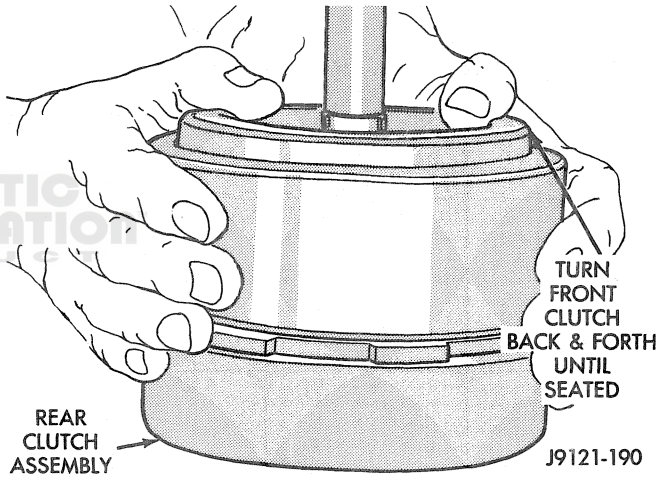


Fig. 107 Assembling Front And Rear Clutch Units

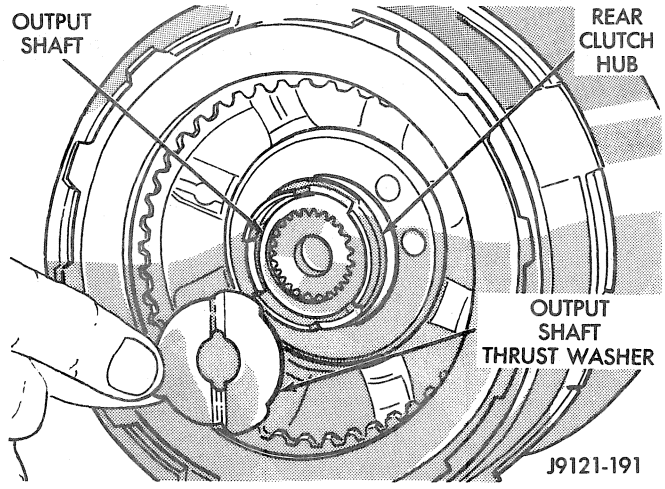


Fig. 108 Output Shaft Thrust Washer

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Align drive teeth on rear clutch discs with small screwdriver (Fig. 109). This will make installation on front planetary easier.

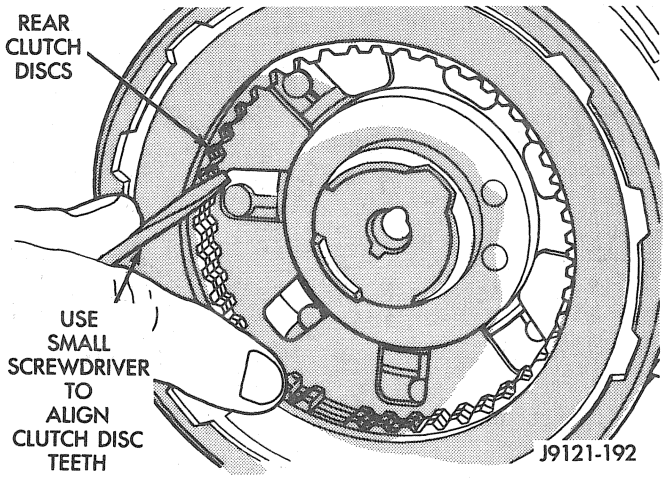


Fig. 109 Aligning Rear Clutch Disc Lugs

(7) Raise front end of transmission upward as far as possible and support case with wood blocks. Front/rear clutch and oil pump assemblies are easier to install if transmission is as close to upright position as possible.

(8) Install front and rear clutch units as assembly (Fig. 110). Align rear clutch with front annulus gear and install assembly in driving shell. **Be sure output shaft thrust washer and thrust plate are not displaced during installation.**

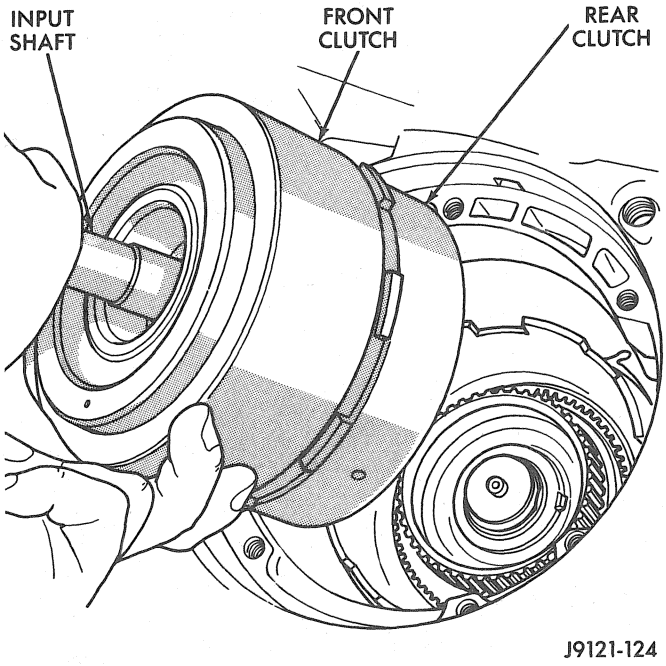


Fig. 110 Installing Front/Rear Clutch

(9) Carefully work assembled clutches back and forth to engage and seat rear clutch discs on front annulus gear. Verify that front clutch drive lugs are fully engaged in slots of driving shell after installation.

FRONT BAND AND OIL PUMP INSTALLATION

(1) Slide front band over front clutch retainer (Fig. 111).

(2) Insert front band reaction pin part way into case (Fig. 111).

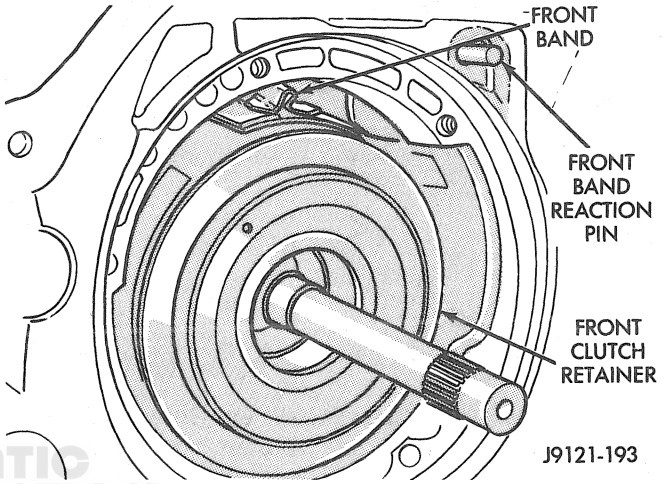


Fig. 111 Installing Front Band And Reaction Pin

(3) Install front band lever, strut, lever pin and adjusting screw (Fig. 112).

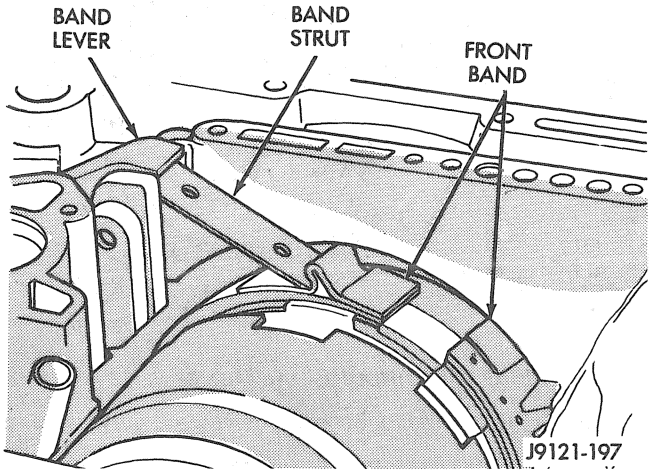


Fig. 112 Front Band Linkage Installation

(4) Tighten front band adjusting screw until band just grips clutch retainer. Verify that front/rear clutches are still seated before continuing.

(5) Coat band lever pin access plug with sealer and install plug in converter housing (Fig. 113).

(6) Verify that reaction shaft support hub seal rings are hooked together (Fig. 114).

(7) Coat front clutch thrust washer with petroleum jelly to hold it in place. Then install washer over reaction shaft hub and seat it on pump (Fig. 115).

DISASSEMBLY AND ASSEMBLY (Continued)

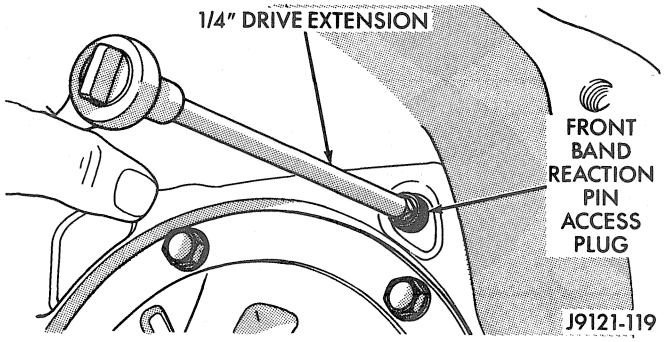


Fig. 113 Installing Front Band Pivot Pin Access Plug

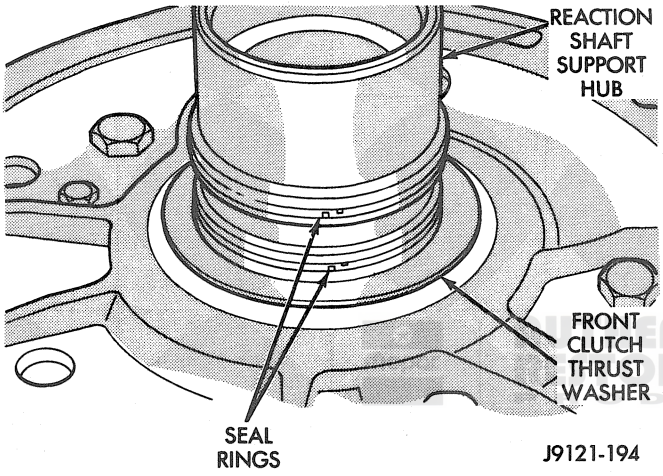


Fig. 114 Reaction Shaft Support Seal Rings

CAUTION: The thrust washer bore (I.D.), is chamfered on one side. Make sure the chamfered side is installed so it faces the pump.

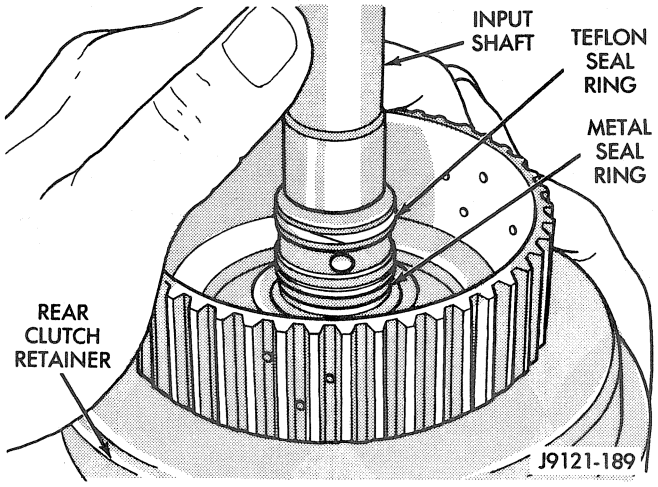


Fig. 115 Front Clutch Thrust Washer Installation

(8) Thread two Pilot Stud Tools C-3288-B into bolt holes in oil pump flange (Fig. 116).

(9) Align and install oil pump gasket (Fig. 116).

(10) Lubricate oil pump seals with Mopar Door-Ease, or Ru-Glyde, Door Eze, or ATF Plus.

(11) Install oil pump (Fig. 117). Align and position pump on pilot studs. Slide pump down studs and work it into front clutch hub and case by hand. Then install two or three pump bolts to hold pump in place.

(12) Remove pilot stud tools and install remaining oil pump bolts. Tighten bolts alternately in diagonal pattern to 20 N·m (15 ft. lbs.).

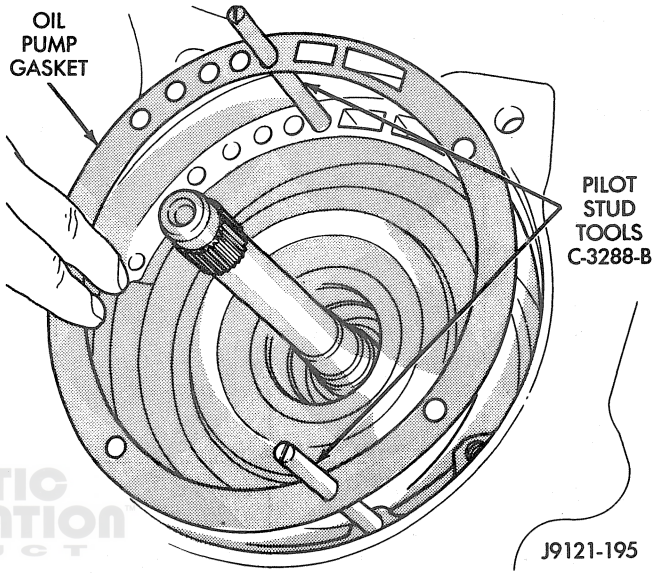


Fig. 116 Installing Pilot Studs And Oil Pump Gasket

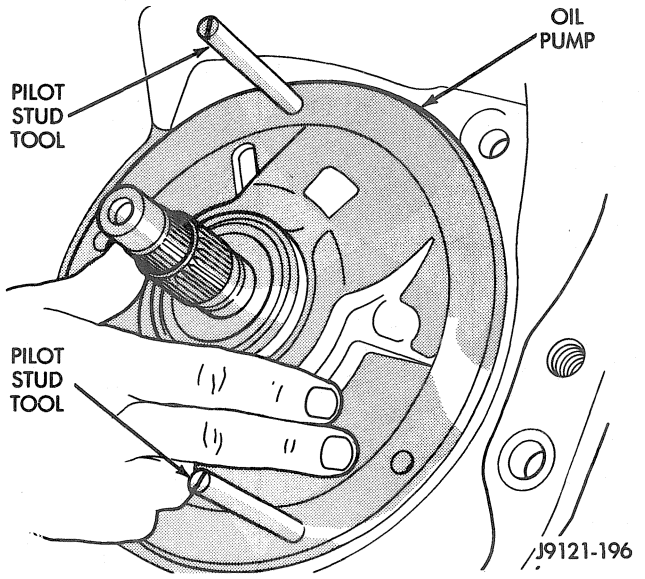


Fig. 117 Installing Oil Pump And Reaction Shaft Support

CHECKING INPUT SHAFT END PLAY

(1) Measure input shaft end play (Fig. 118).

(2) Attach dial indicator to converter housing. Position indicator plunger against input shaft and zero indicator.

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Move input shaft in and out and record reading. End play should be 0.56 - 2.31 mm (0.022 - 0.091 in.).

(4) If end play is incorrect, transmission is incorrectly assembled, or output shaft thrust washer and/or thrust plate are worn and need to be changed.

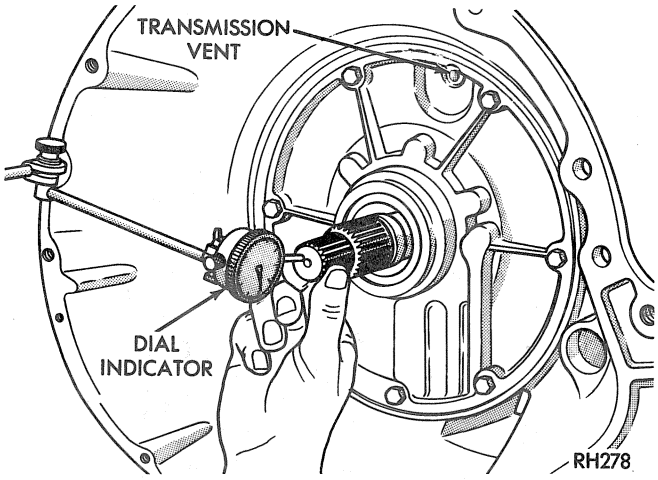


Fig. 118 Checking Input Shaft End Play

VALVE BODY INSTALLATION

(1) Install new manual lever shaft seal in case. Use 15/16 deep well socket to install seal.

(2) Make sure neutral switch has **not** been installed in case. Remove switch if necessary as it will interfere with valve body installation.

(3) Install new seal rings on accumulator piston (Fig. 119). Lubricate accumulator piston, seals and accumulator bore with transmission fluid.

(4) Install accumulator piston and spring (Fig. 119) in case.

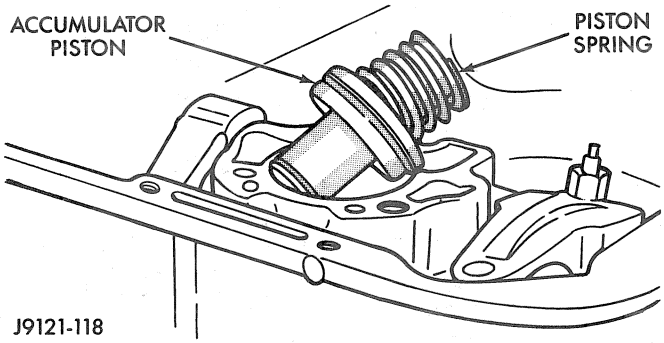


Fig. 119 Installing Accumulator Piston And Spring

(5) Place valve body manual lever in low to move park lock rod rearward.

(6) Position valve body on case. Work park rod past sprag and install valve body-to-case bolts finger tight.

(7) Install park/neutral position switch in case. Tighten switch to 34 N·m (25 ft. lbs.) torque.

(8) Align valve body on case (Fig. 120).

(9) Install and tighten valve body-to-case bolts alternately and evenly to 12 N·m (105 in. lbs.) torque. Start at center and work outward when tightening bolts. **Do not overtighten valve body bolts. This could result in distortion and cross leakage after installation.**.

(10) Connect converter clutch solenoid wire to case connector (Fig. 120).

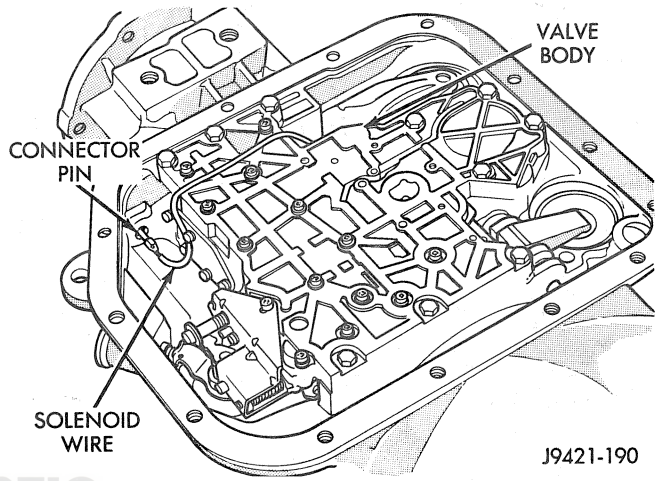


Fig. 120 Valve Body Installation

(11) Install new filter on valve body (Fig. 121). Tighten filter screws to 4 N·m (35 in. lbs.).

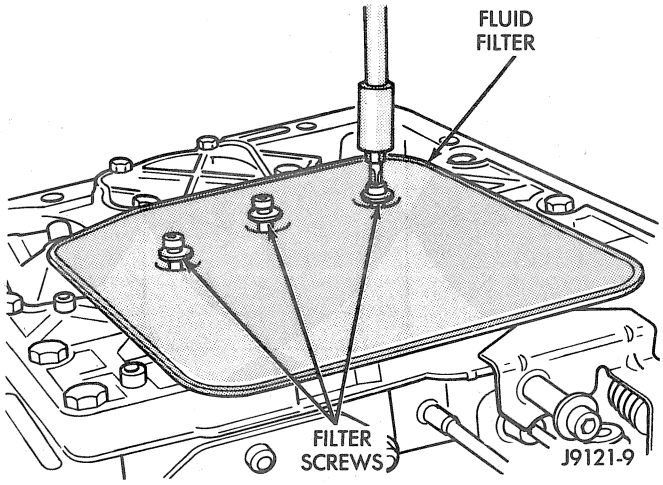


Fig. 121 Fluid Filter Installation

BAND ADJUSTMENT AND OIL PAN INSTALLATION

Refer to the Adjustment section of this group for proper band adjustment procedures.

Refer to the Service Procedures section of this group for proper fluid pan installation procedures.

EXTENSION HOUSING, CONTROL LEVER AND CONVERTER INSTALLATION

(1) Install throttle valve and transmission shift levers on manual valve shaft. Tighten lever clamp screws securely.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Position new extension housing gasket on transmission case. Use petroleum jelly to hold gasket in place.

(3) Install new rear seal in extension housing if required.

(4) Install extension housing on transmission case. Tighten housing fasteners to 33 N·m (24 ft. lbs.). Be sure park lock rod is properly engaged in sprag beforehand.

(5) Lubricate converter hub with transmission fluid and carefully install converter. Turn converter back and forth until seated.

(6) Secure converter in oil pump before mounting transmission on jack and before moving transmission back under vehicle. Use metal strapping, C-clamp, or locking pliers to hold converter in place. Attach holding tool to converter housing.

OVERRUNNING CLUTCH/LOW-REVERSE DRUM

DISASSEMBLE

If the clutch assembly came out with the low-reverse drum, thread two clutch cam bolts into the cam. Then lift the cam out of the drum with the bolts (Fig. 122). Rotate the cam back and forth to ease removal if necessary. Remove the clutch roller and spring assembly from the race afterward.

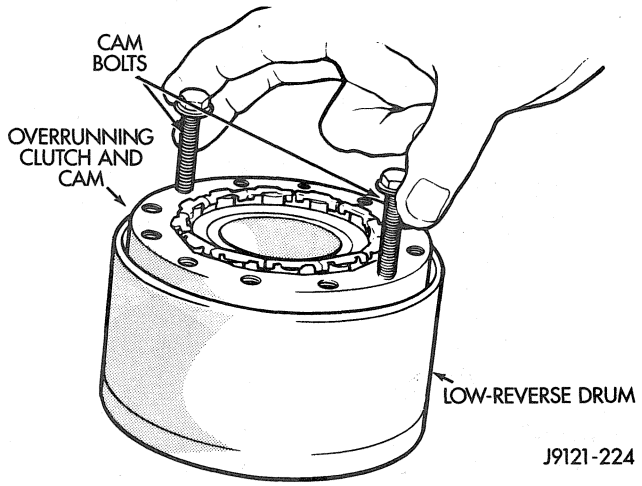


Fig. 122 Removing Overrunning Clutch From Low-Reverse Drum

OVERRUNNING CLUTCH/LOW-REVERSE DRUM, ASSEMBLE

(1) Assemble clutch rollers and springs in retainer if necessary (Fig. 123).

(2) Install overrunning clutch roller, spring and retainer assembly in clutch cam (Fig. 124).

(3) Temporarily assemble and check overrunning clutch operation as follows:

(a) Assemble cam and clutch.

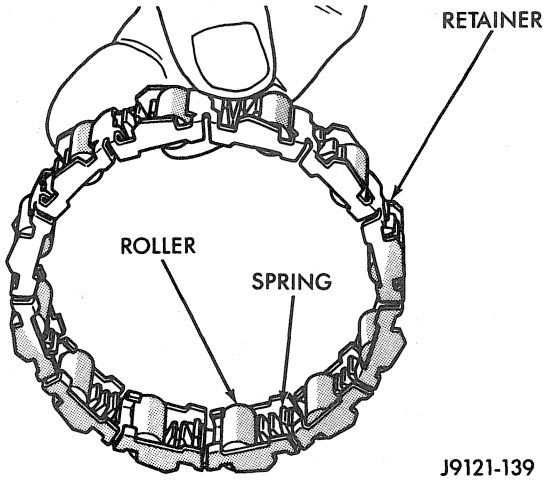


Fig. 123 Overrunning Clutch Rollers, Springs, Retainer

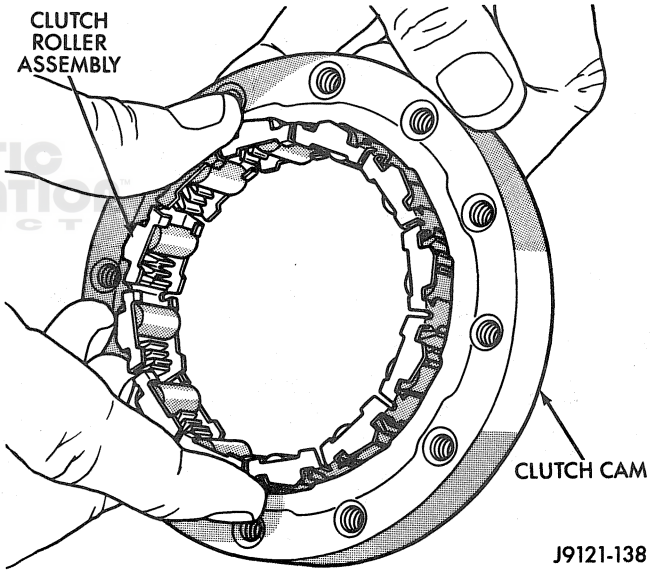


Fig. 124 Assembling Overrunning Clutch And Cam

(b) Install clutch assembly on low-reverse drum with twisting motion (Fig. 125).

(c) Install drum-clutch assembly in case and install clutch cam bolts.

(d) Install rear support and support attaching bolts.

(e) Check low-reverse drum rotation. **Drum should rotate freely in clockwise direction and lock when turned in counterclockwise direction (as viewed from front of case).**

(4) Note component position for assembly reference. Bolt holes in clutch cam are countersunk on one side, Be sure this side of cam will face rearward when installed (Fig. 126).

(5) Remove rear support, overrunning clutch and low-reverse drum. Set components aside for final assembly. **If overrunning clutch will be installed**

DISASSEMBLY AND ASSEMBLY (Continued)

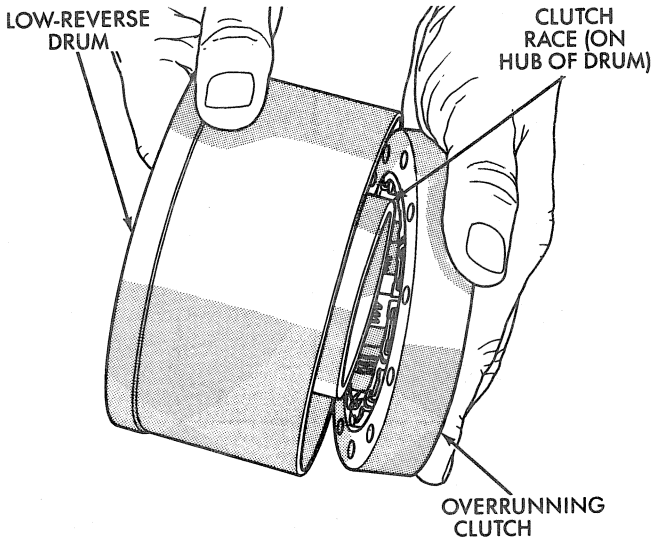


Fig. 125 Temporary Assembly Of Clutch And Drum To Check Operation

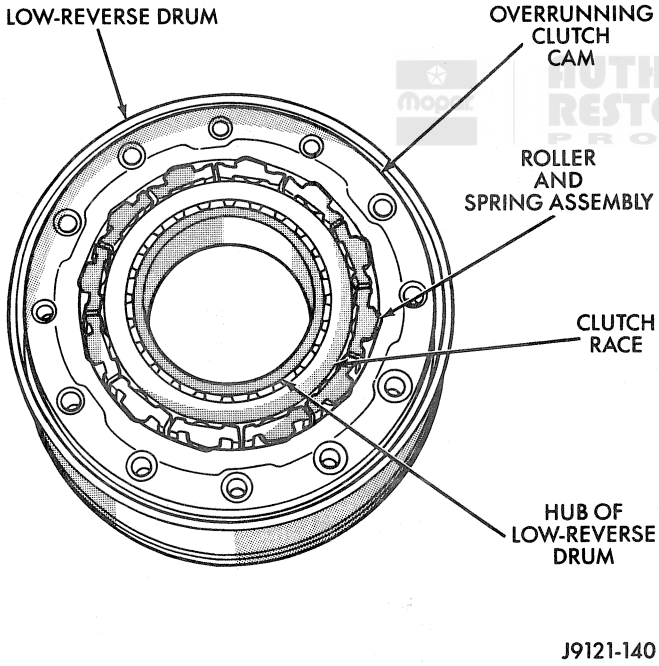


Fig. 126 Assembled Overrunning Clutch

before final assembly, install cam only as described in Transmission Assembly And Adjustment section. Clutch cam must be properly indexed in case to fit and operate properly.

FRONT SERVO PISTON

DISASSEMBLE

(1) Remove seal ring from rod guide (Fig. 127).

(2) Remove small snap ring from servo piston rod. Then remove piston rod, spring and washer from piston.

(3) Remove and discard servo component O-ring and seal rings.

ASSEMBLE

Clean and inspect front servo components.

(1) Lubricate new O-ring and seal rings with petroleum jelly and install them on piston, guide and rod.

(2) Install rod in piston. Install spring and washer on rod. Compress spring and install snap ring (Fig. 127).

(3) Set servo components aside for installation during transmission reassembly.

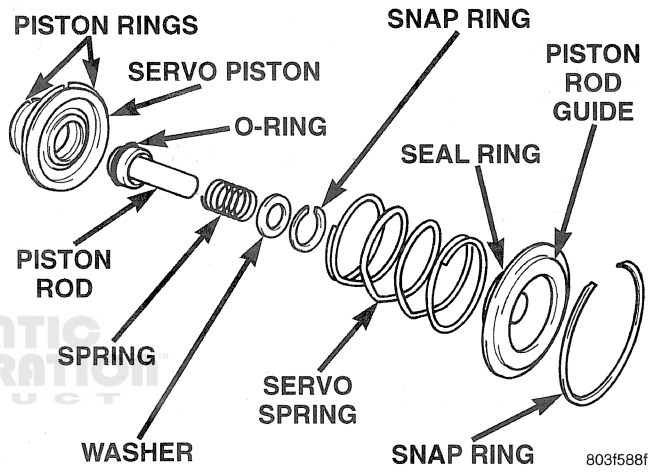


Fig. 127 Front Servo

REAR SERVO PISTON

DISASSEMBLE

(1) Remove small snap ring and remove plug and spring from servo piston (Fig. 128).

(2) Remove and discard servo piston seal ring.

(3) Lubricate piston and guide seals with petroleum jelly. Lubricate other servo parts with Mopar ATF Plus transmission fluid.

ASSEMBLE

(1) Install new seal ring on servo piston.

(2) Assemble piston, plug, spring and new snap ring.

(3) Lubricate piston seal lip with petroleum jelly.

(4) Set servo components aside for assembly installation.

OIL PUMP AND REACTION SHAFT SUPPORT

DISASSEMBLE

(1) Remove seal ring from housing and reaction shaft support (Fig. 129).

(2) Mark pump housing and support assembly for alignment reference.

DISASSEMBLY AND ASSEMBLY (Continued)

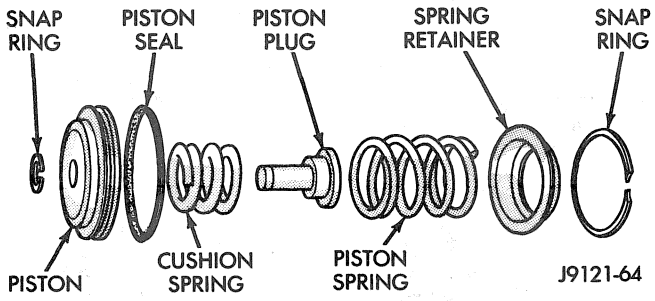


Fig. 128 Rear Servo Components

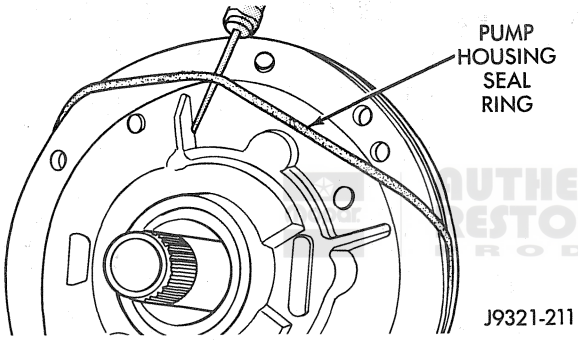


Fig. 129 Removing Pump Seal Ring

(3) Loosen bolts that attach pump body to support (Fig. 130).

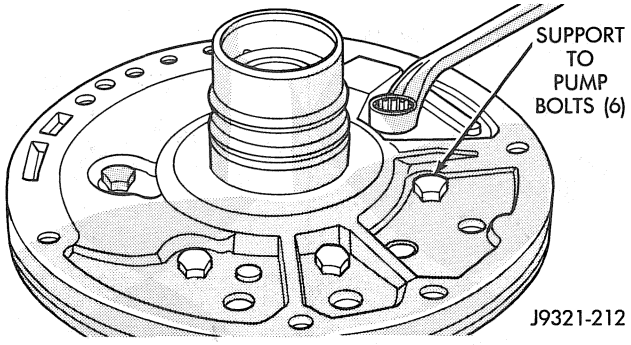


Fig. 130 Loosening Pump Support Bolts

(4) Remove pump-to-support bolts and separate support from pump housing (Fig. 131).

(5) Remove inner and outer gears from reaction shaft support (Fig. 132).

(6) If pump seal was not removed during transmission disassembly, remove seal with punch and hammer.

(7) Remove front clutch thrust washer from support hub (Fig. 133).

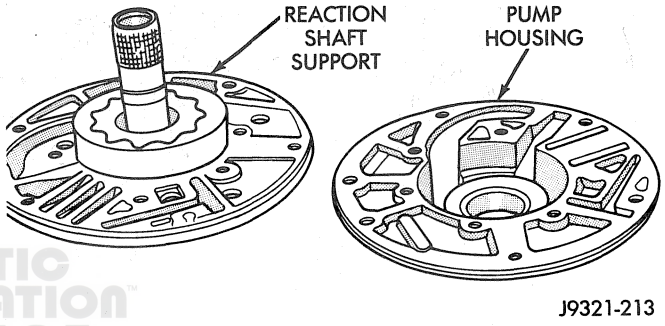


Fig. 131 Separating Pump Housing From Reaction Shaft Support

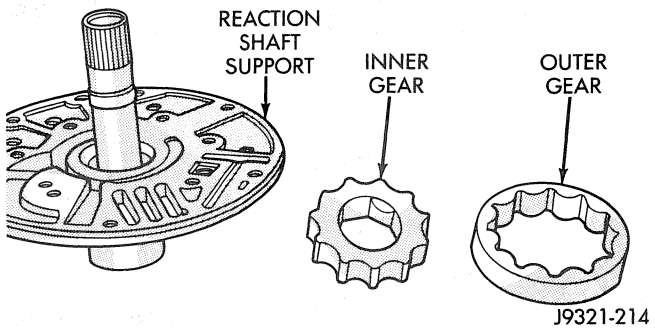


Fig. 132 Pump Gear Removal

OIL PUMP BUSHING REPLACEMENT

(1) Remove pump bushing with Tool Handle C-4171 and Bushing Remover SP-3551 (Fig. 134).

(2) Install new pump bushing with Tool Handle C-4171 and Bushing Installer SP-5117 (Fig. 134). Bushing should be flush with pump housing bore.

(3) Stake new pump bushing in two places with blunt punch (Fig. 135). Remove burrs from stake points with knife blade afterward.

DISASSEMBLY AND ASSEMBLY (Continued)

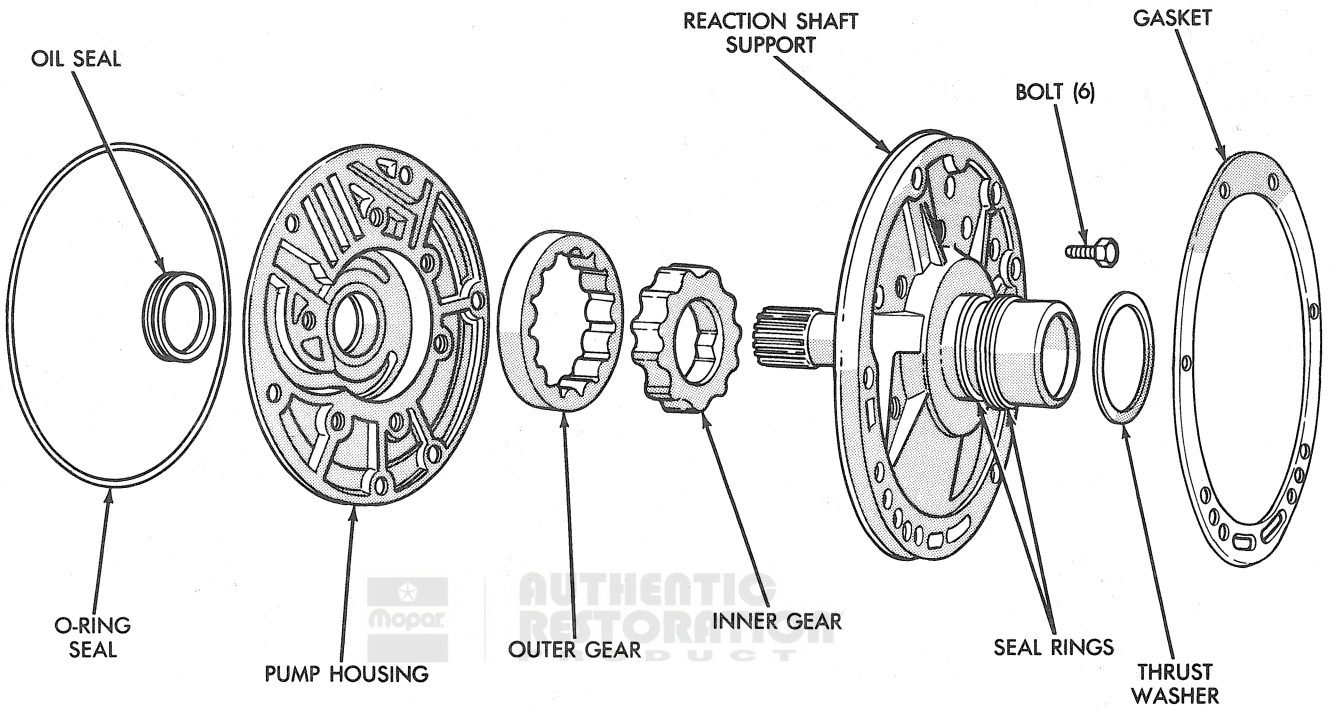


Fig. 133 Oil Pump And Reaction Shaft Support Components

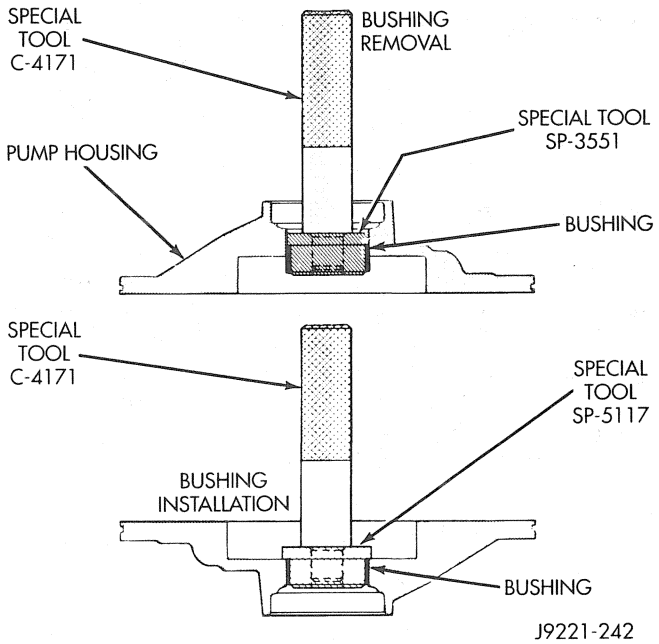


Fig. 134 Removing Oil Pump Bushing

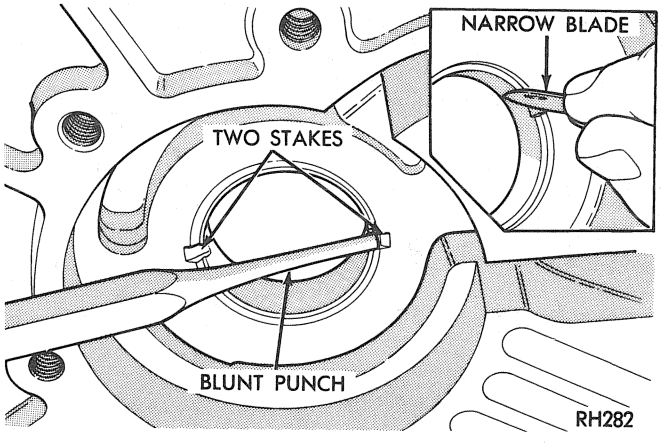


Fig. 135 Staking Oil Pump Bushing

DISASSEMBLY AND ASSEMBLY (Continued)

REACTION SHAFT SUPPORT BUSHING REMOVAL

(1) Assemble Bushing Remover Tools SP-1191, 3633 and 5324 (Fig. 136). **Do not clamp any part of reaction shaft or support in vise.**

(2) Hold Cup Tool SP-3633 firmly against reaction shaft and thread remover SP-5324 into bushing as far as possible by hand. Then thread remover tool 3-4 additional turns into bushing with a wrench.

(3) Turn remover tool hex nut down against remover cup to pull bushing from shaft. Clean all chips from shaft after bushing removal.

(4) Lightly grip old bushing in vise or with pliers and back remover tool out of bushing.

(5) Assemble Bushing Installer Tools C-4171 and SP-5325 (Fig. 136).

(6) Slide new bushing onto Installer Tool SP-5325.

(7) Position reaction shaft support upright on a clean smooth surface.

(8) Align bushing in bore. Then tap bushing into place until Bushing Installer SP-5325 bottoms.

(9) Clean reaction shaft support thoroughly after installing bushing.

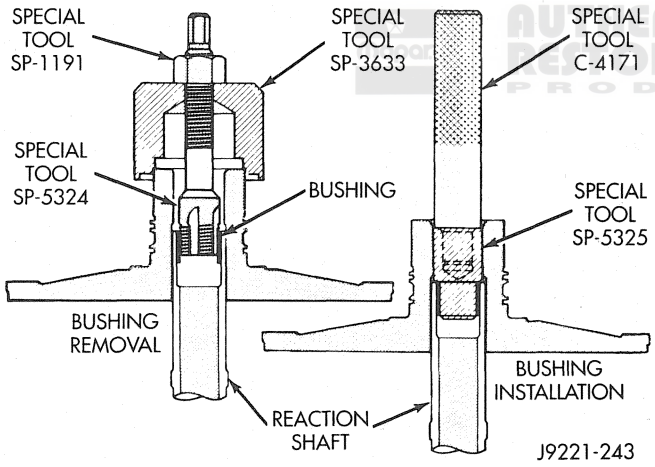


Fig. 136 Replacing Reaction Shaft Support Bushing

OIL PUMP AND REACTION SHAFT SUPPORT ASSEMBLE

(1) Lubricate gear bore in pump housing with transmission fluid.

(2) Lubricate pump gears with transmission fluid.

(3) Support pump housing on wood blocks (Fig. 137).

(4) Install outer gear in pump housing (Fig. 137). Gear can be installed either way (it is not a one-way fit).

(5) Install pump inner gear (Fig. 138).

CAUTION: The pump inner gear is a one way fit. The bore on one side of the gear inside diameter (I.D.) is chamfered. Be sure the chamfered side faces forward (to front of pump).

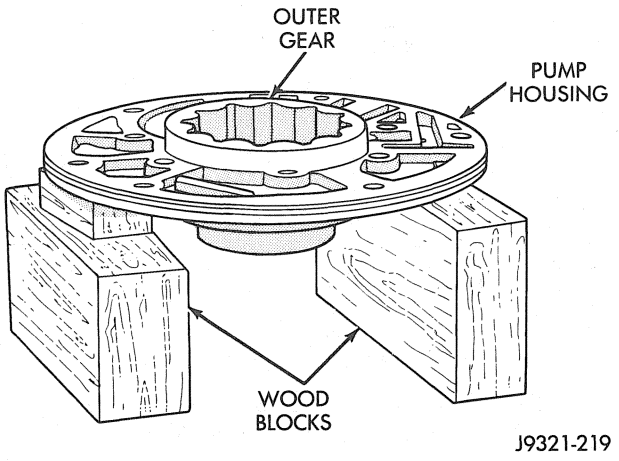


Fig. 137 Supporting Pump And Installing Outer Gear

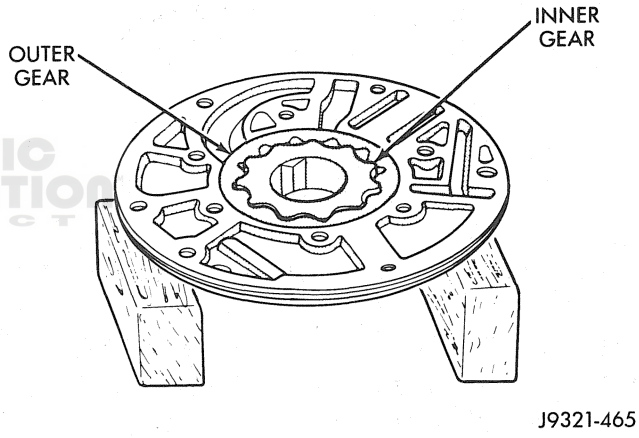


Fig. 138 Pump Inner Gear Installation

(6) Install new thrust washer on hub of reaction shaft support. Lubricate washer with transmission fluid or petroleum jelly.

(7) If reaction shaft seal rings are being replaced, install new seal rings on support hub (Fig. 139). Lubricate seal rings with transmission fluid or petroleum jelly after installation. Squeeze each ring until ring ends are securely hooked together.

CAUTION: The reaction shaft support seal rings will break if overspread, or twisted. If new rings are being installed, spread them only enough for installation. Also be very sure the ring ends are securely hooked together after installation. Otherwise, the rings will either prevent pump installation, or break during installation.

(8) Install reaction shaft support on pump housing (Fig. 140).

(9) Align reaction support on pump housing. Use alignment marks made at disassembly. Or, rotate

DISASSEMBLY AND ASSEMBLY (Continued)

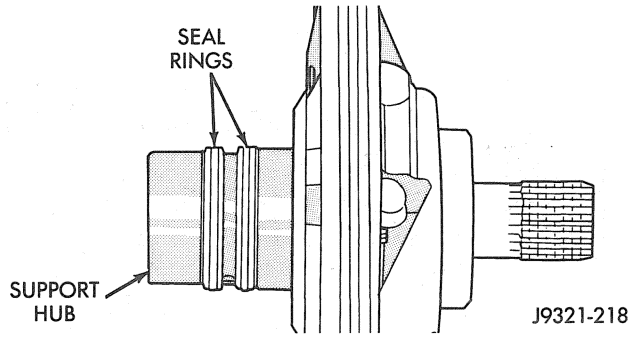


Fig. 139 Hub Seal Ring Position

support until bolt holes in support and pump housing are all aligned (holes are offset for one-way fit).

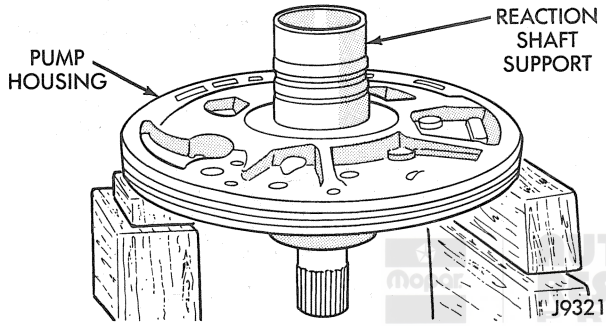


Fig. 140 Assembling Reaction Shaft Support And Pump Housing

(10) Install all bolts that attach support to pump housing. Then tighten bolts finger tight.

(11) Tighten support-to-pump bolts to required torque as follows:

(a) Reverse pump assembly and install it in transmission case. Position pump so bolts are facing out and are accessible.

(b) Secure pump assembly in case with 2 or 3 bolts, or with pilot studs.

(c) Tighten support-to-pump bolts to 20 N·m (15 ft. lbs.).

(d) Remove pump assembly from transmission case.

(12) Install new oil seal in pump with Special Tool C-4193 and Tool Handle C-4171 (Fig. 141). Be sure seal lip faces inward.

(13) Install new seal ring around pump housing. Be sure seal is properly seated in groove.

(14) Lubricate lip of pump oil seal and O-ring seal with transmission fluid.

FRONT CLUTCH

DISASSEMBLE

(1) Remove waved snap ring and remove pressure plate, clutch plates and clutch discs (Fig. 142).

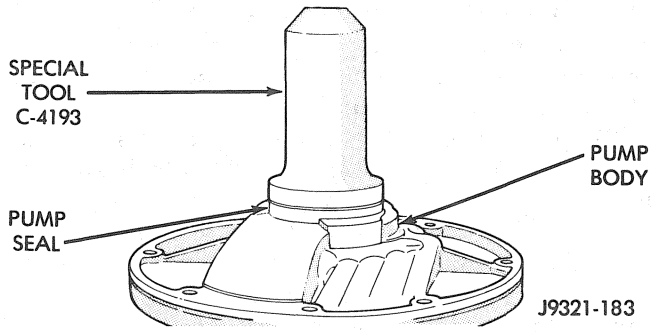


Fig. 141 Pump Oil Seal Installation

(2) Compress clutch piston spring with Compressor Tool C-3575-A (Fig. 143). Be sure legs of tool are seated squarely on spring retainer before compressing spring.

(3) Remove retainer snap ring and remove compressor tool.

(4) Remove spring retainer and clutch spring. Note position of retainer on spring for assembly reference.

(5) Remove clutch piston from clutch retainer. Remove piston by rotating it up and out of retainer.

(6) Remove seals from clutch piston and clutch retainer hub. Discard both seals as they are not reusable.

ASSEMBLE

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seals on piston and in hub of retainer. Be sure lip of each seal faces interior of clutch retainer.

(3) Lubricate lips of piston and retainer seals with liberal quantity of Mopar Door Ease, or Ru-Glyde. Then lubricate retainer hub, bore and piston with light coat of transmission fluid.

(4) Install clutch piston in retainer (Fig. 144). Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020″ thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

(5) Position spring in clutch piston (Fig. 145).

(6) Position spring retainer on top of piston spring (Fig. 146). **Make sure retainer is properly installed. Small raised tabs should be facing upward. Semicircular lugs on underside of retainer are for positioning retainer in spring.**

(7) Compress piston spring and retainer with Compressor Tool C-3575-A (Fig. 147). Then install new snap ring to secure spring retainer and spring.

DISASSEMBLY AND ASSEMBLY (Continued)

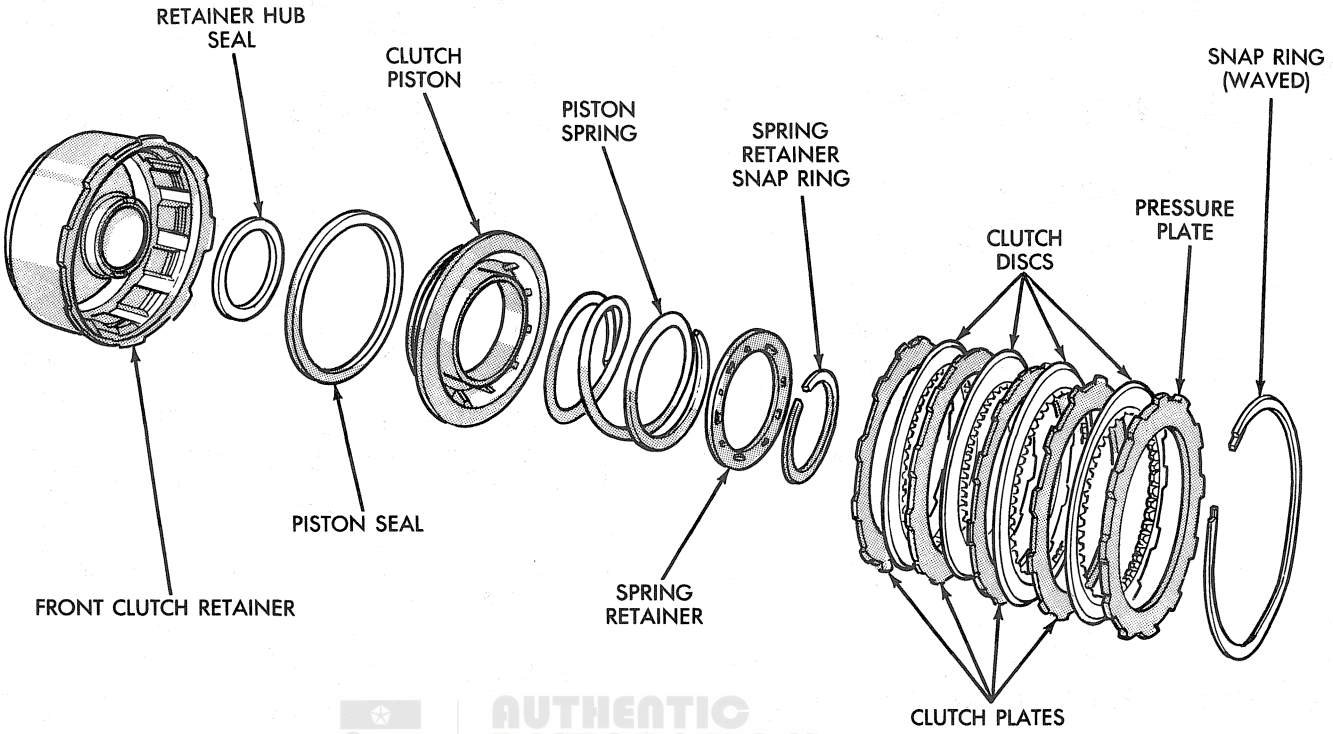


Fig. 142 Front Clutch Components

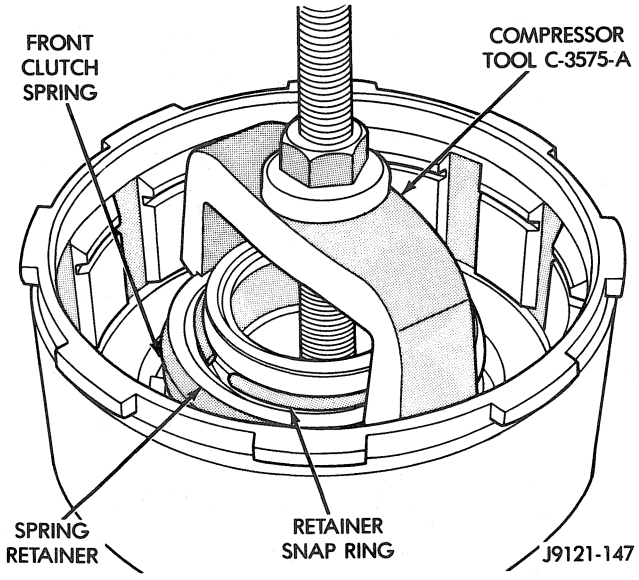


Fig. 143 Compressing Front Clutch Piston Spring

(8) Install clutch plates and discs (Fig. 142). Install steel plate then disc until all plates and discs are installed. The front clutch uses 4 clutch discs.

(9) Install pressure plate and waved snap ring (Fig. 142).

(10) Check clutch plate clearance (Fig. 147). Clearance should be 1.70 to 3.40 mm (0.067 to 0.134 in.).

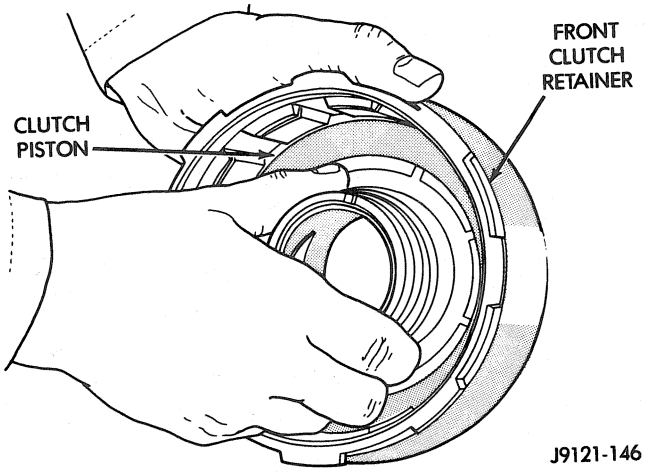


Fig. 144 Front Clutch Piston Installation

If clearance is incorrect, clutch discs, plates pressure plates and snap ring may have to be changed.

REAR CLUTCH

DISASSEMBLE

(1) Remove fiber thrust washer from forward side of clutch retainer.

(2) Remove selective clutch pack snap ring (Fig. 148).

DISASSEMBLY AND ASSEMBLY (Continued)

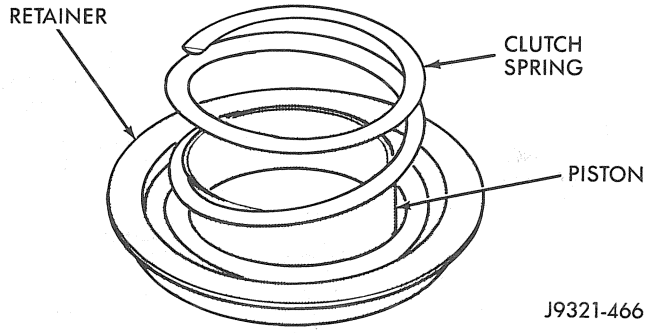


Fig. 145 Clutch Piston Spring Installation

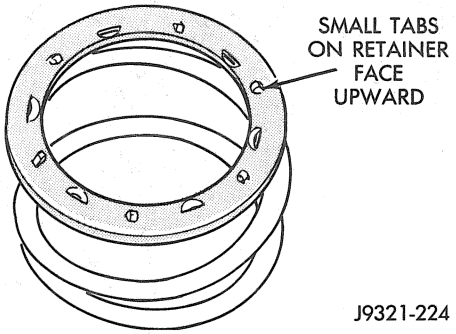


Fig. 146 Correct Spring Retainer Installed Position

(3) Remove top pressure plate, clutch discs, steel plates, bottom pressure plate and wave spring (Fig. 148).

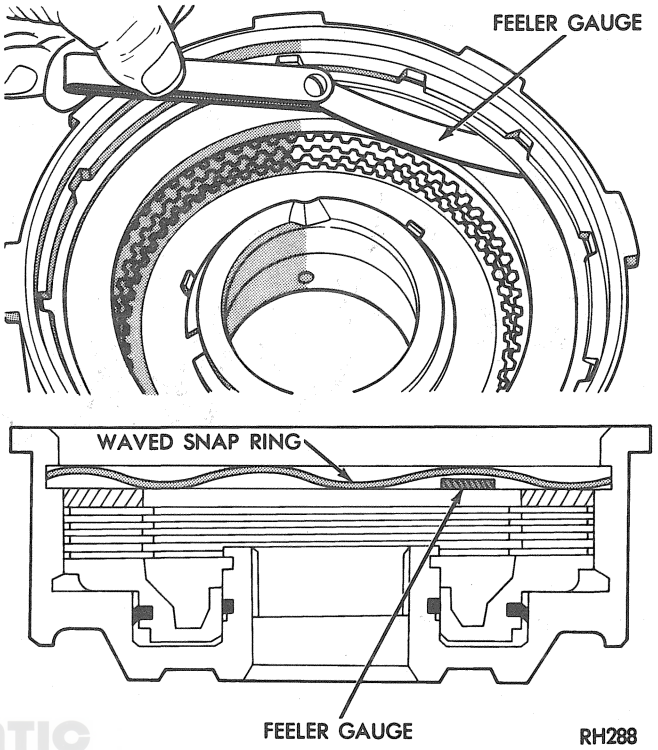


Fig. 147 Typical Method Of Measuring Front Clutch Pack Clearance

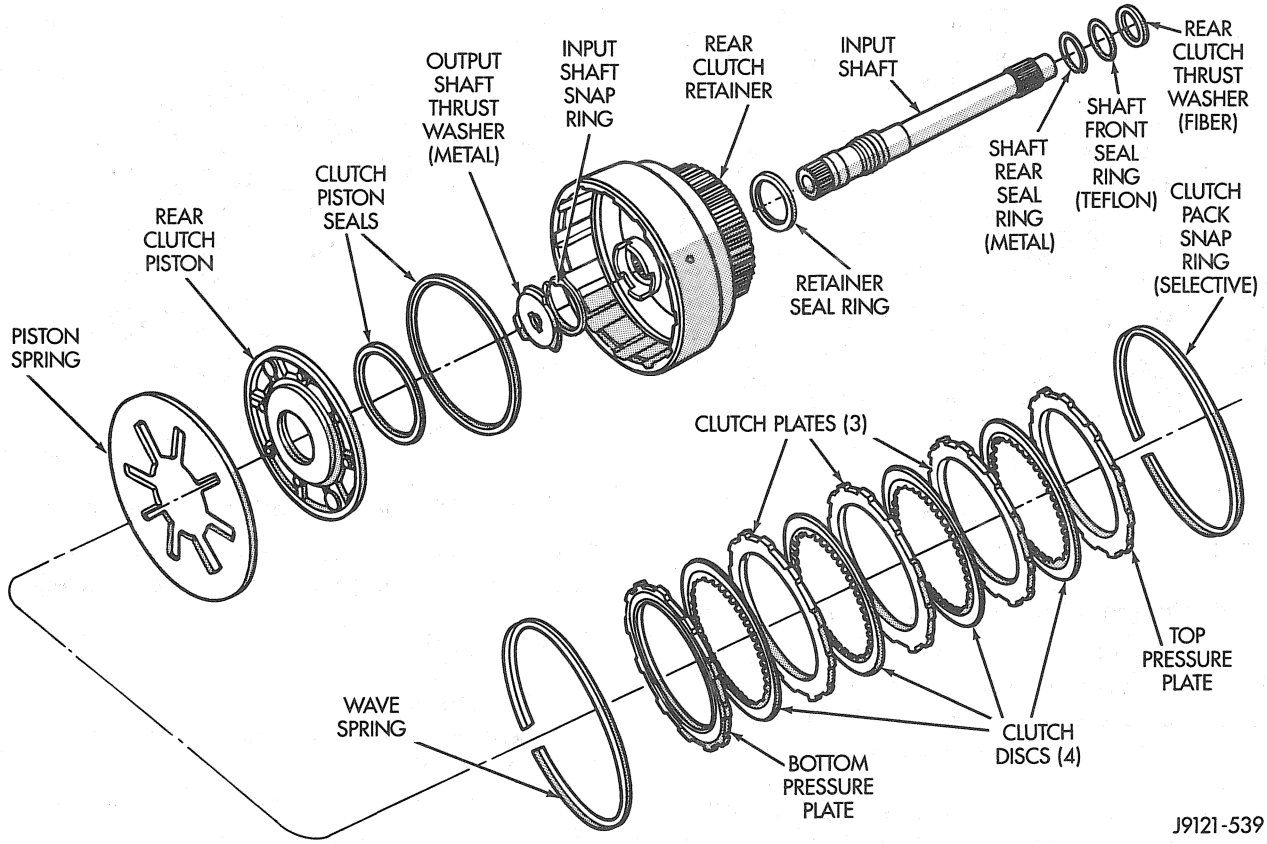


Fig. 148 Rear Clutch Components

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Remove clutch piston with rotating motion.
(5) Remove and discard piston seals.
(6) Remove input shaft snap ring (Fig. 149).

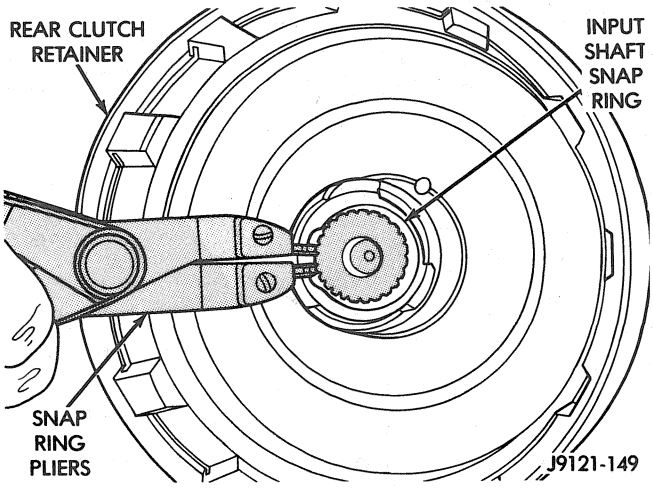


Fig. 149 Removing/Installing Input Shaft Snap Ring

(7) Press input shaft out of retainer with shop press and suitable size press tool (Fig. 150).
(8) Remove input shaft front/rear seal rings.

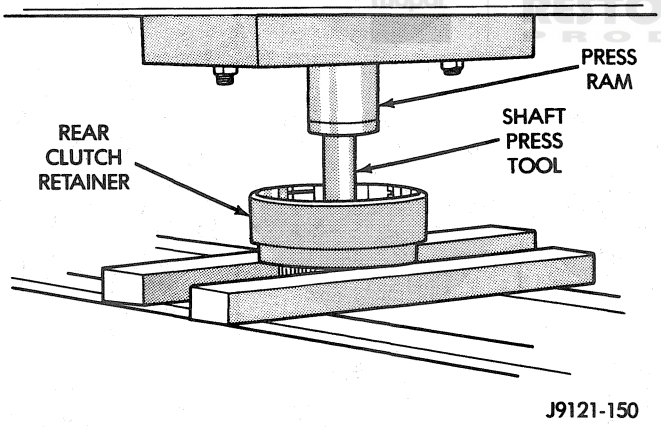


Fig. 150 Pressing Input Shaft Out Of Rear Clutch Retainer

ASSEMBLE

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.
(2) Install new seal rings on clutch retainer hub and input shaft if necessary (Fig. 151).
(a) Be sure clutch hub seal ring is fully seated in groove and is not twisted.
(b) Note that input shaft front seal ring is teflon and rear seal ring is metal (Fig. 152). Be sure chamfered ends of teflon ring are properly joined and that ends of rear ring are securely hooked together. Lubricate both rings with transmission fluid after installation.

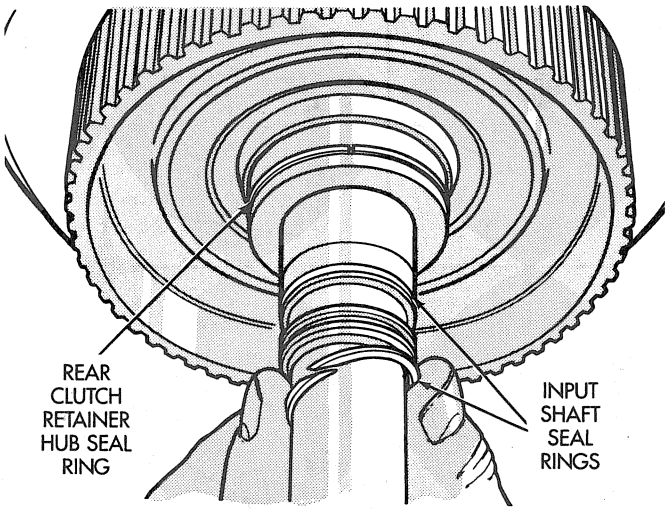


Fig. 151 Rear Clutch Retainer And Input Shaft Seal Ring Installation

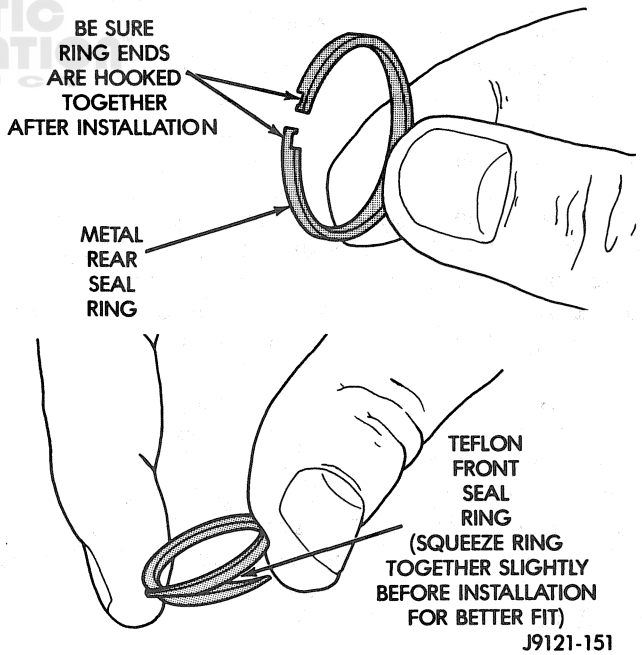


Fig. 152 Input Shaft Seal Ring Identification

(3) Lubricate splined end of input shaft and clutch retainer with transmission fluid. Then press input shaft into retainer (Fig. 153).
(4) Install input shaft snap ring (Fig. 149).
(5) Install new seals on clutch piston. Be sure lip of each seal faces interior of clutch retainer.
(6) Lubricate lip of piston seals with generous quantity of Mopar Door Ease, or Ru-Glyde. Then lubricate retainer hub and bore with light coat of transmission fluid.

DISASSEMBLY AND ASSEMBLY (Continued)

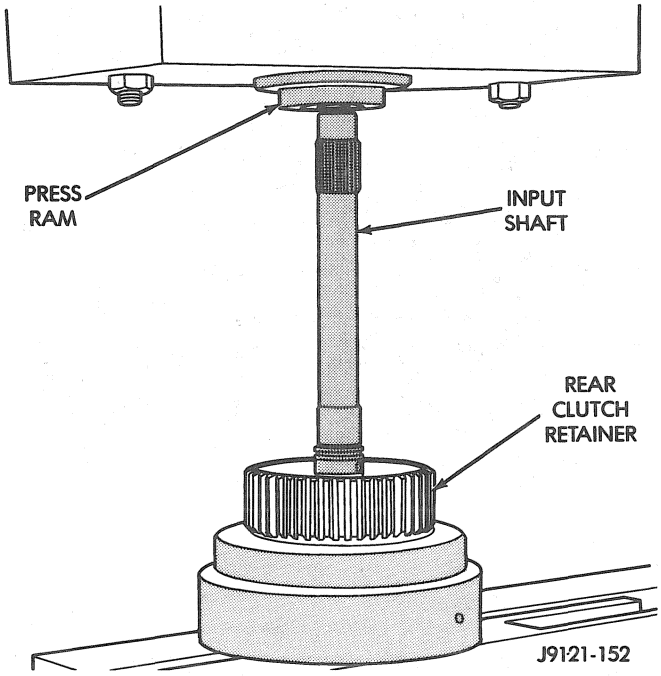


Fig. 153 Pressing Input Shaft Into Rear Clutch Retainer

(7) Install clutch piston in retainer. Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020″ thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

(8) Install piston spring in retainer and on top of piston (Fig. 154). Concave side of spring faces downward (toward piston).

(9) Install wave spring in retainer (Fig. 154). Be sure spring is completely seated in retainer groove.

(10) Install bottom pressure plate (Fig. 148). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

(11) Install first clutch disc in retainer on top of bottom pressure plate. Then install a clutch plate followed by a clutch disc until entire clutch pack is installed (4 discs and 3 plates are required) (Fig. 148).

(12) Install top pressure plate.

(13) Install selective snap ring. Be sure snap ring is fully seated in retainer groove.

(14) Measure clutch pack clearance (Fig. 155). Clearance should be 0.64 - 1.14 mm (0.025 - 0.045 in.). If clearance is incorrect, steel plates, discs, snap ring and pressure plates may have to be changed.

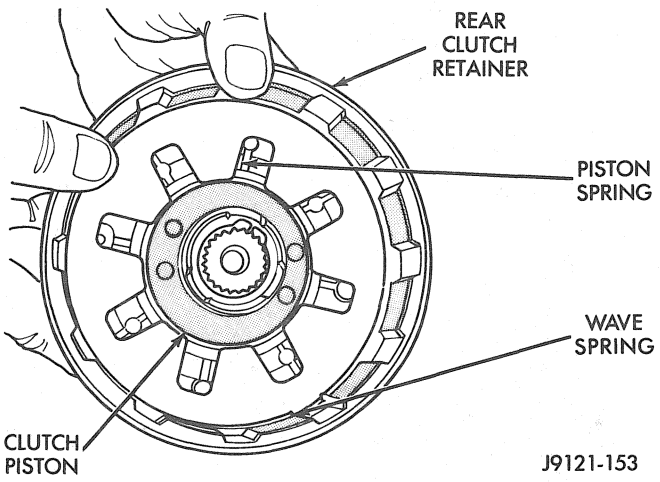


Fig. 154 Piston Spring/Wave Spring Position

(15) Coat rear clutch fiber thrust washer with petroleum jelly and install washer over input shaft and into clutch retainer (Fig. 156). Use enough petroleum jelly to hold washer in place.

(16) Set rear clutch aside for installation during final assembly.

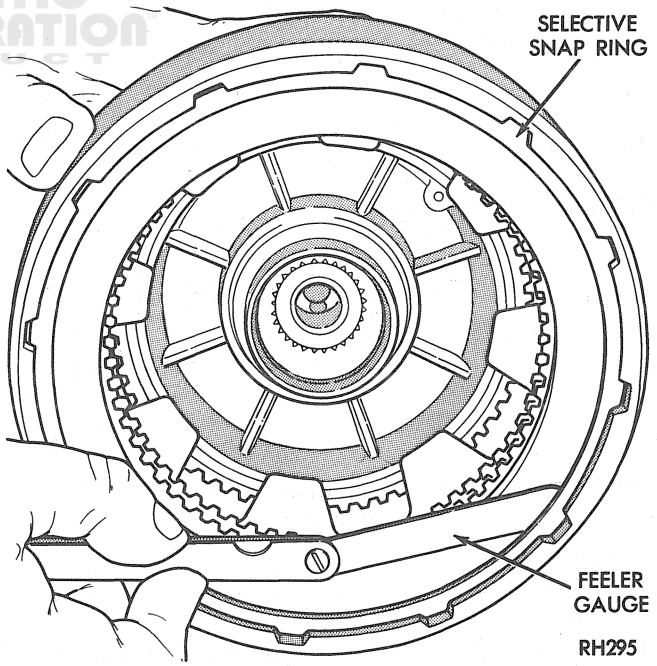


Fig. 155 Typical Method Of Checking Rear Clutch Pack Clearance

PLANETARY GEAR TRAIN/OUTPUT SHAFT

DISASSEMBLE

(1) Remove planetary snap ring (Fig. 157).

(2) Remove front annulus and planetary assembly from driving shell (Fig. 157).

(3) Remove snap ring that retains front planetary gear in annulus gear (Fig. 158).

DISASSEMBLY AND ASSEMBLY (Continued)

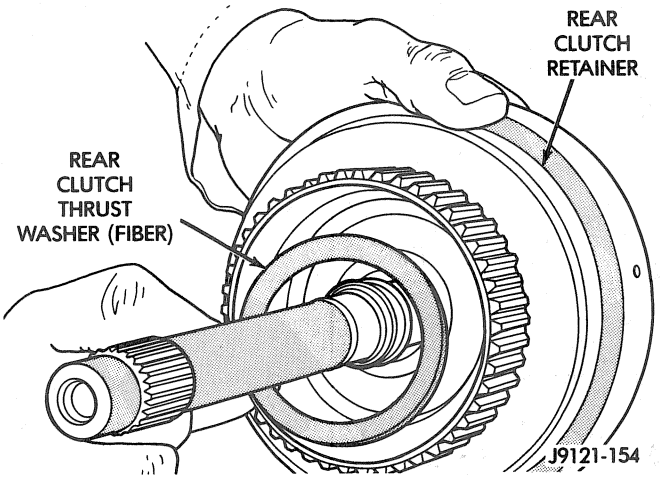


Fig. 156 Installing Rear Clutch Thrust Washer

(4) Remove tabbed thrust washer and tabbed thrust plate from hub of front annulus (Fig. 159).

(5) Separate front annulus and planetary gears (Fig. 159).

(6) Remove front planetary gear front thrust washer from annulus gear hub.

(7) Remove front planetary rear thrust washer from driving shell.

(8) Separate and remove driving shell, rear planetary and rear annulus from output shaft (Fig. 160).

(9) Remove tabbed thrust washers from rear planetary gear.

(10) Remove snap ring that retains sun gear in driving shell. Then remove sun gear, spacer and thrust plates.

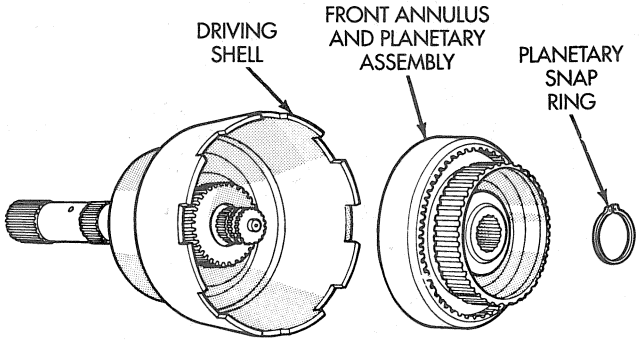


Fig. 157 Front Annulus And Planetary Assembly Removal

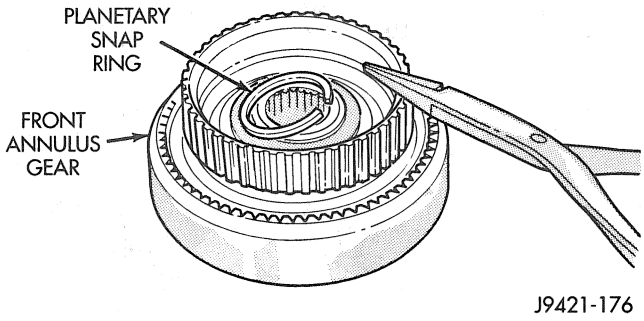


Fig. 158 Front Planetary Snap Ring Removal

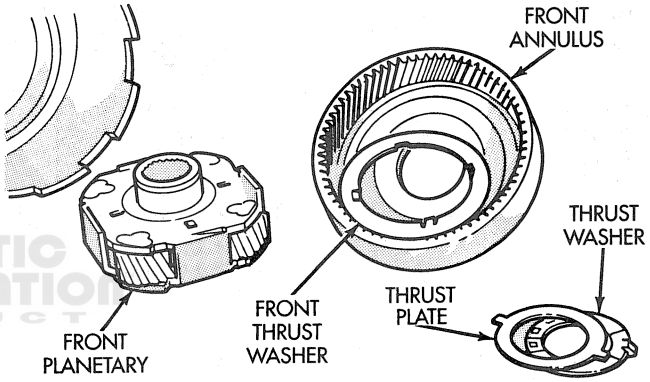


Fig. 159 Front Planetary And Annulus Gear Disassembly

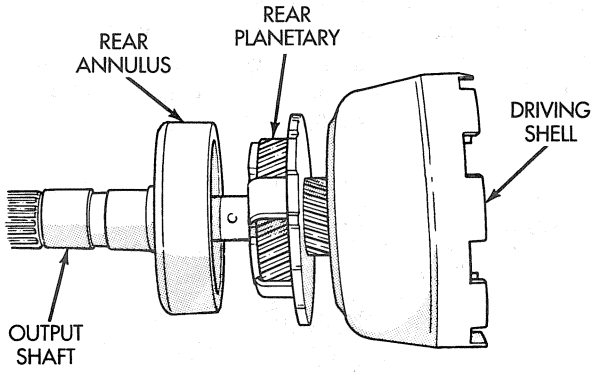


Fig. 160 Removing Driving Shell, Rear Planetary And Rear Annulus

DISASSEMBLY AND ASSEMBLY (Continued)

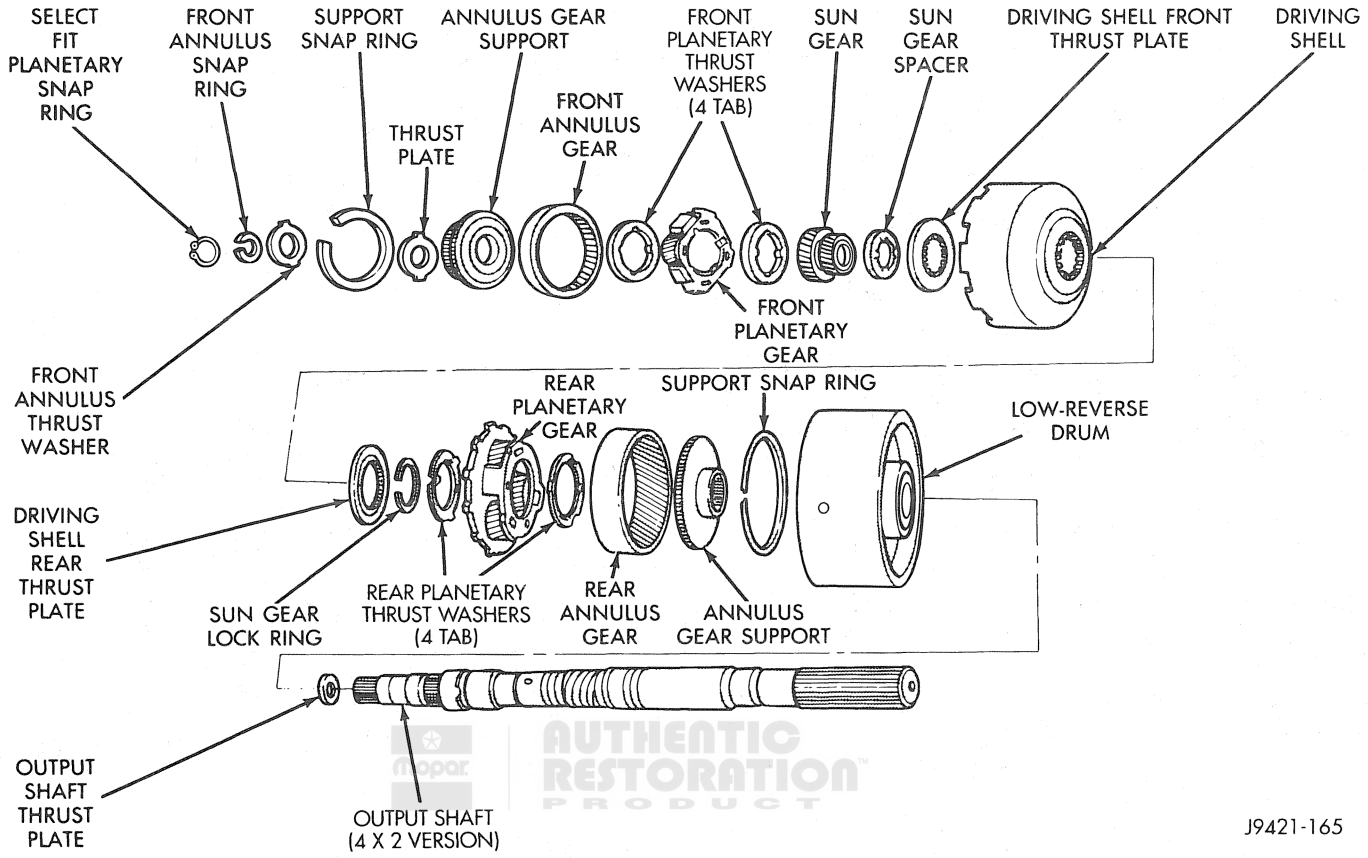


Fig. 161 Planetary Geartrain Components

ASSEMBLE

(1) Lubricate output shaft and planetary components with transmission fluid. Use petroleum jelly to lubricate and hold thrust washers and plates in position.

(2) Assemble rear annulus gear and support if disassembled. Be sure support snap ring is seated and that shoulder-side of support faces rearward (Fig. 162).

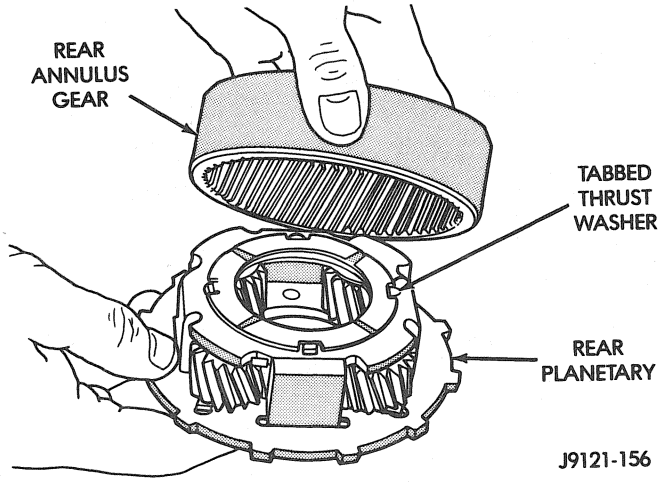


Fig. 162 Assembling Rear Annulus And Planetary Gear

(3) Install rear thrust washer on rear planetary gear (Fig. 161). Use enough petroleum jelly to hold washer in place. Also be sure all four washer tabs are properly engaged in gear slots.

(4) Install rear annulus over and onto rear planetary gear (Fig. 162).

(5) Install assembled rear planetary and annulus gear on output shaft (Fig. 163). Verify that assembly is fully seated on shaft.

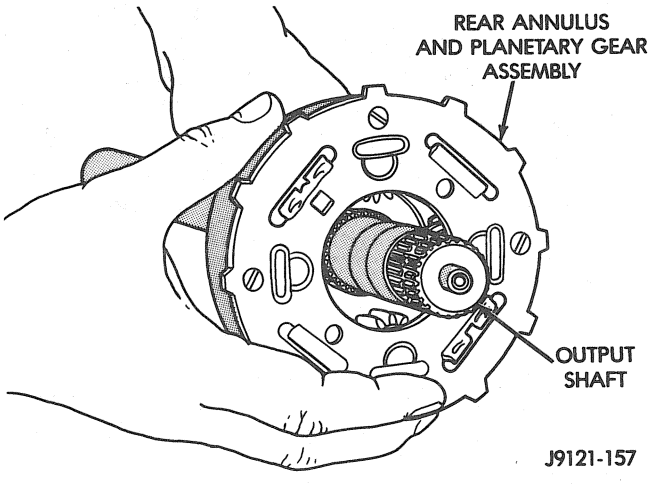


Fig. 163 Installing Rear Annulus And Planetary On Output Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install front thrust washer on rear planetary gear (Fig. 164). Use enough petroleum jelly to hold washer on gear. Be sure all four washer tabs are seated in slots.

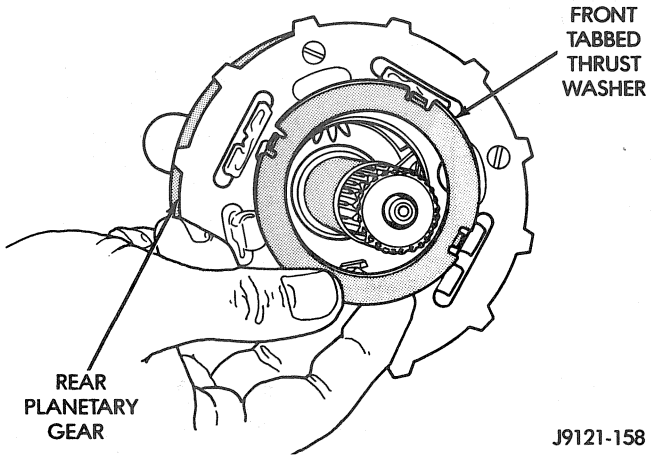


Fig. 164 Installing Rear Planetary Front Thrust Washer

(7) Install spacer on sun gear (Fig. 165).

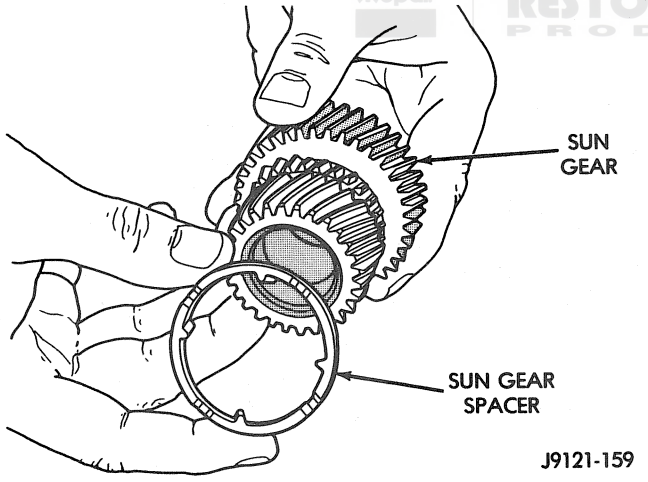


Fig. 165 Installing Spacer On Sun Gear

(8) Install thrust plate on sun gear (Fig. 166). Note that driving shell thrust plates are interchangeable. Use either plate on sun gear and at front/rear of shell.

(9) Hold sun gear in place and install thrust plate over sun gear at rear of driving shell (Fig. 167).

(10) Position wood block on bench and support sun gear on block (Fig. 168). This makes it easier to align and install sun gear lock ring. Keep wood block handy as it will also be used for geartrain end play check.

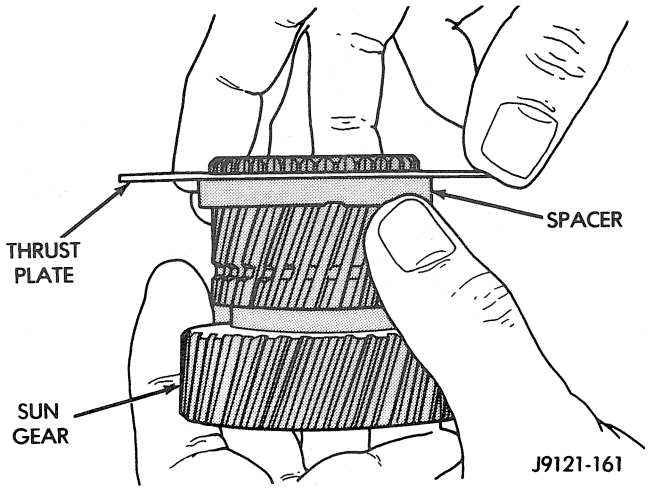


Fig. 166 Installing Driving Shell Front Thrust Plate On Sun Gear

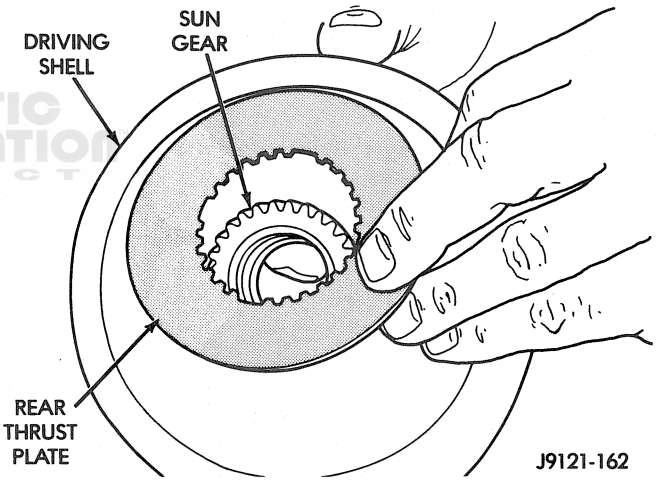


Fig. 167 Installing Driving Shell Rear Thrust Plate

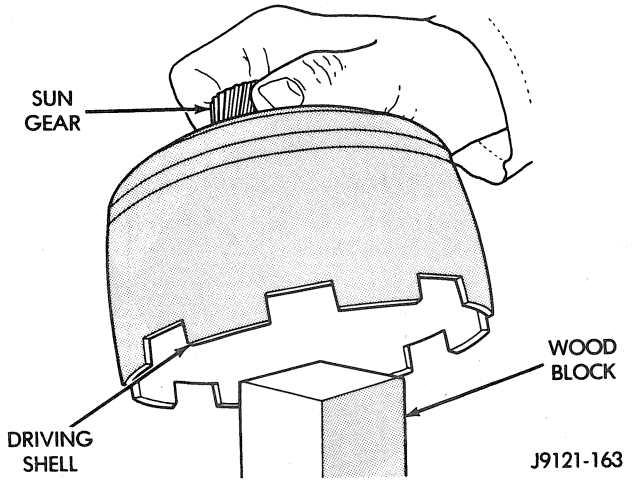


Fig. 168 Supporting Sun Gear On Wood Block

DISASSEMBLY AND ASSEMBLY (Continued)

(11) Align rear thrust plate on driving shell and install sun gear lock ring. Be sure ring is fully seated in sun gear ring groove (Fig. 169).

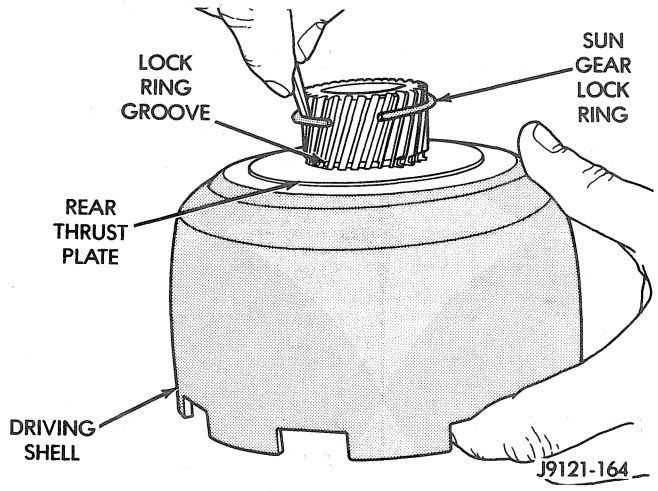


Fig. 169 Installing Sun Gear Lock Ring

(12) Install assembled driving shell and sun gear on output shaft (Fig. 170).

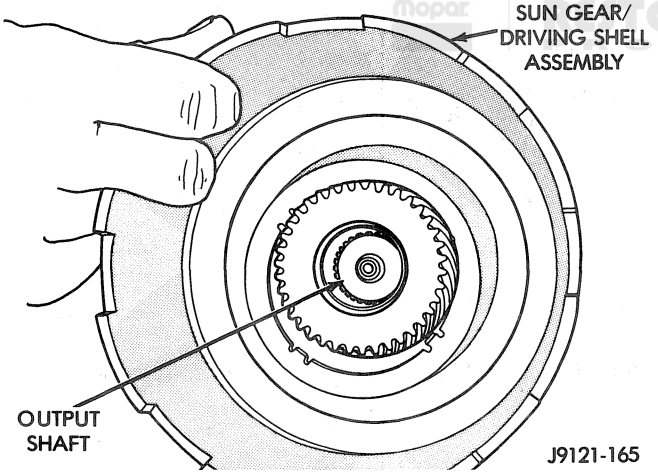


Fig. 170 Installing Assembled Sun Gear And Driving Shell On Output Shaft

(13) Install rear thrust washer on front planetary gear (Fig. 171). Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

(14) Install front planetary gear on output shaft and in driving shell (Fig. 172).

(15) Install front thrust washer on front planetary gear. Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

(16) Assemble front annulus gear and support, if necessary. Be sure support snap ring is seated.

(17) Install front annulus on front planetary (Fig. 172).

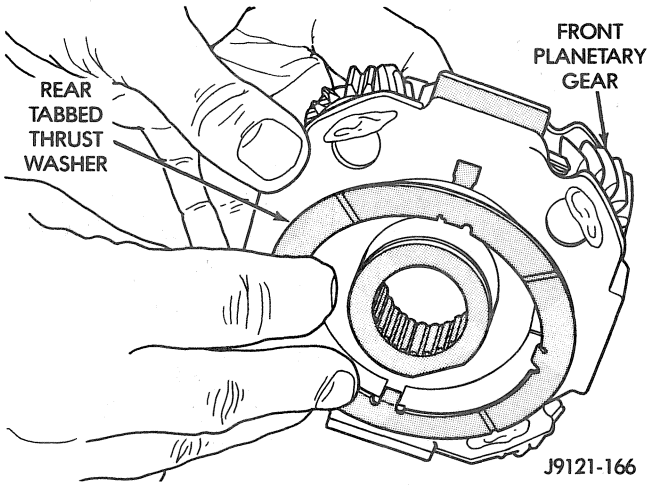


Fig. 171 Installing Rear Thrust Washer On Front Planetary Gear

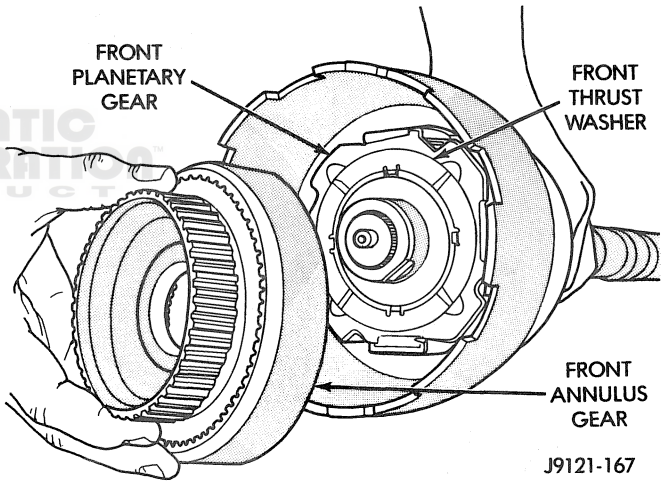


Fig. 172 Installing Front Planetary And Annulus Gears

(18) Position thrust plate on front annulus gear support (Fig. 173). **Note that plate has two tabs on it. These tabs fit in notches of annulus hub.**

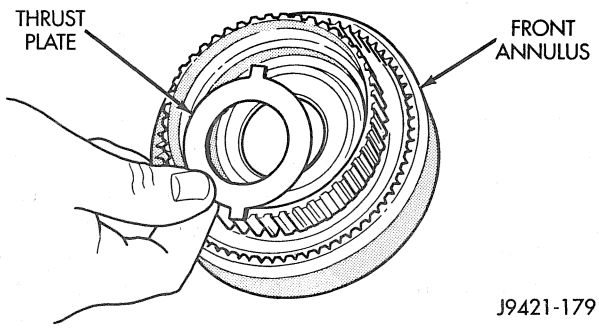


Fig. 173 Positioning Thrust Plate On Front Annulus Support

DISASSEMBLY AND ASSEMBLY (Continued)

(19) Install thrust washer in front annulus (Fig. 174). **Align flat on washer with flat on planetary hub. Also be sure washer tab is facing up.**

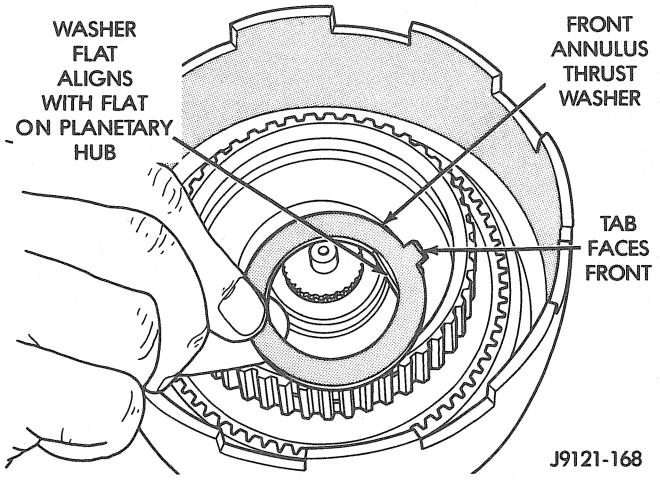


Fig. 174 Installing Front Annulus Thrust Washer

(20) Install front annulus snap ring (Fig. 175). Use snap ring pliers to avoid distorting ring during installation. Also be sure ring is fully seated.

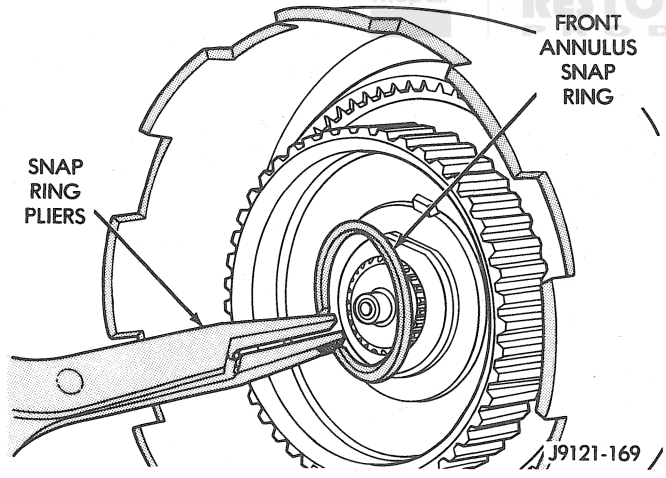


Fig. 175 Installing Front Annulus Snap Ring

(21) Install planetary selective snap ring with snap ring pliers (Fig. 176). Be sure ring is fully seated.

(22) Turn planetary geartrain assembly over so driving shell is facing workbench. Then support geartrain on wood block positioned under forward end of output shaft. This allow geartrain components to move forward for accurate end play check.

(23) Check planetary geartrain end play with feeler gauge (Fig. 177). Gauge goes between shoulder on output shaft and end of rear annulus support.

(24) Geartrain end play should be 0.12 to 1.22 mm (0.005 to 0.048 in.). If end play is incorrect, snap ring (or thrust washers) may have to be replaced. Snap

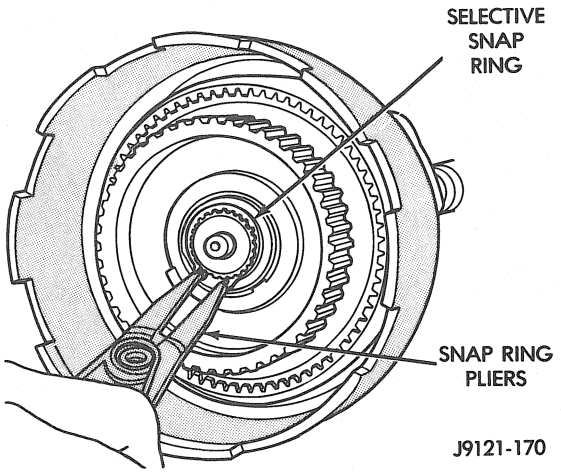


Fig. 176 Installing Planetary Selective Snap Ring

ring is available in three different thicknesses for adjustment purposes.

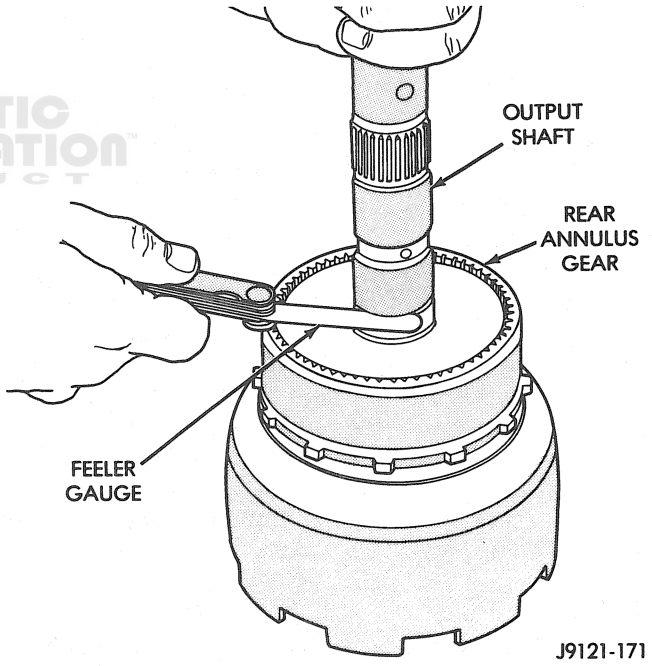


Fig. 177 Checking Planetary Geartrain End Play

CLEANING AND INSPECTION

GOVERNOR AND PARK GEAR

CLEANING AND INSPECTION

Thoroughly clean all the governor parts in a suitable cleaning solution but do not use any type of caustic cleaning agents.

The governor weight components (Fig. 178) and the governor valve (Fig. 179), must slide freely in their bores when clean and dry. Minor surface scratches and burrs can be smoothed with crocus cloth

CLEANING AND INSPECTION (Continued)

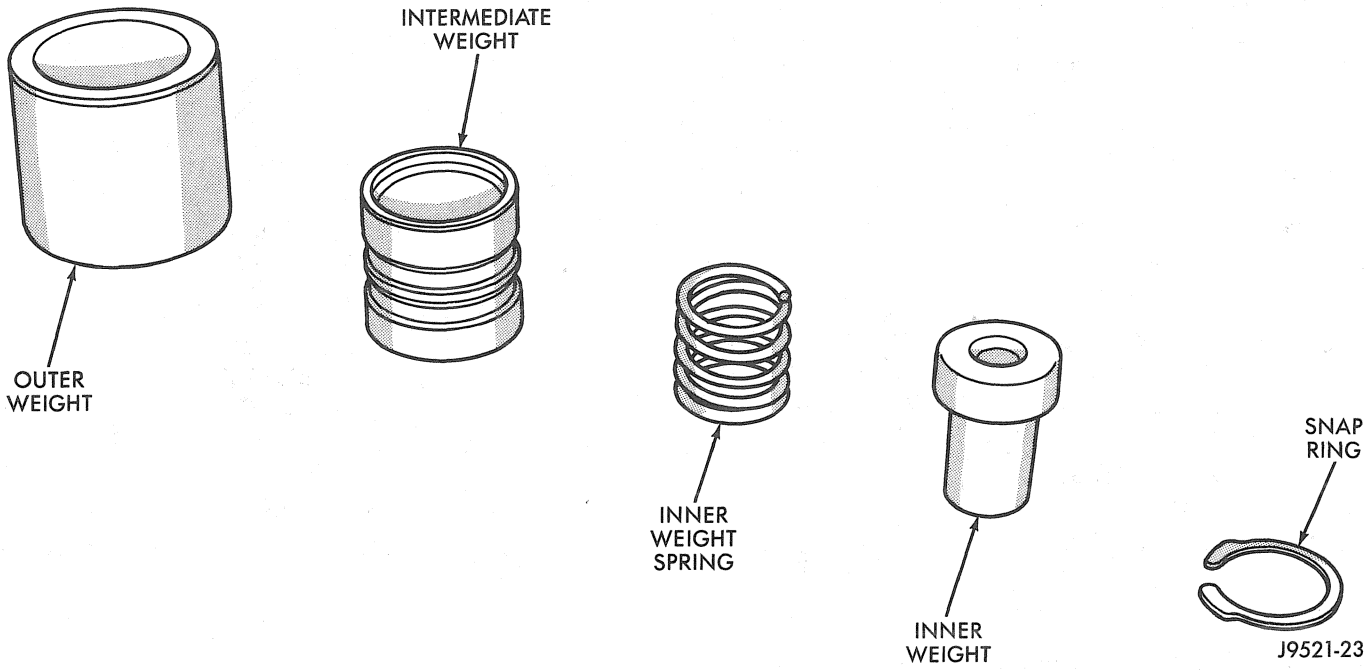


Fig. 178 Governor Weights

The aluminum governor valve and outer weight have a hard coating on them. Check condition of this coating carefully. Do not reuse either part if the coating is damaged.

Inspect the governor weight spring for distortion. Replace the spring, if distorted, collapsed, or broken. Clean the filter in solvent and dry it with compressed air. Replace the filter, if damaged. Inspect the park gear for chipped or worn gear teeth or damaged ring grooves. Replace the gear, if damaged.

Check the teeth on the park gear for wear or damage. Replace the gear if necessary. Inspect the metal seal rings on the park gear hub. Replace the rings only if severely worn, or broken.

EXTENSION HOUSING AND PARK LOCK

Clean the housing and park lock components in solvent and dry them with compressed air.

Examine the park lock components in the housing. If replacement is necessary, remove the shaft with parallel jaw snap ring pliers (Fig. 180) and remove the sprag and spring. Then remove the spring clip and reaction plug (Fig. 181). **Compress the reaction plug spring clip only enough to remove and install it. Do not distort the clip during removal or installation.**

Be sure a replacement sprag is installed so the sprag locking lug will face the park gear (Fig. 182). Also be sure the spring is correctly positioned as shown (Fig. 182). The sprag may not retract if the spring is improperly installed.

VALVE BODY

Serviceable valve body components are:

- park lock rod and E-clip
- switch valve and spring
- pressure adjusting screw bracket
- throttle valve lever
- manual lever
- manual lever shaft seal, washer, E-clip and detent ball
- fluid filter
- converter clutch solenoid

The remaining valve body components are serviced only as part of a complete valve body assembly.

Clean the valve body components in a parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution. Dry the parts with compressed air. Make sure all passages are clean and free from obstructions.

NOTE: Do not use rags or shop towels to wipe off valve body components. Lint from these materials will adhere to the valve body components. Lint will interfere with valve operation and may clog filters and fluid passages.

Inspect the throttle and manual valve levers and shafts. Do not attempt to straighten a bent shaft or correct a loose lever. Replace these components if worn, bent, loose or damaged in any way.

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straightedge to check surface flatness. Minor scratches may

CLEANING AND INSPECTION (Continued)

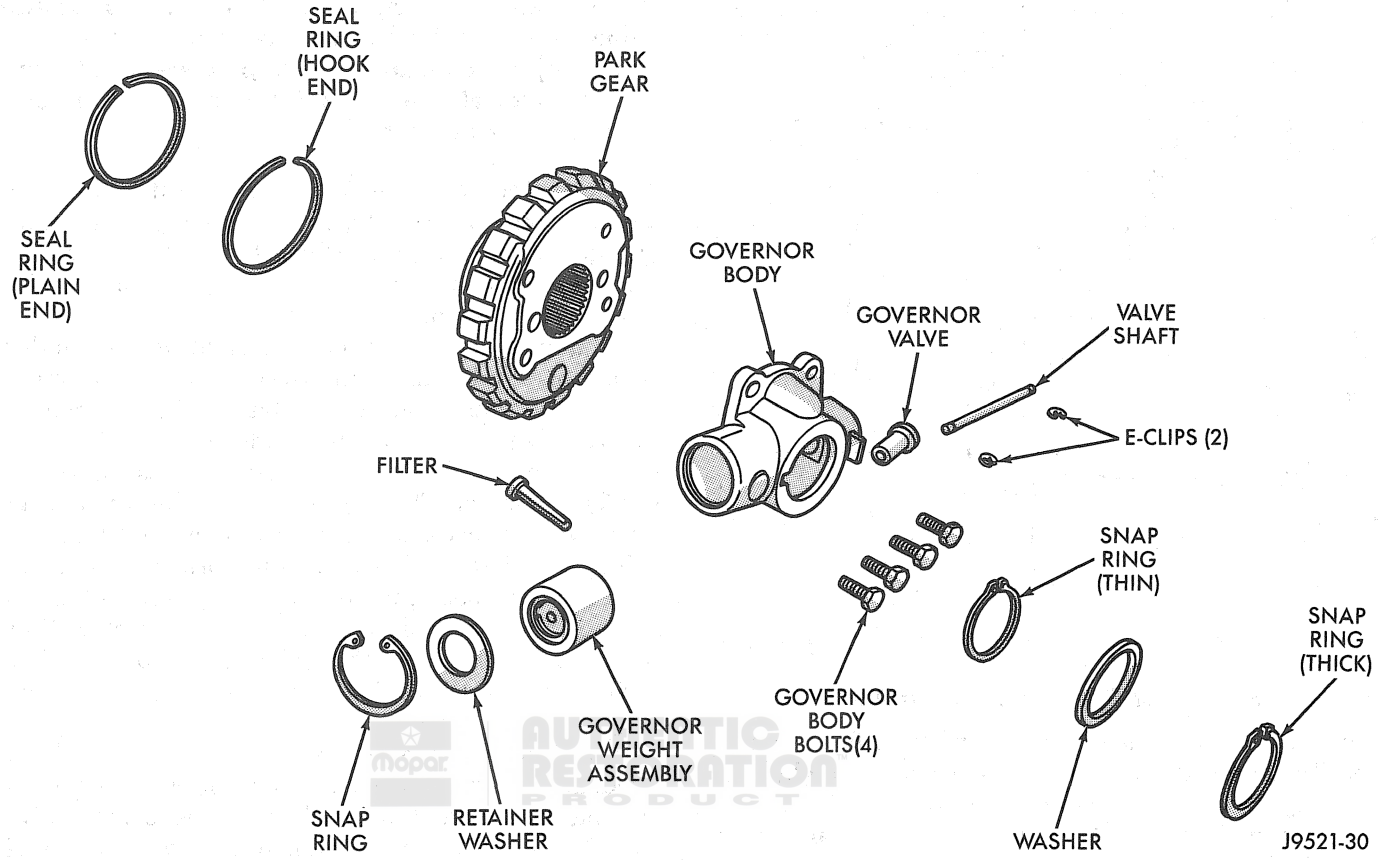


Fig. 179 Governor Components

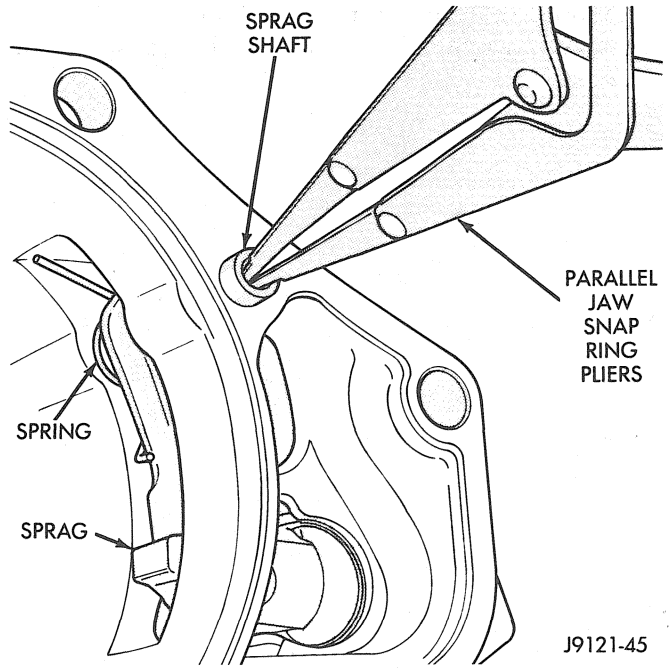


Fig. 180 Park Sprag, Shaft And Spring

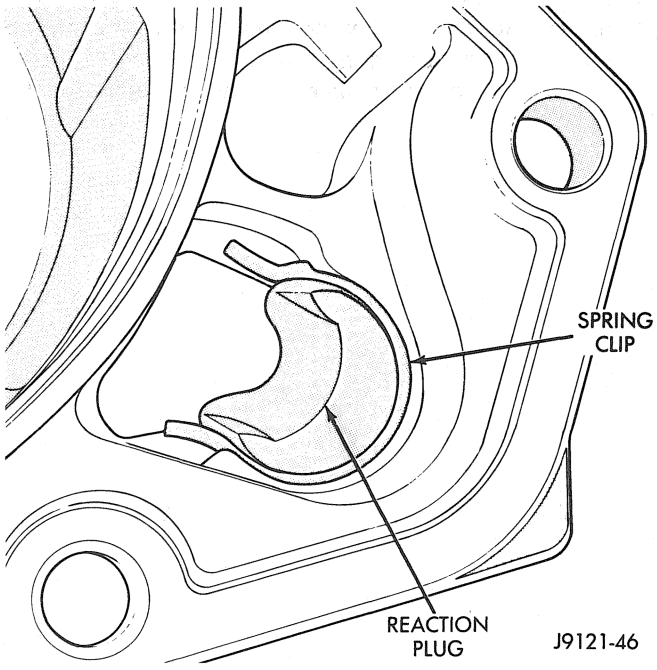


Fig. 181 Park Sprag Reaction Plug And Spring Location

be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with cro-

CLEANING AND INSPECTION (Continued)

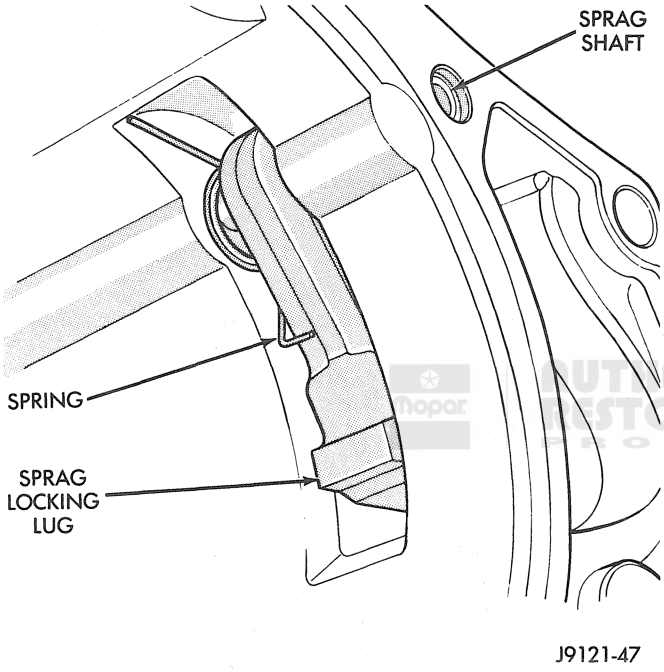


Fig. 182 Correct Position Of Sprag And Spring

cus cloth. The cloth should be in sheet form and be positioned on a surface plate, sheet of plate glass, or equally flat surface. However, if distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

CAUTION: Many of the valve body valves and plugs are made of coated aluminum. Aluminum components can be identified by the dark color of the special coating applied to the surface (or by testing with a magnet). DO NOT polish or sand aluminum valves or plugs with any type of material, or under any circumstances. This practice might damage the special coating and cause the valves and plugs to stick and bind.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Also inspect the coating on the aluminum valves and plugs (Fig. 183). If the coating is damaged or worn through, the valve (or valve body) should be replaced.

Aluminum valves and plugs should not be sanded or polished under any circumstances. However, minor burrs or scratches on steel valves and plugs can be removed with crocus cloth but do not round off the valve or plug edges. Squareness of these edges is vitally important. These edges prevent foreign matter from lodging between the valves, plugs and bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores. Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

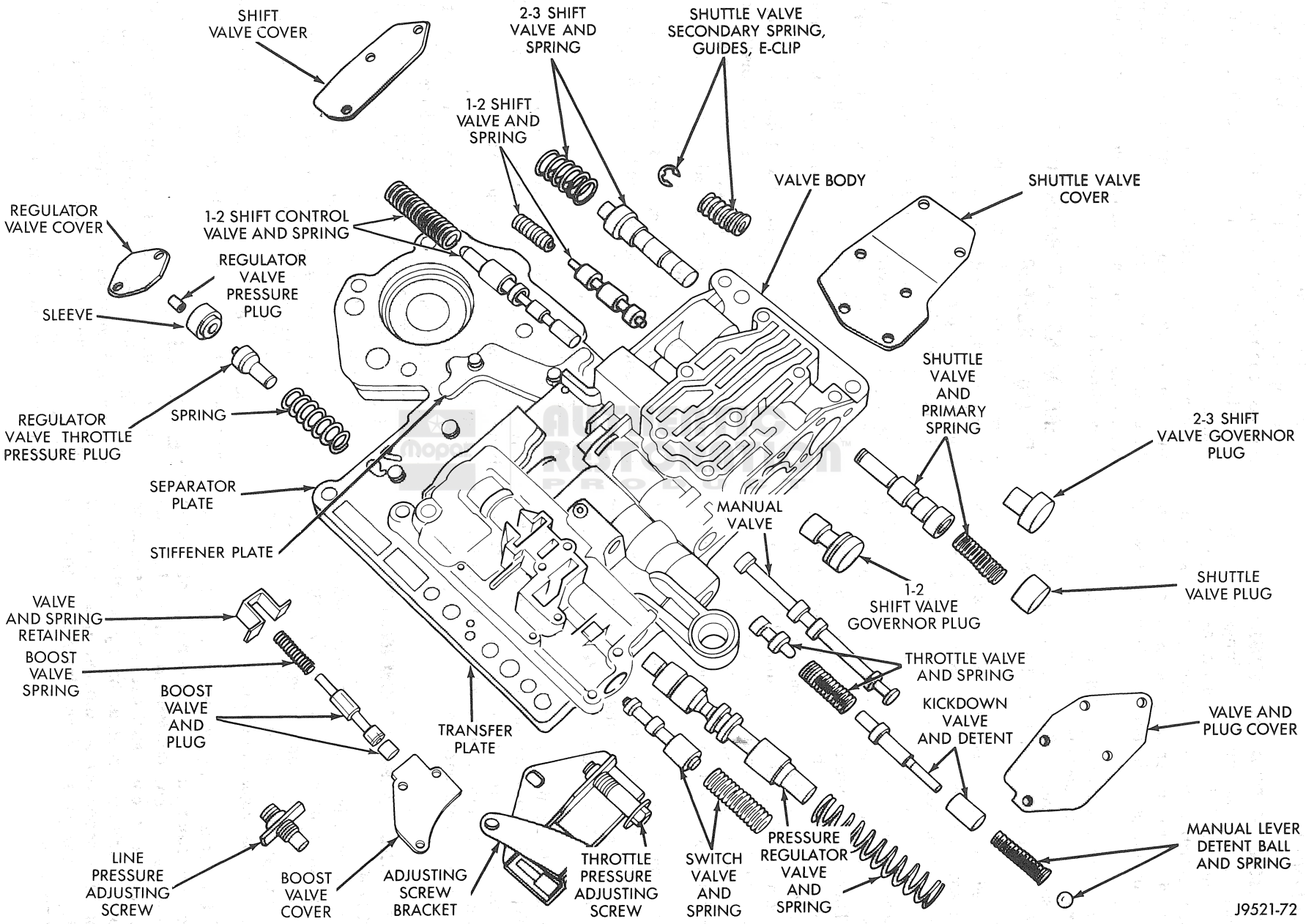


Fig. 183 Valve Body Components

CLEANING AND INSPECTION (Continued)

TRANSMISSION

INSPECTION AFTER DISASSEMBLY

Inspect all the transmission bushings during overhaul. Bushing condition is important as worn, scored bushings contribute to low pressures, clutch slip and accelerated wear of other components. Replace worn, or scored bushings, or if doubt exists about bushing condition.

Use recommended tools to replace bushings. The tools are sized and designed to remove, install and seat bushings correctly. The bushing replacement tools are included in Bushing Tool Sets C-3887-B, or C-3887-J.

Pre-sized service bushings are available for replacement purposes. Only the sun gear bushings are not serviced. Replace the gear as an assembly if the bushings are severely scored, or worn.

Heli-Coil inserts are recommended for repairing damaged, stripped or worn threads in aluminum parts. These inserts are available from most automotive jobbers. Stainless steel inserts are preferred.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar ATF Plus, Type 7176 transmission fluid during assembly. Use Mopar Door Ease, or Ru-Glyde to lubricate piston seals and O-rings. Use petroleum jelly on thrust washers and to hold parts in place during reassembly.

TRANSMISSION CASE CLEANING AND INSPECTION

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will readily adhere to case surfaces and transmission components and will circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

Inspect the case for cracks, porous spots, worn servo bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits damage or wear.

Lubricate the front band adjusting screw and locknut with petroleum jelly and thread it part way into the case. Be sure the screw turns freely and does not bind. Install the locknut on the screw after checking screw thread operation.

OVERRUNNING CLUTCH/LOW-REVERSE DRUM/REAR SUPPORT

Clean the overrunning clutch assembly, clutch cam, low-reverse drum and rear support in solvent. Dry them with compressed air after cleaning.

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse drum if the clutch race, roller surface or inside diameter is scored, worn or damaged. **Do not remove the clutch race from the low-reverse drum under any circumstances. Replace the drum and race as an assembly if either component is damaged.**

Examine the rear support carefully for wear, cracks, scoring or other damage. Be sure the support hub is a snug fit in the case and drum. Replace the support if worn or damaged.

FRONT SERVO

Clean the servo piston components (Fig. 184) with solvent and dry them with compressed air. Wipe the band clean with lint free shop towels.

Replace the front band if distorted, lining is burned, flaking off, or worn to the point where the grooves in the lining material are no longer visible.

Inspect the servo components. Replace the springs if collapsed, distorted or broken. Replace the guide, rod and piston if cracked, bent, or worn. Discard the servo snap ring if distorted or warped.

Check the servo piston bore for wear. If the bore is severely scored, or damaged, it will be necessary to replace the case.

Replace any servo component if doubt exists about condition. Do not reuse suspect parts.

REAR SERVO

Remove and discard the servo piston seal ring (Fig. 185). Then clean the servo components with solvent and dry with compressed air. Replace either spring if collapsed, distorted or broken. Replace the plug and piston if cracked, bent, or worn. Discard the servo snap rings and use a new ones at assembly.

CLEANING AND INSPECTION (Continued)

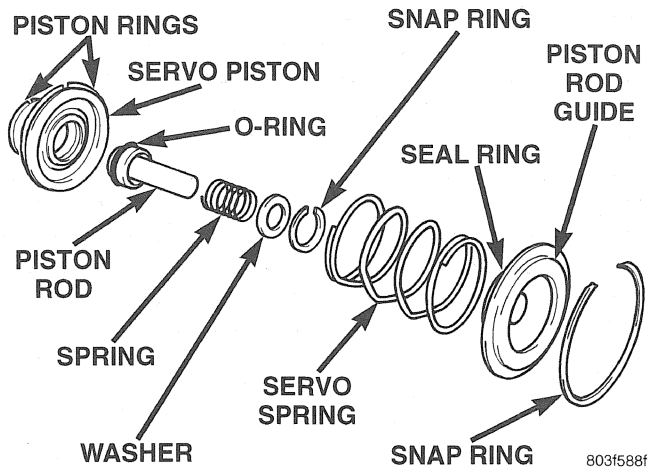


Fig. 184 Front Servo Components

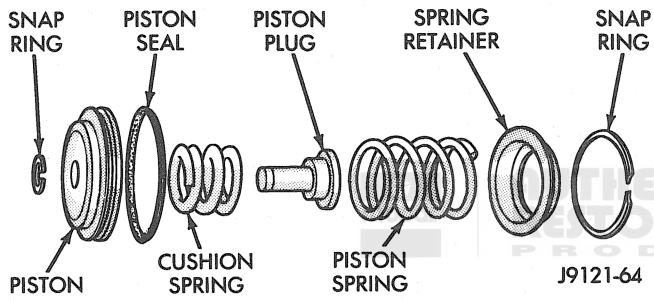


Fig. 185 Rear Servo Components

OIL PUMP AND REACTION SHAFT SUPPORT

Clean pump and reaction shaft support components with solvent and dry them with compressed air.

Inspect the pump housing and support components. Replace the housing or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged.

Replace the pump gears if pitted, worn chipped, or damaged. Inspect the thrust washer for wear or damage. Replace the washer if necessary.

Inspect the pump and reaction shaft support bushings. Minor bushing wear is acceptable. Replace the bushings only if scored, or severely worn.

Install the gears in the pump housing and measure end clearance with a feeler gauge and straightedge (Fig. 186). The pump inner gear is a one way fit. The bore on one side of the gear inside diameter is chamfered. Be sure the chamfered side faces forward (to front of pump). Clearance should be 0.010 - 0.06 mm (0.0004 - 0.0025 in.).

Measure clearance between the outer gear and the pump body (Fig. 187). Clearance should be 0.08 - 0.19 mm (0.0035 - 0.0075 in.).

Measure gear tooth clearance with a feeler gauge. Align one tooth of the outer gear in inner gear and measure clearance (Fig. 188). Clearance should be 0.08 - 0.19 mm (0.0035 - 0.0075 in.).

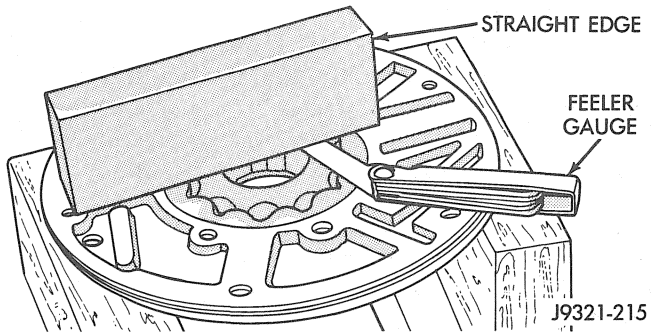


Fig. 186 Measuring Pump Gear End Clearance

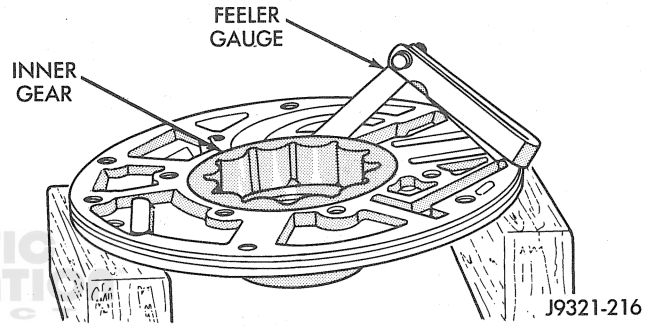


Fig. 187 Measuring Pump Housing-To-Inner Gear Clearance

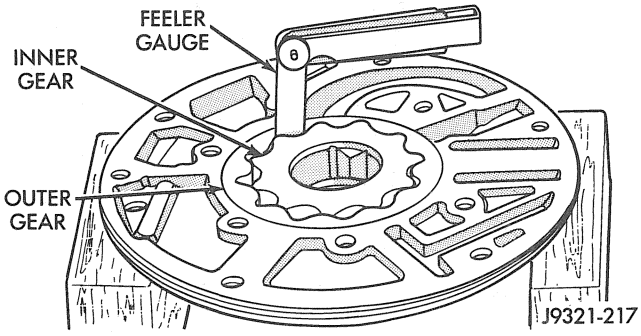


Fig. 188 Measuring Pump Gear Tooth Clearance

FRONT CLUTCH

Clean the front clutch components in solvent and dry them with compressed air only. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to the component surfaces and could restrict or block fluid passages after assembly.

Replace the clutch discs if warped, worn, scored, burned or charred, or if the facing is flaking off. Replace the steel plates if heavily scored, warped, or broken. Be sure the driving lugs on the plates are in good condition. The lugs must not be bent, cracked or damaged in any way.

CLEANING AND INSPECTION (Continued)

Replace the clutch spring and spring retainer if either is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The steel plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged.

Check action of the check ball in the retainer (Fig. 189). The ball must move freely and not stick.

NOTE: Inspect the clutch retainer bushings carefully (Fig. 190). The retainer bushings are NOT serviceable. It will be necessary to replace the retainer if either bushing is scored, or worn.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

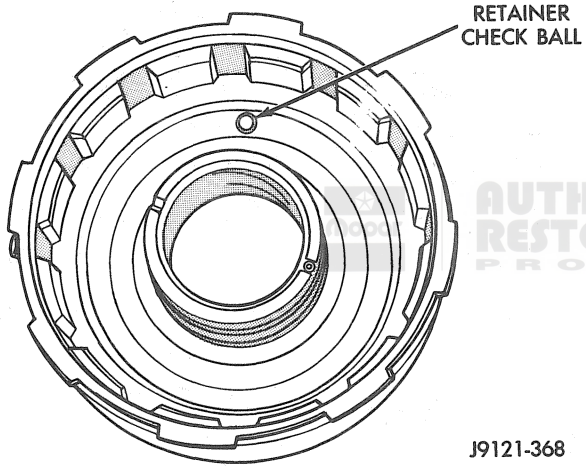


Fig. 189 Front Clutch Piston Retainer Check Ball Location

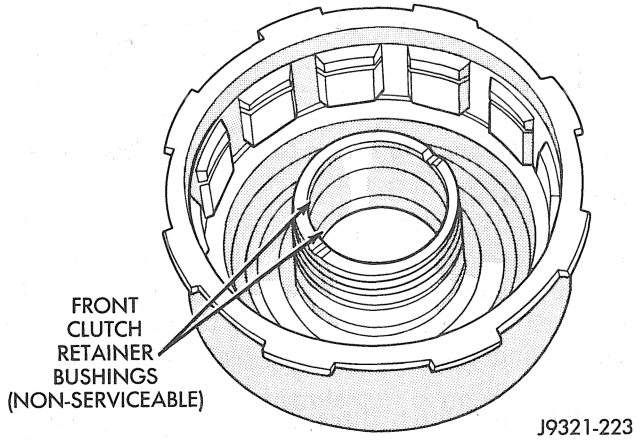


Fig. 190 Retainer Bushing Location/Inspection

REAR CLUTCH

Clean the clutch components (Fig. 191) with solvent and dry them with compressed air. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to component surfaces and could restrict or block fluid passages after assembly.

Replace the clutch discs if warped, worn, scored, burned/charred, the lugs are damaged, or if the facing is flaking off. Replace the top and bottom pressure plates if scored, warped, or cracked. Be sure the driving lugs on the pressure and clutch plates are also in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the piston spring and wave spring if either part is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The clutch and pressure plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged. Also check action of the check balls in the retainer and piston. Each check ball must move freely and not stick.

Replace the retainer bushing if worn, scored, or doubt exists about bushing condition.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

Check condition of the fiber thrust washer and metal output shaft thrust washer. Replace either washer if worn or damaged.

Check condition of the seal rings on the input shaft and clutch retainer hub. Replace the seal rings only if worn, distorted, or damaged. The input shaft front seal ring is teflon with chamfered ends. The rear ring is metal with interlocking ends.

Check the input shaft for wear, or damage. Replace the shaft if worn, scored or damaged in any way.

PLANETARY GEARTRAIN

Clean the planetary components in solvent and dry them with compressed air.

Check sun gear and driving shell condition (Fig. 192). Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Inspect the geartrain spacers, thrust plates, snap rings, and thrust washers (Fig. 192). Replace any of these parts that are worn, distorted or damaged. Do not attempt to reuse these parts.

The planetary gear thrust washers are different sizes. The large diameter washers go on the front planetary and the smaller washers go on the rear planetary. All the washers have four locating tabs on

CLEANING AND INSPECTION (Continued)

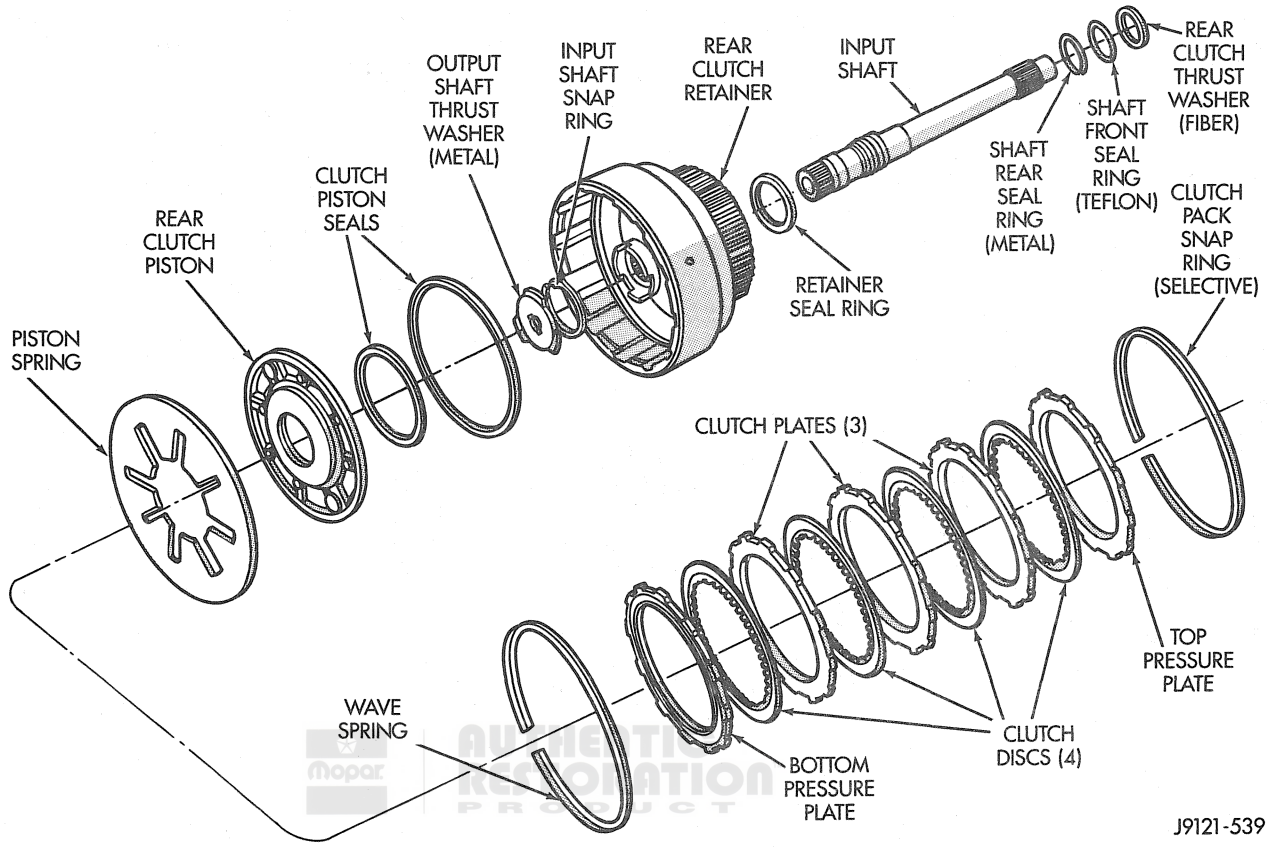


Fig. 191 Rear Clutch Comonents

them. These tabs fit in the holes or slots provided in each planetary gear.

Inspect the output shaft carefully. Pay particular attention to the machined bushing/bearing surfaces on the shaft and the governor valve shaft bore at the shaft rear.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location (especially at the governor valve shaft bore).

The annulus gears can be removed from their supports if necessary. Just remove the snap rings and separate the two parts when replacement is necessary. In addition, the annulus gear bushings can be replaced if severely worn, or scored. However it is not necessary to replace the bushings if they only exhibit normal wear. Check bushing fit on the output shaft to be sure.

ADJUSTMENTS

SHIFT CABLE ADJUSTMENT

(1) Shift transmission into Park.
(2) Raise vehicle.
(3) Release cable adjuster clamp to unlock cable (Fig. 193) and (Fig. 194). Clamp is at transmission end of cable.
(4) Unsnap cable from transmission cable bracket.
(5) Move transmission shift lever fully rearward to Park detent. Lever is on manual valve shaft at driver side of case.
(6) Verify positive engagement of park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
(7) Snap cable into cable bracket.
(8) Lock shift cable by pressing cable adjuster clamp down until it snaps into place.
(9) Check engine starting. Engine should start only in Park and Neutral.
(10) Lower vehicle.

PARK INTERLOCK CABLE ADJUSTMENT

(1) Shift transmission into Park.
(2) Turn ignition switch to Lock position.
(3) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.
(4) Pull cable lock button up to release cable (Fig. 194).
(5) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.
(6) Check adjustment as follows:

ADJUSTMENTS (Continued)

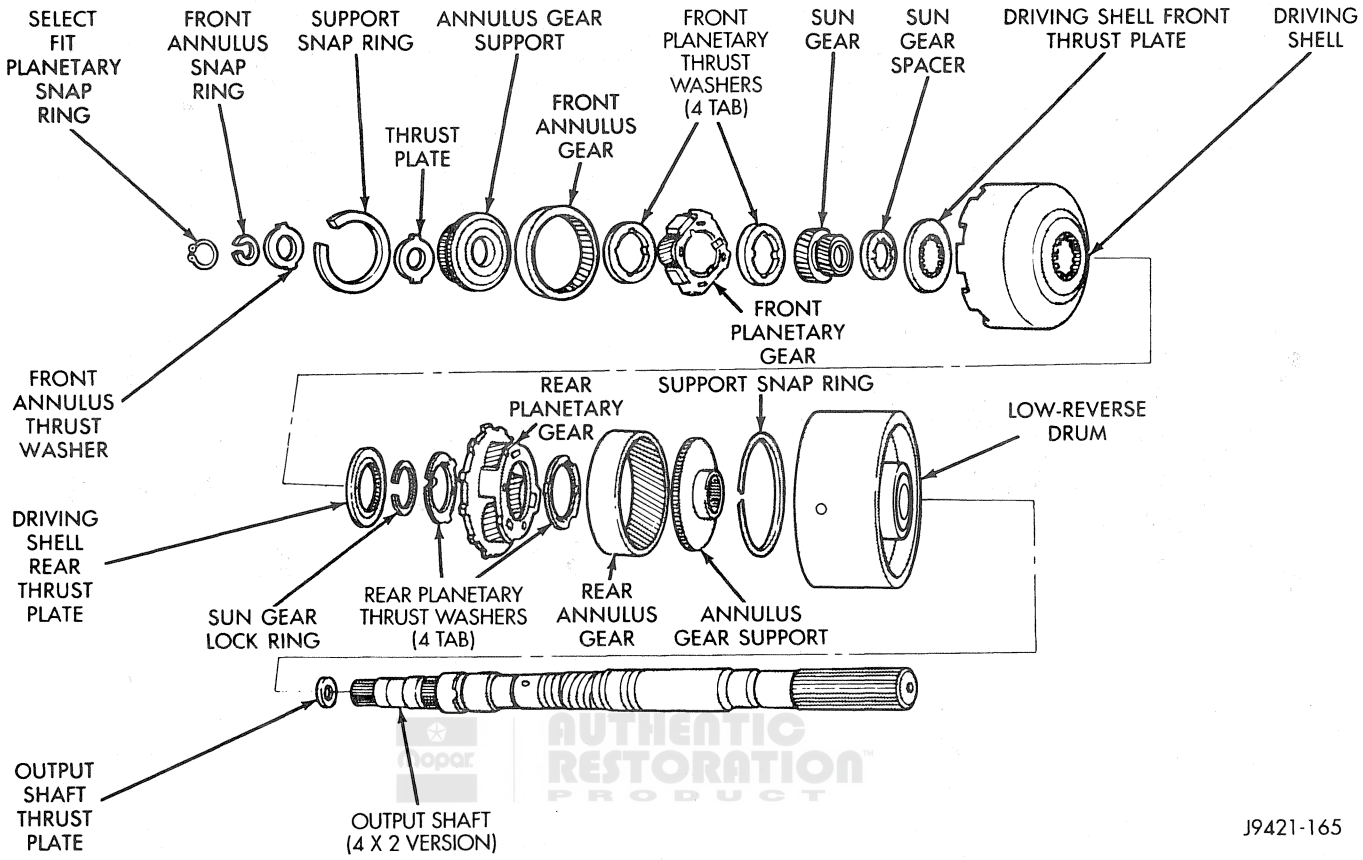


Fig. 192 Planetary Geartrain Components

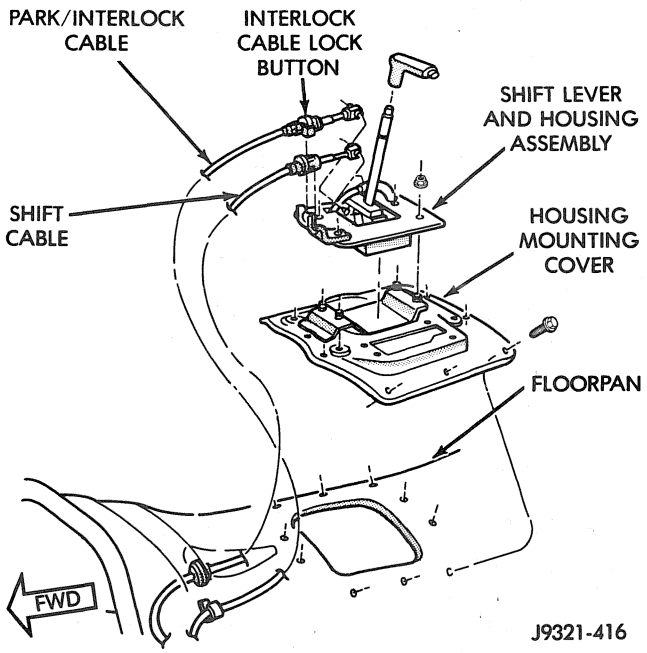


Fig. 193 Shift Cable

(a) Check movement of release shift handle button. You should not be able to press button inward.

(b) Turn ignition switch to On position.

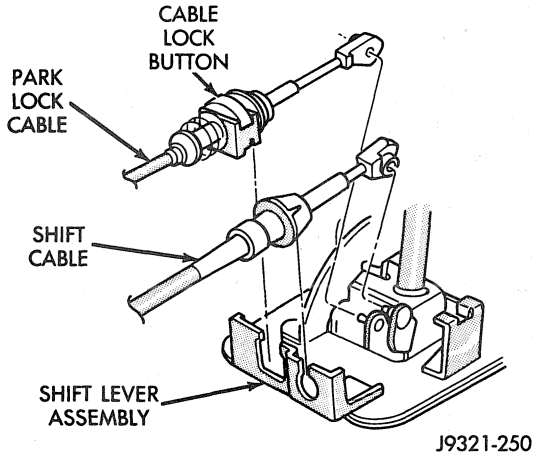


Fig. 194 Cable Attachment

(c) Press floor shift lever release button or move column lever. Then shift into Neutral. If cable adjustment is correct, ignition switch can not be turned to Lock position. Perform same check with transmission in D range.

(7) Move shift lever back to Park and check ignition switch operation. You should be able to turn switch to Lock position and shift lever release button/lever should not move.

ADJUSTMENTS (Continued)

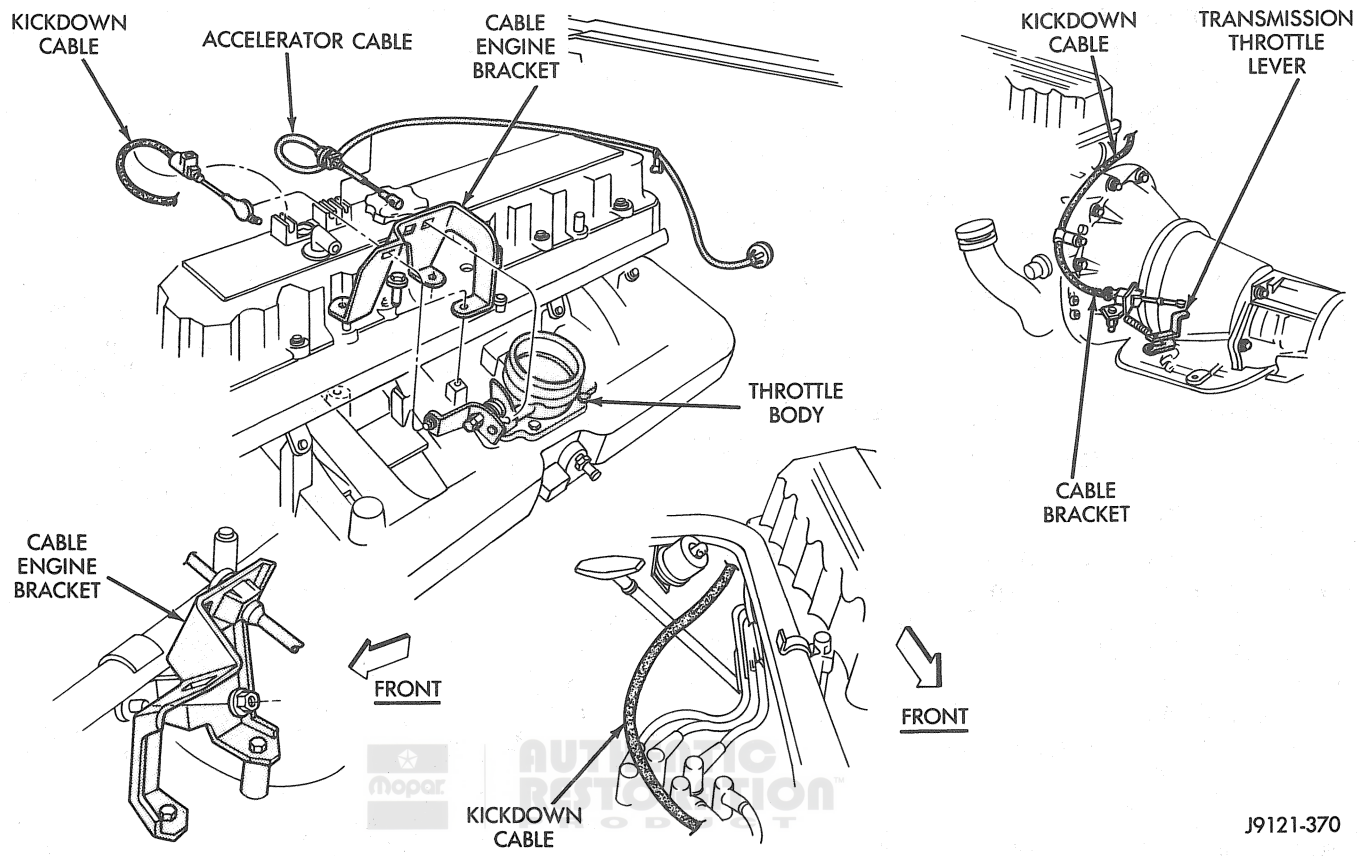


Fig. 195 Transmission Throttle Valve Cable

THROTTLE VALVE CABLE ADJUSTMENT

The throttle valve cable controls throttle pressure and kickdown on 30RH transmissions (Fig. 195).

Correct cable adjustment is important to proper shifting. The cable positions the throttle valve which controls shift speed, shift quality and part throttle downshift sensitivity. If the setting is incorrect, shift quality and shift speeds will be unsatisfactory.

THROTTLE VALVE CABLE ADJUSTMENT PROCEDURE

Cable adjustment is performed in the engine compartment. It is not necessary to raise the vehicle for access.

(1) Shift transmission into Park and shut engine off.

(2) Press cable release button (Fig. 196).

(3) Push cable conduit back into cable adjuster body as far as possible (Fig. 197).

(4) Rotate throttle body lever to wide open throttle position. Cable will ratchet to correct adjustment point as lever is rotated (Fig. 197).

FRONT BAND ADJUSTMENT

The front band adjusting screw is located on the left side of the transmission case above the manual valve and throttle valve levers.

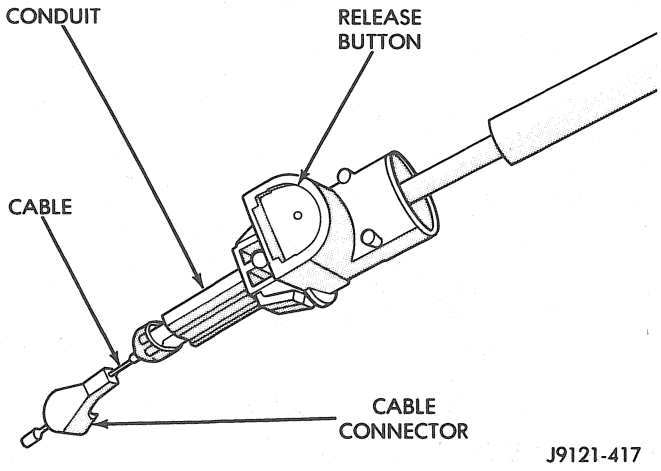


Fig. 196 Throttle Valve Cable Components

(1) Raise vehicle.

(2) Loosen band adjusting screw locknut. Then back locknut off 4-5 turns.

(3) Clean adjusting screw threads with Mopar rust penetrant if necessary. Then lubricate threads with Mopar spray lube or petroleum jelly. Be sure screw turns freely in case. This is necessary for accurate adjustment.

(4) Tighten band adjusting screw to 8 N·m (72 in. lbs.) torque with inch-pound torque wrench. **If**

ADJUSTMENTS (Continued)

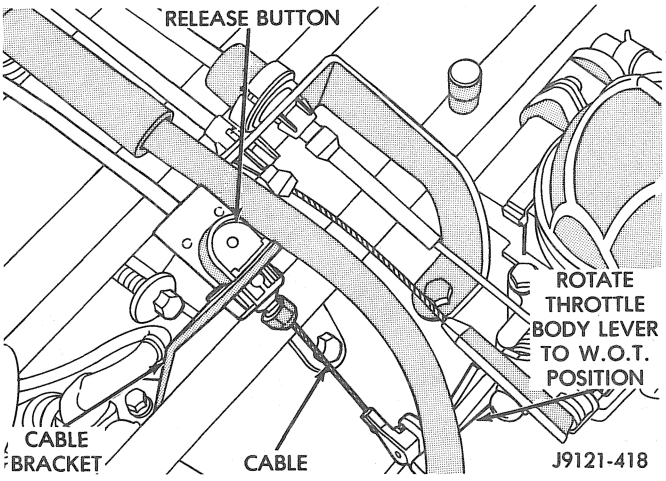


Fig. 197 Throttle Valve Cable Adjustment

Adapter Extension C-3705 is needed in order to reach adjusting screw, tighten screw to only 5-6 N·m (47-50 in. lbs.) torque (Fig. 198).

(5) Back off front band adjusting screw 2-1/2 turns.

(6) Hold adjuster screw in position and tighten locknut to 41 N·m (30 ft. lbs.) torque.

(7) Lower vehicle.

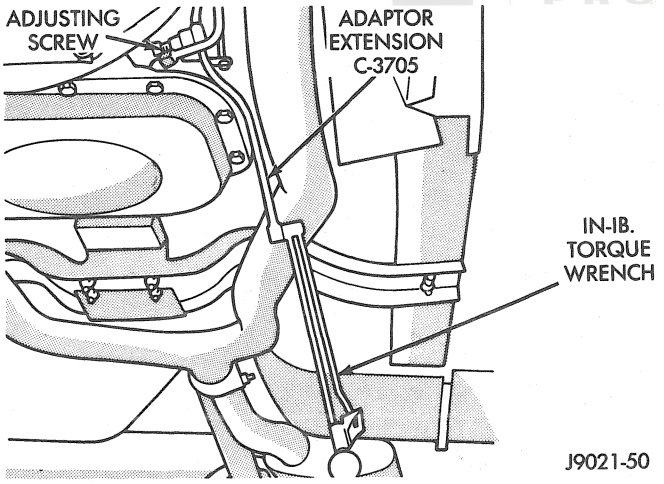


Fig. 198 Front Band Adjustment

REAR BAND ADJUSTMENT

The transmission oil pan must be removed for access to the rear (low-reverse) band adjusting screw.

(1) Raise vehicle.

(2) Remove transmission oil pan and drain fluid.

(3) Loosen band adjusting screw locknut 5-6 turns. Be sure adjusting screw turns freely in lever.

(4) Tighten adjusting screw to 5 N·m (41 in. lbs.) torque (Fig. 199).

(5) Back off rear band adjusting screw 7 turns.

(6) Hold adjusting screw in place and tighten locknut to 34 N·m (25 ft. lbs.) torque.

(7) Position new gasket on oil pan and install pan on transmission. Tighten pan bolts to 17 N·m (150 in. lbs.) torque.

(8) Lower vehicle and refill transmission with recommended fluid.

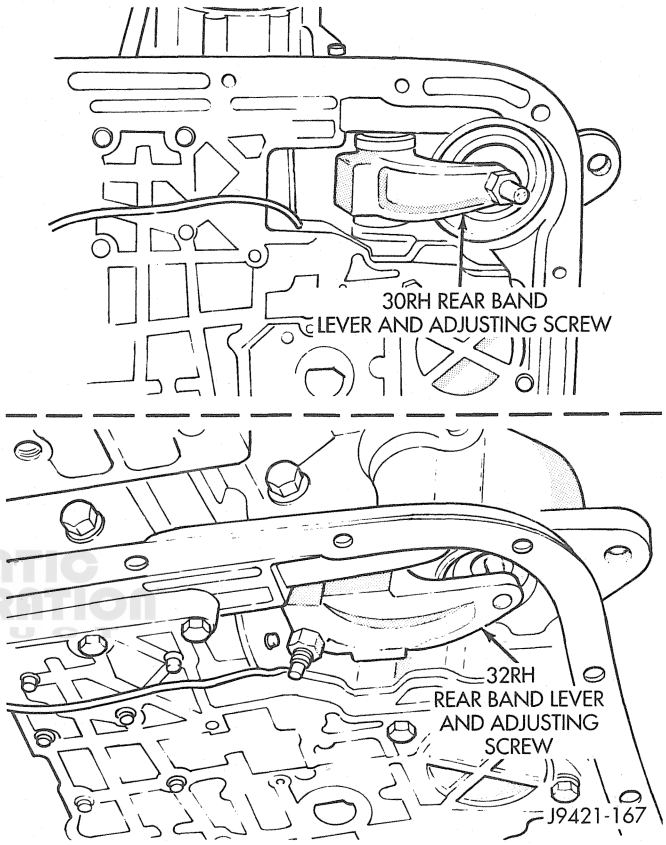


Fig. 199 Rear Band Lever And Adjusting Screw Location

VALVE BODY

CONTROL PRESSURE ADJUSTMENTS

There are two control pressure adjustments on the valve body;

- Line Pressure
- Throttle Pressure

Line and throttle pressures are interdependent because each affects shift quality and timing. As a result, both adjustments must be performed properly and in the correct sequence. Adjust line pressure first and throttle pressure last.

LINE PRESSURE ADJUSTMENT

Measure distance from the valve body to the inner edge of the adjusting screw with an accurate steel scale (Fig. 200).

Distance should be 33.4 mm (1-5/16 in.).

If adjustment is required, turn the adjusting screw in, or out, to obtain required distance setting.

ADJUSTMENTS (Continued)

NOTE: The 33.4 mm (1-5/16 in.) setting is an approximate setting. Manufacturing tolerances may make it necessary to vary from this dimension to obtain desired pressure.

One complete turn of the adjusting screw changes line pressure approximately 1-2/3 psi (9 kPa).

Turning the adjusting screw counterclockwise increases pressure while turning the screw clockwise decreases pressure.

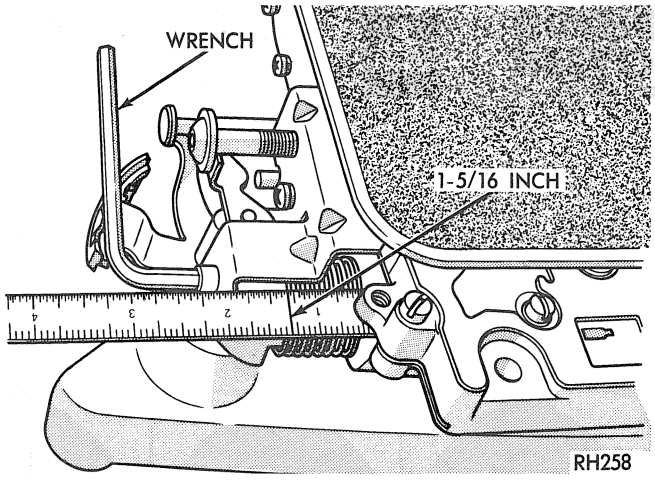


Fig. 200 Line Pressure Adjustment

THROTTLE PRESSURE ADJUSTMENT

Insert Gauge Tool C-3763 between the throttle lever cam and the kickdown valve stem (Fig. 201).

Push the gauge tool inward to compress the kickdown valve against the spring and bottom the throttle valve.

Maintain pressure against kickdown valve spring. Turn throttle lever stop screw until the screw head touches throttle lever tang and the throttle lever cam touches gauge tool.

NOTE: The kickdown valve spring must be fully compressed and the kickdown valve completely bottomed to obtain correct adjustment.

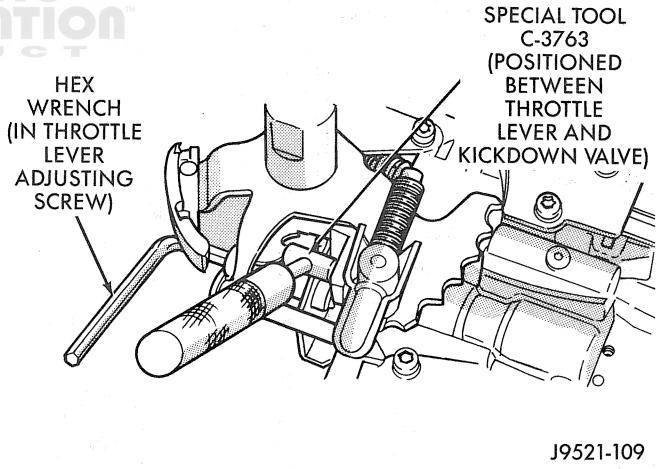
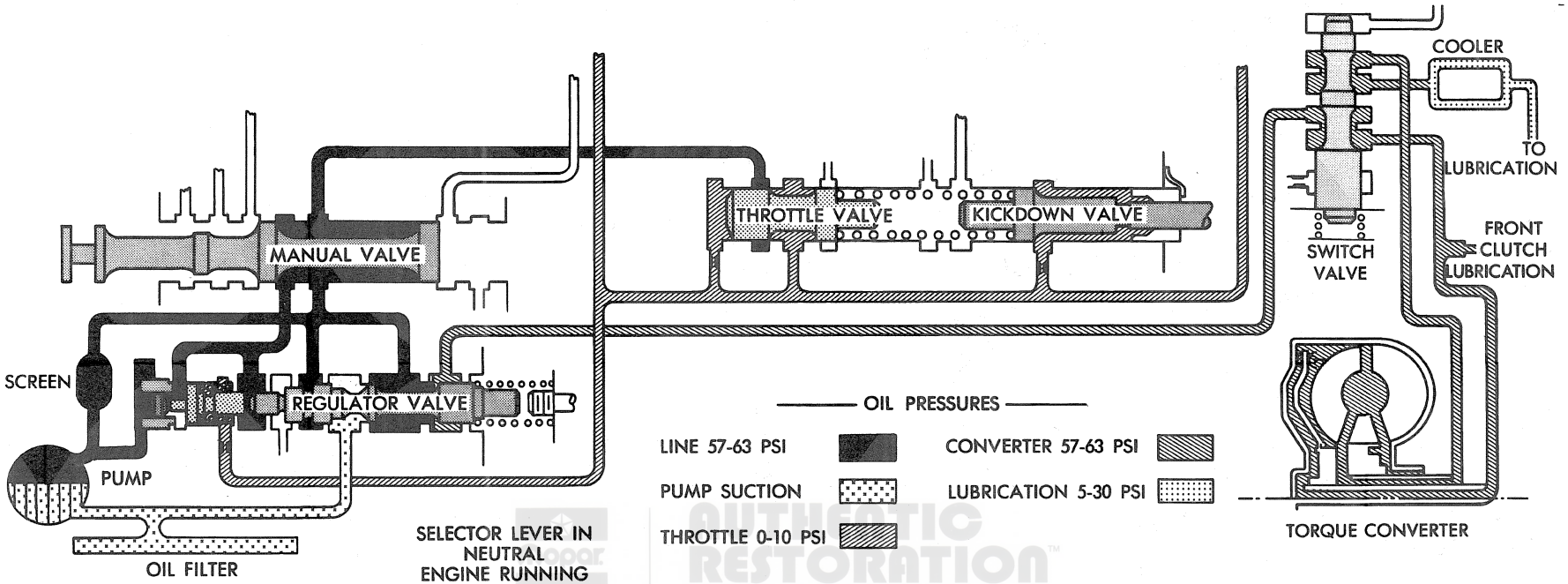
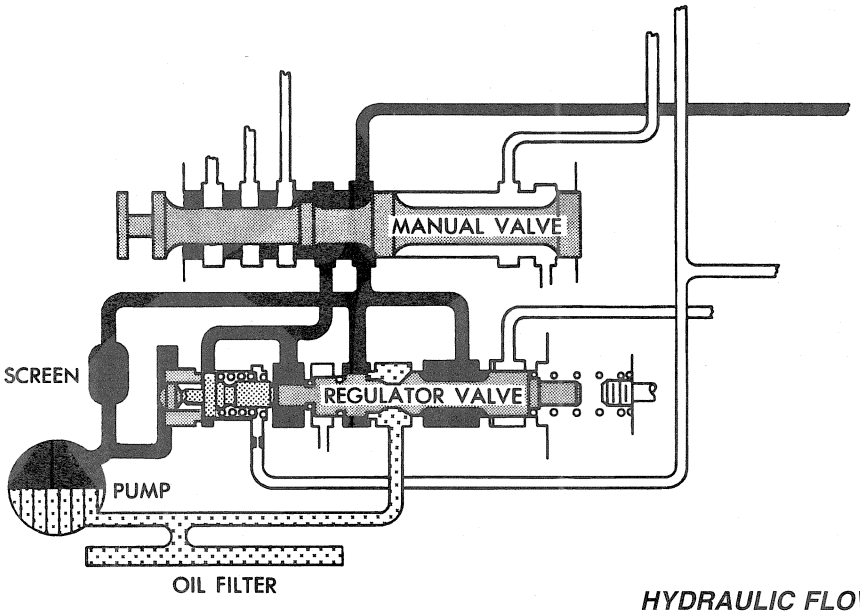


Fig. 201 Throttle Pressure Adjustment

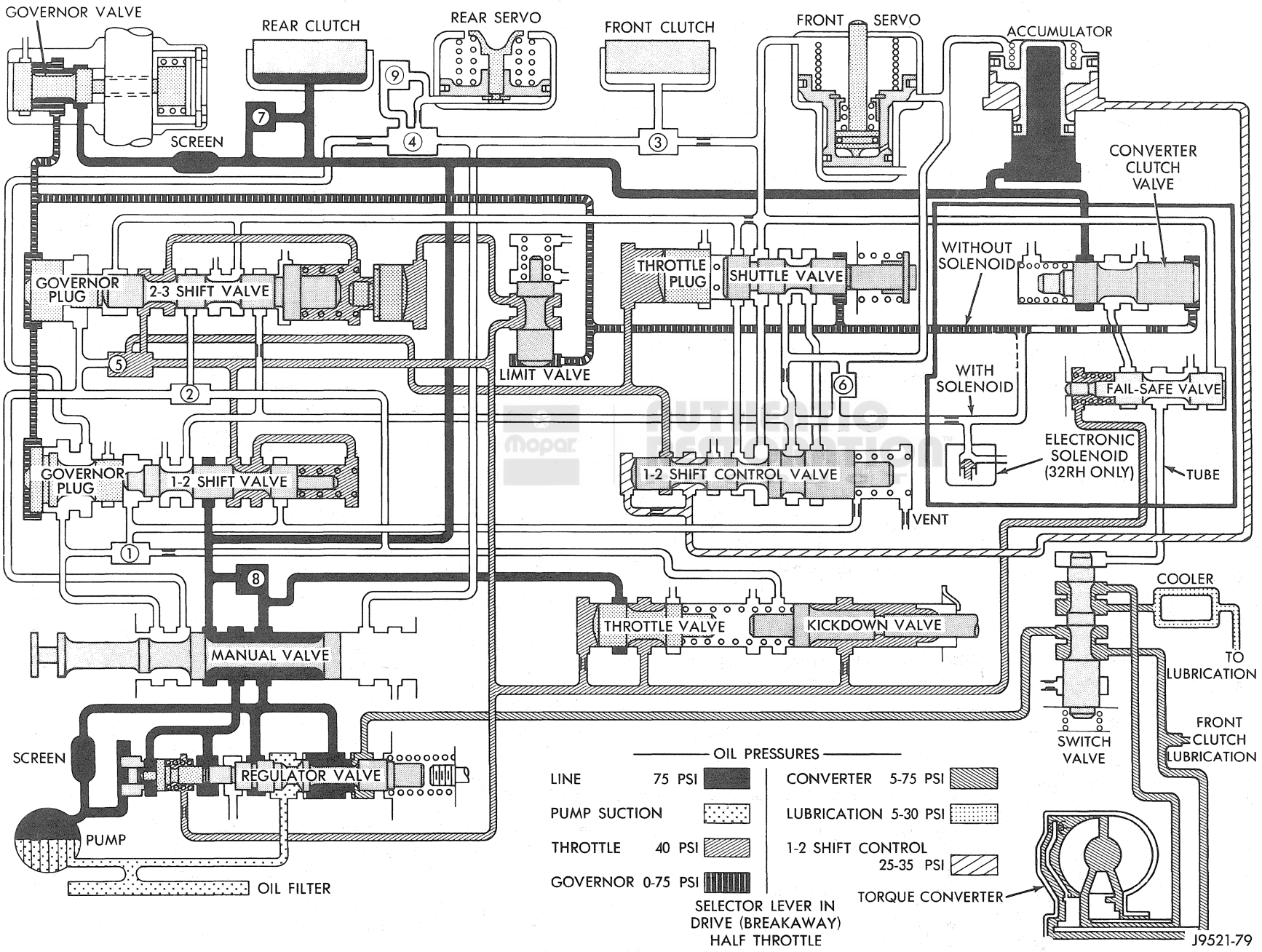
SCHEMATICS AND DIAGRAMS



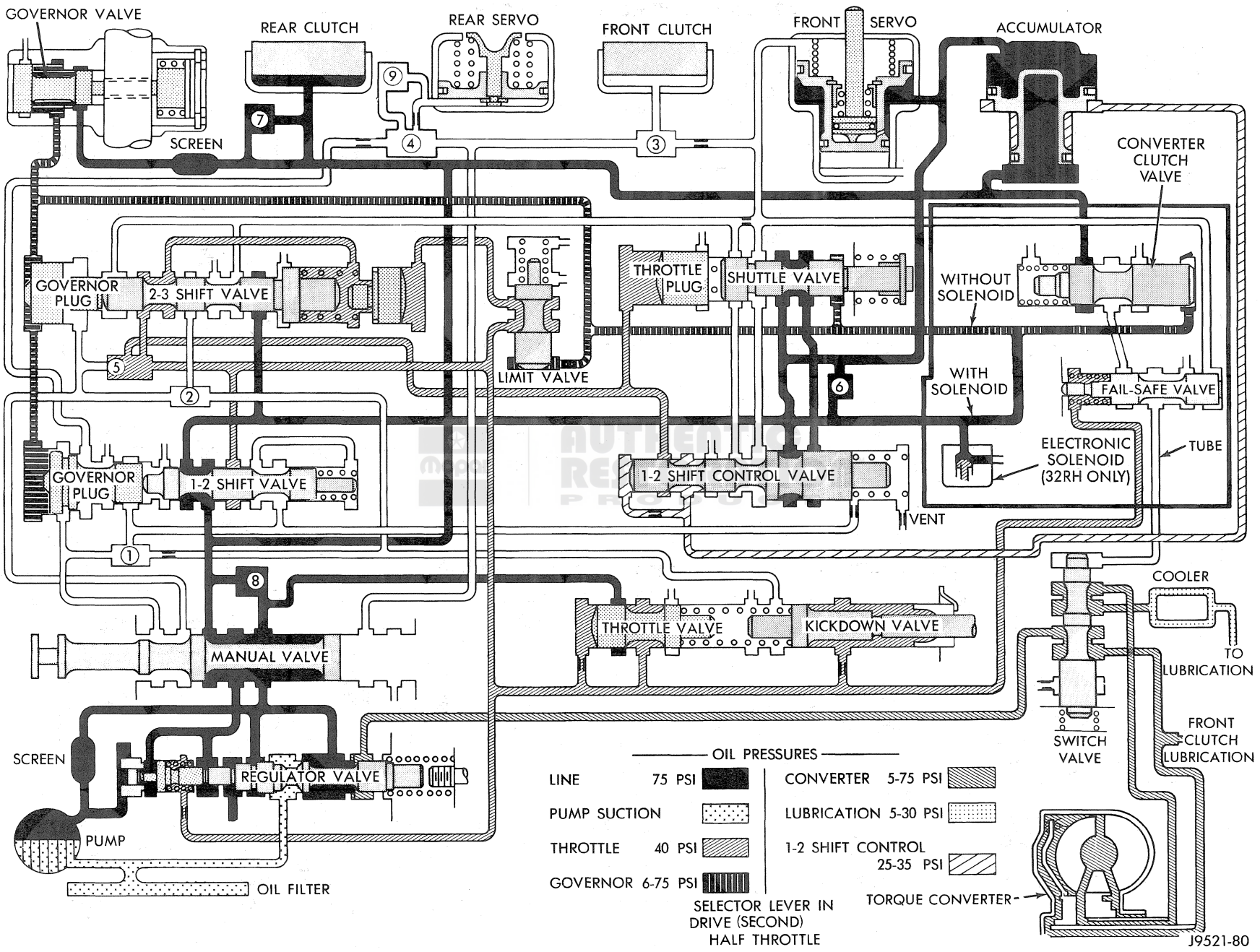


HYDRAULIC FLOW IN PARK/NEUTRAL

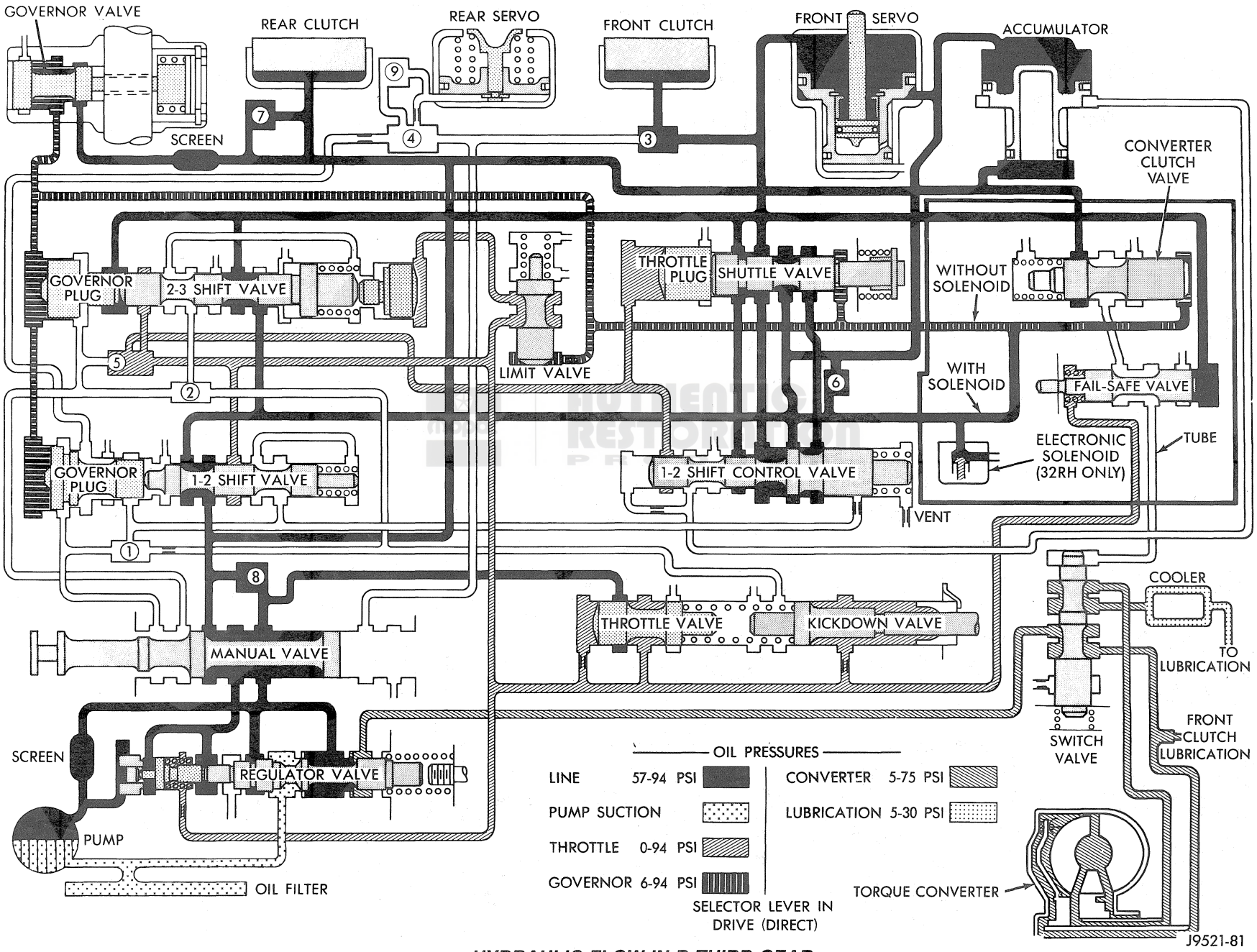
J9021-160



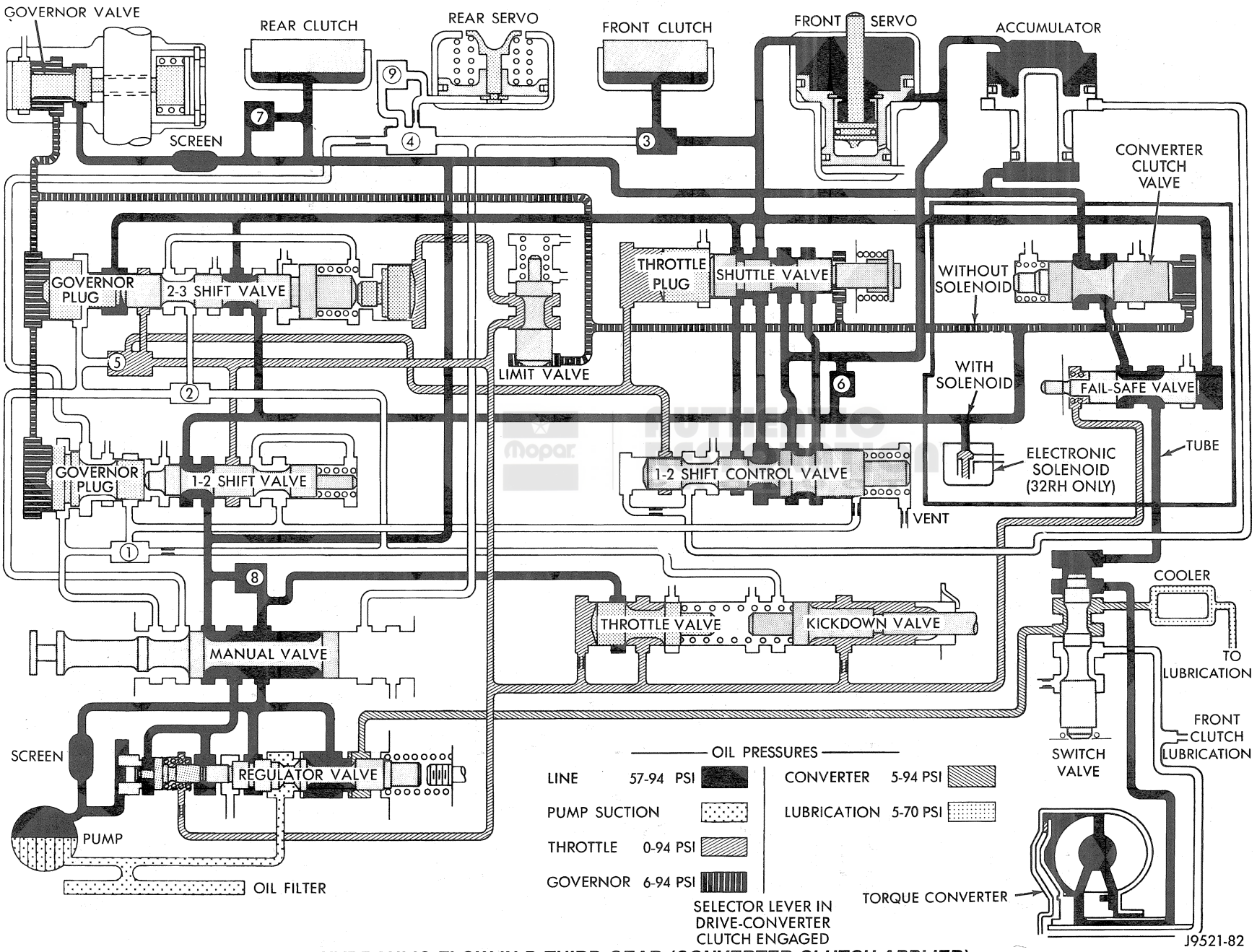
HYDRAULIC FLOW IN D-FIRST GEAR



HYDRAULIC FLOW IN D-SECOND GEAR

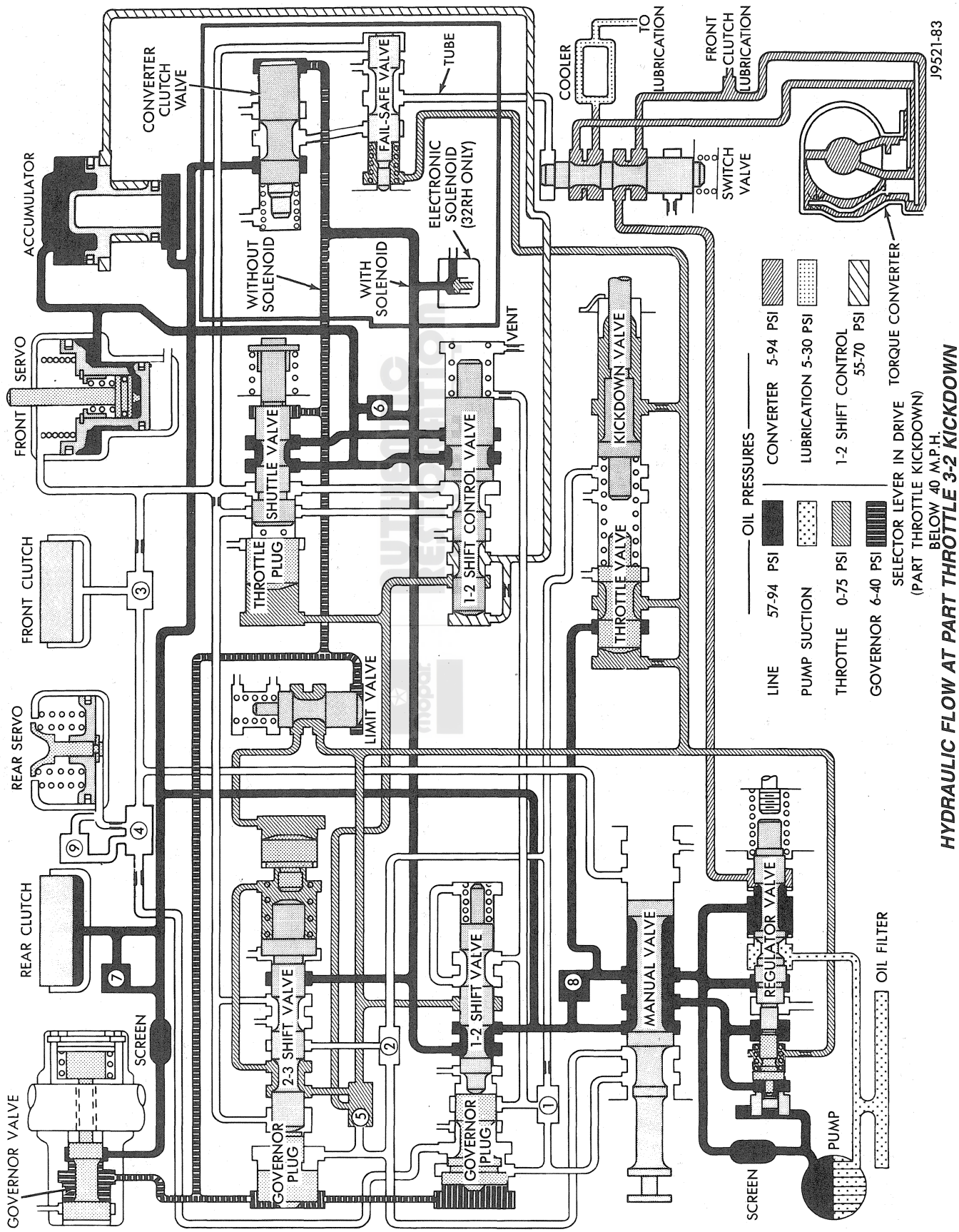


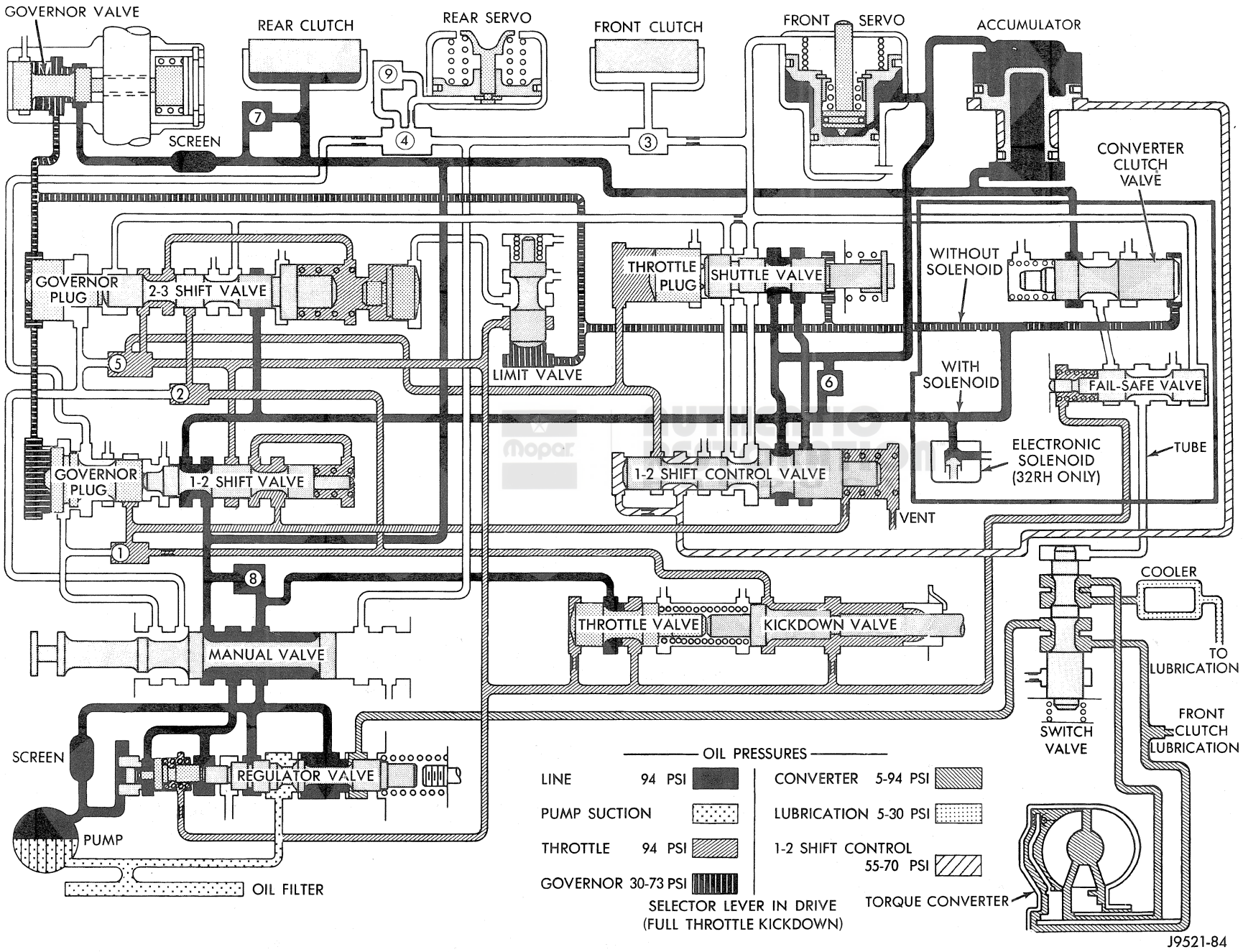
HYDRAULIC FLOW IN D-THIRD GEAR



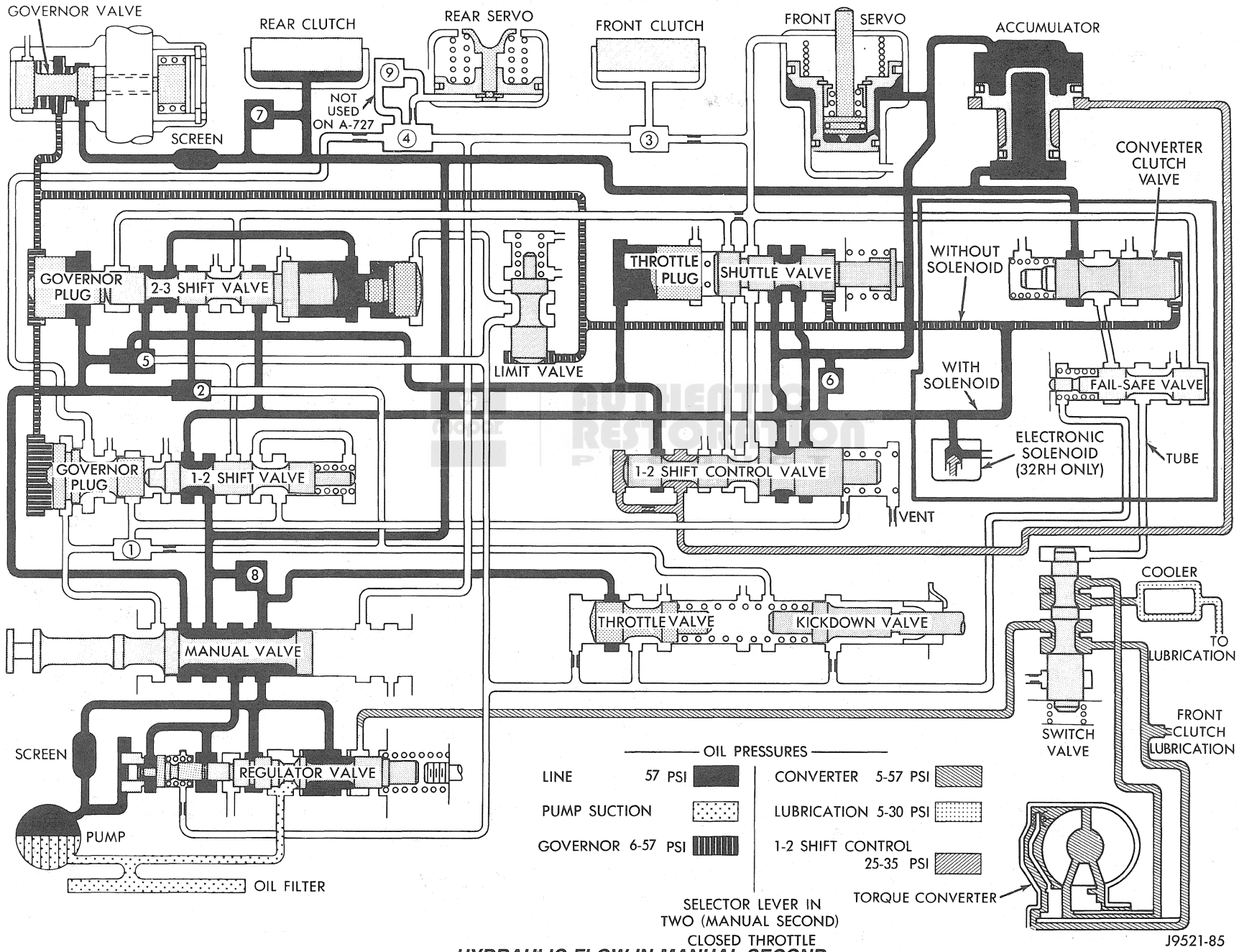
HYDRAULIC FLOW IN D-THIRD GEAR (CONVERTER CLUTCH APPLIED)

SCHEMATICS AND DIAGRAMS (Continued)

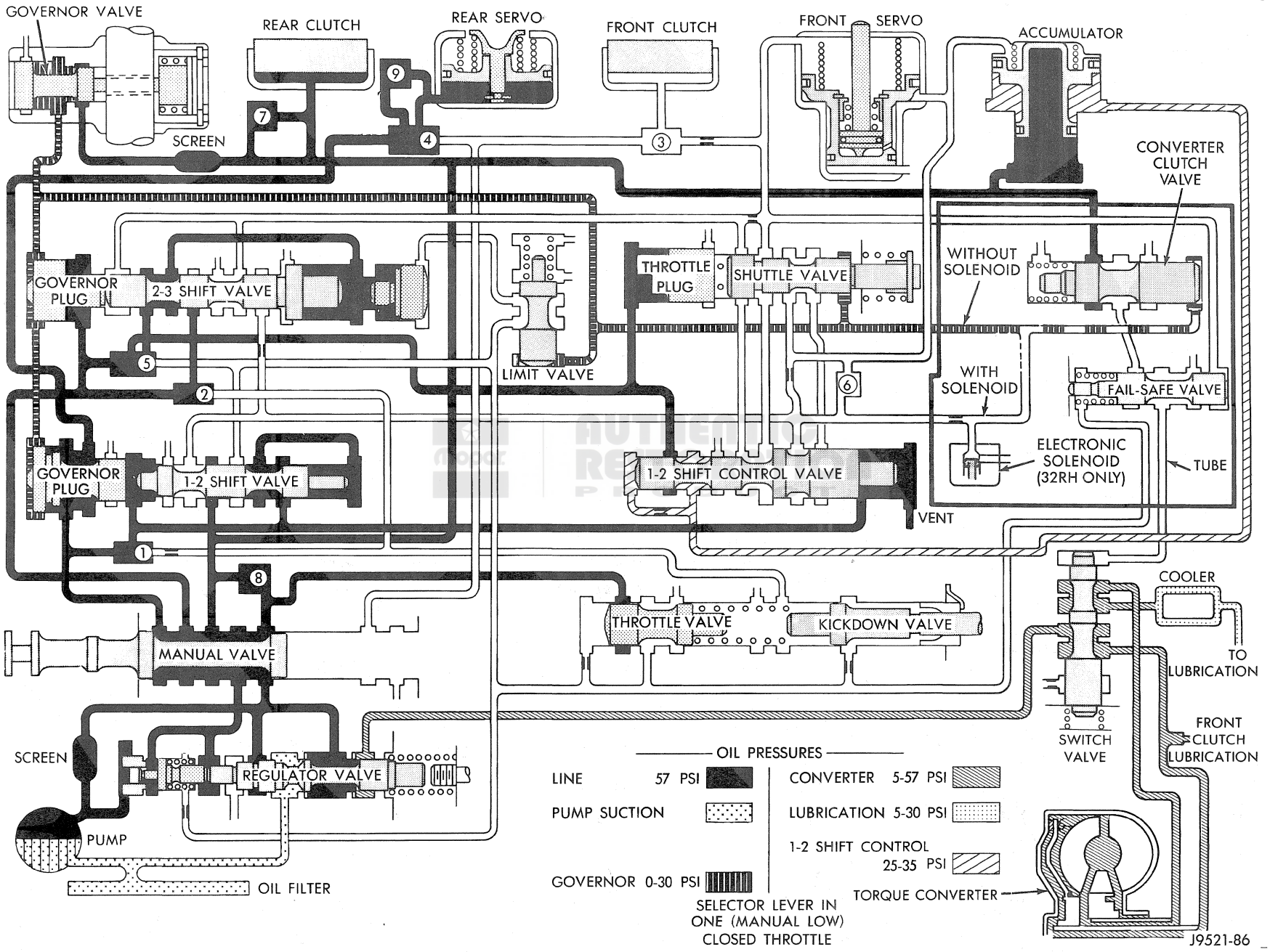




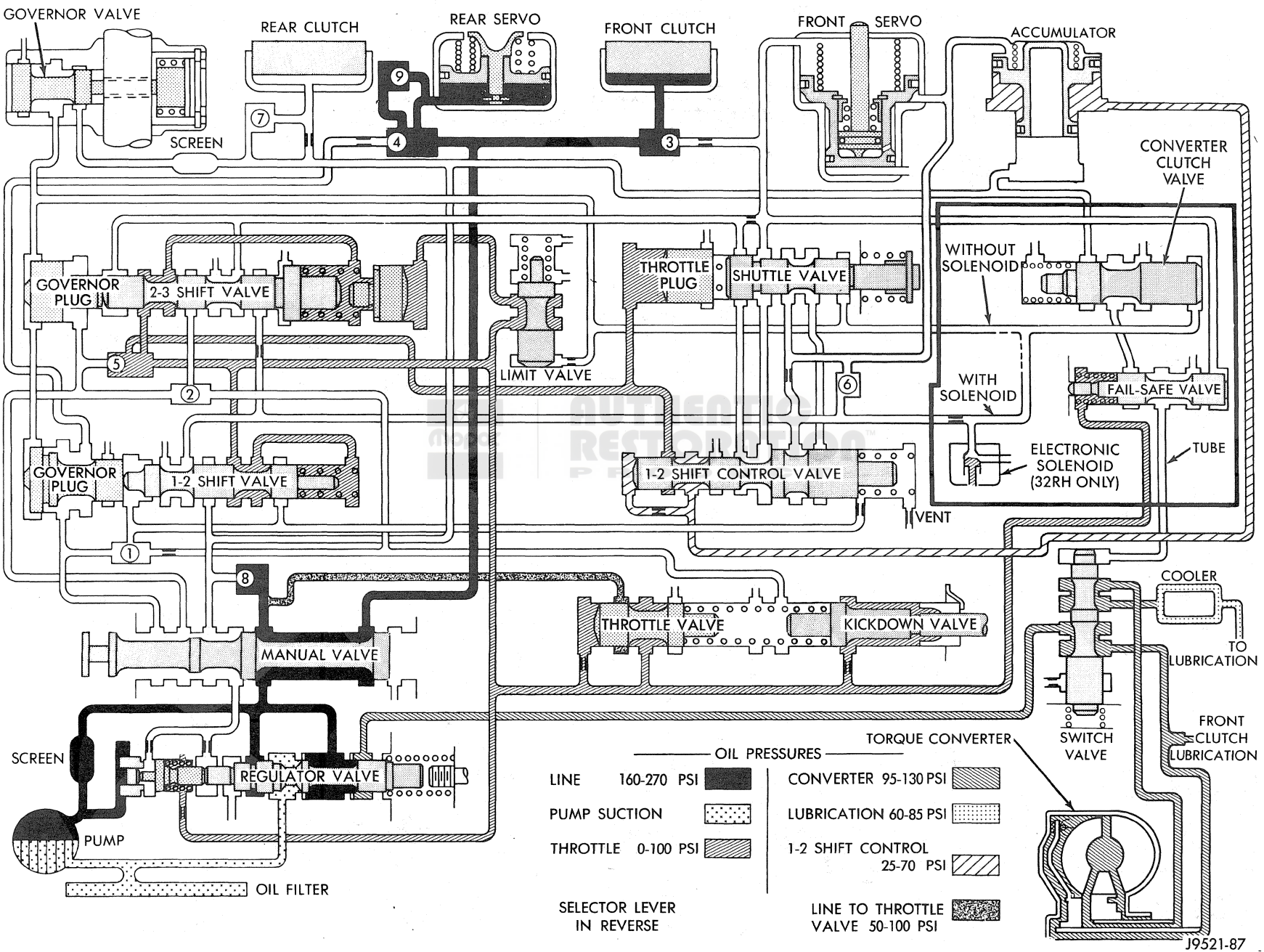
HYDRAULIC FLOW AT FULL THROTTLE 3-2 KICKDOWN



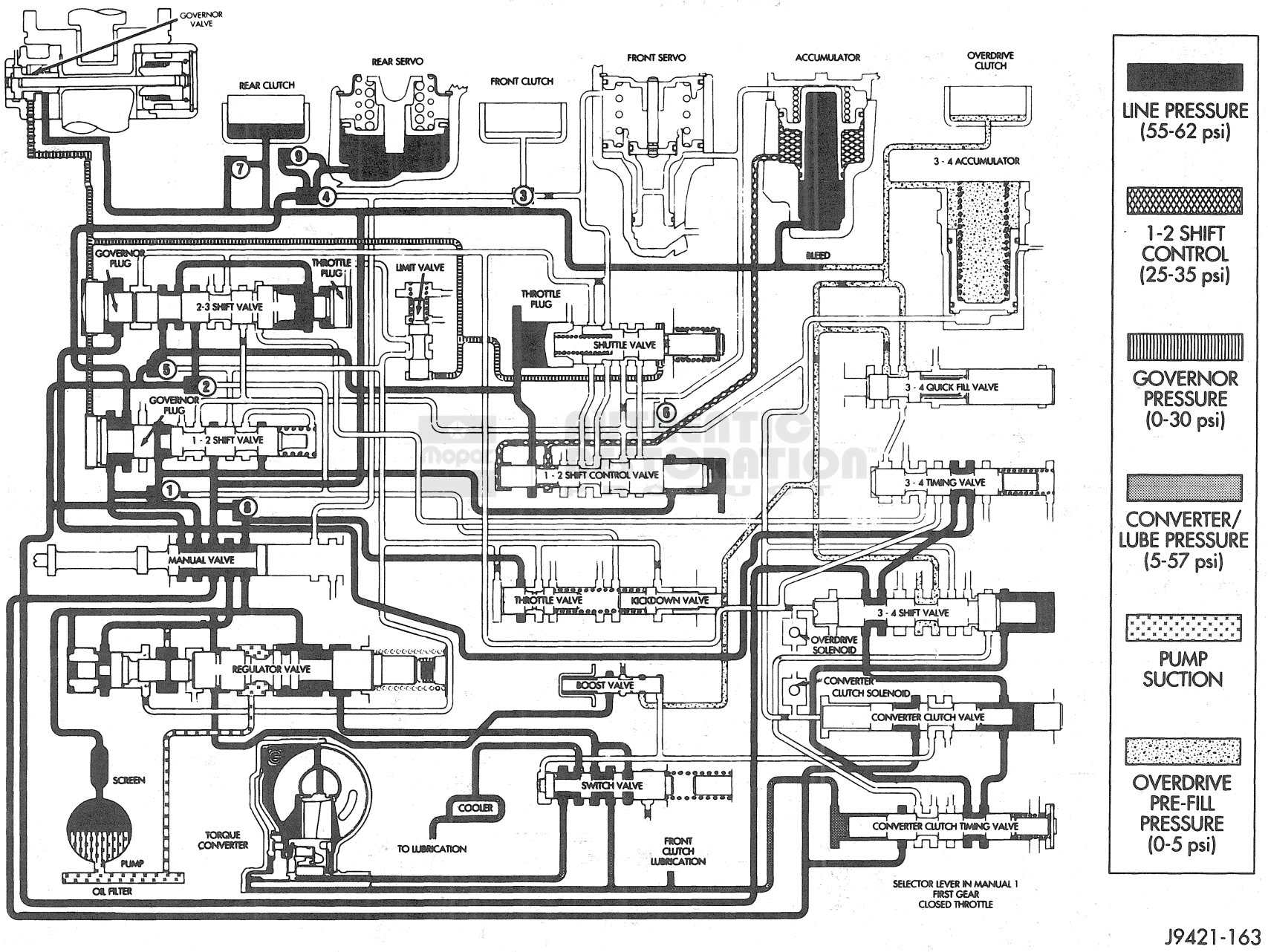
HYDRAULIC FLOW IN MANUAL SECOND



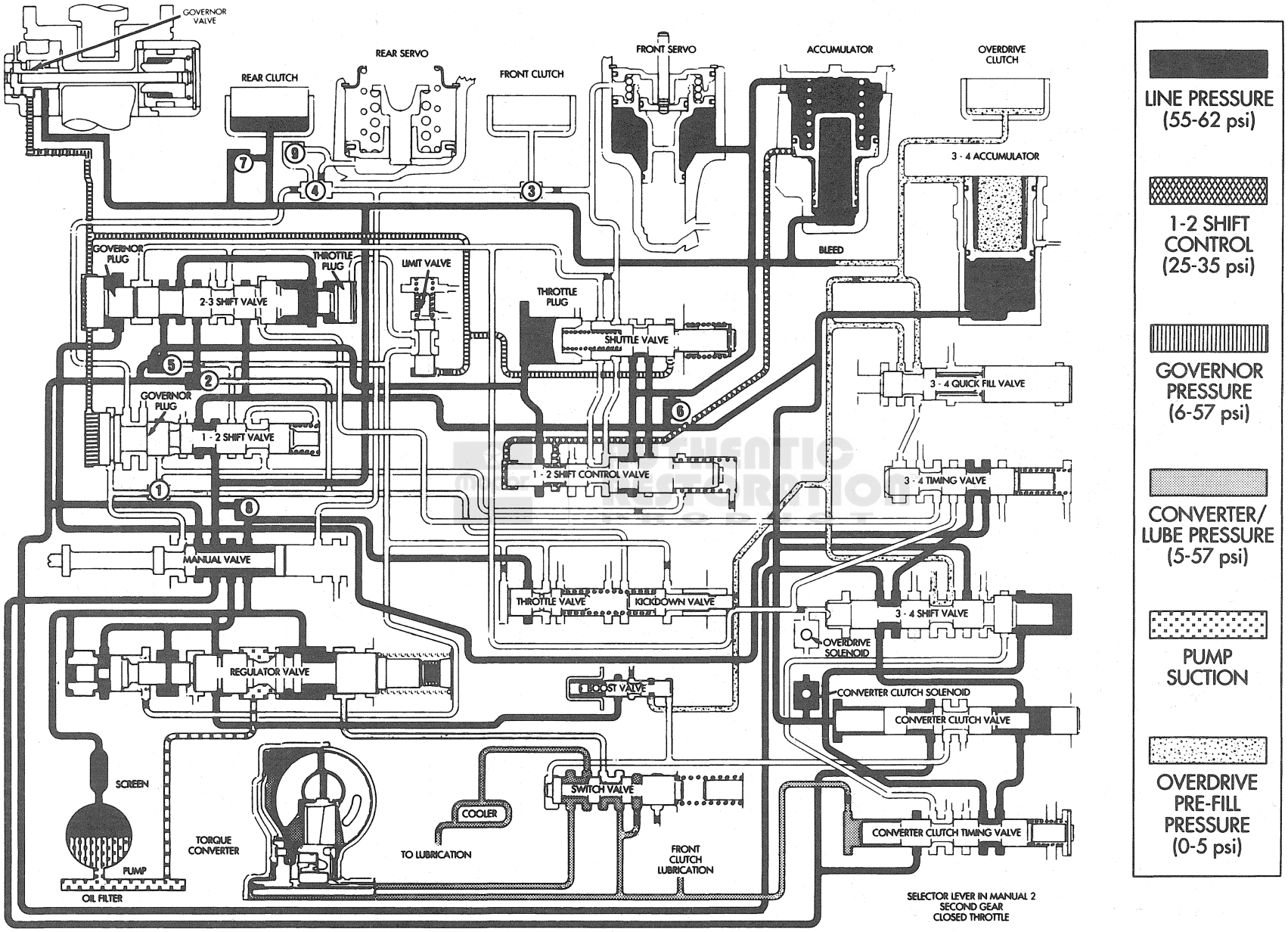
HYDRAULIC FLOW IN MANUAL LOW



HYDRAULIC FLOW IN REVERSE



HYDRAULIC FLOW IN MANUAL FIRST GEAR (1)



HYDRAULIC FLOW IN MANUAL SECOND GEAR (2)

SPECIFICATIONS

30RH AUTOMATIC TRANSMISSION

GENERAL

COMPONENT	METRIC	INCH
Oil pump gear tip clearance	0.089-0.190 mm	0.0035-0.0075 in.
Planetary end play	0.125-1.19 mm	0.001-0.047 in.
Input shaft end play	0.56-2.31 mm	0.022-0.091 in.
Clutch pack clearance/Front 4-disc.	1.70-3.40 mm	0.067-0.134 in.
Clutch pack clearance/Rear 4-disc.	0.635-1.14 mm	0.025-0.045 in.
Front clutch spring usage	1 spring	
Band adjustment from 72 in. lbs. Front band	Back off 2.5 turns	
Recommended fluid	Mopar, ATF Plus type 7176	

THRUST WASHER/SPACER/SNAP RING DIMENSIONS

COMPONENT	METRIC	INCH
Front clutch thrust washer (reaction shaft support hub)	1.55 mm	0.061 in.
Rear clutch thrust washer (clutch retainer)	1.55 mm	0.061 in.
Output shaft thrust plate (output shaft pilot hub)	1.5-1.6mm	0.060-0.063 in.
Output shaft thrust washer (rear clutch hub)	1.3-1.4 mm 1.7-1.8 mm 2.1-2.2 mm	0.052-0.054 in. 0.068-0.070 in. 0.083-0.086 in.
Rear clutch pack snap ring	1.5-1.6 mm 1.7-1.8 mm 1.9-2.0 mm	0.06-0.062 in. 0.068-0.070 in. 0.076-0.078 in.
Planetary geartrain snap ring (at front of output shaft)	1.0-1.1 mm 1.6-1.7 mm 2.1-2.2 mm	0.040-0.044 in. 0.062-0.066 in. 0.082-0.086 in.

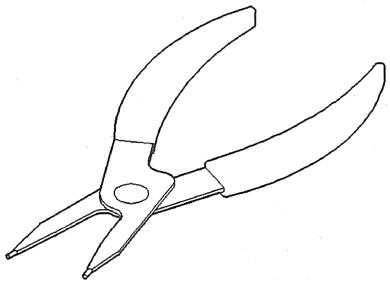
PRESSURE TEST—ALL

ITEM	RANGE	PRESSURE
Overdrive clutch	Fourth gear only	Pressure should be 469-496 kPa (68-72 psi) with closed throttle and increase to 620-896 kPa (90-130 psi) at 1/2 to 3/4 throttle.
Line pressure (at accumulator)	Closed throttle	372-414 kPa (54-60 psi).
Front servo	Third gear only	No more than 21 kPa (3 psi) lower than line pressure.
Rear servo	1 range R range	No more than 21 kPa (3 psi) lower than line pressure. 1103 kPa (160 psi) at idle, builds to 1862 kPa (270 psi) at 1600 rpm.
Governor	D range closed throttle	Pressure should respond smoothly to changes in mph and return to 0-7 kPa (0-1.5 psi) when stopped with transmission in D, 1, 2. Pressure above 7 kPa (1.5 psi) at stand still will prevent transmission from downshifting.

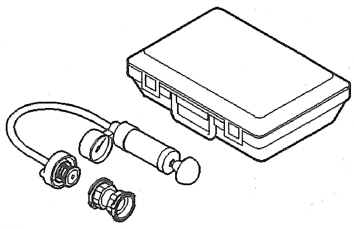
SPECIFICATIONS (Continued)

TORQUE—ALL

DESCRIPTION	TORQUE
Bolt, torque convertor	31 N·m (23 ft. lbs.)
Bolt/nut, crossmember	68 N·m (50 ft. lbs.)
Bolt, driveplate to crankshaft	75 N·m (55 ft. lbs.)
Plug, front band reaction	17 N·m (13 ft. lbs.)
Locknut, front band adj.	34 N·m (25 ft. lbs.)
Switch, park/neutral	34 N·m (25 ft. lbs.)
Bolt, fluid pan	17 N·m (13 ft. lbs.)
Bolt, oil pump	20 N·m (15 ft. lbs.)
Bolt, overrunning clutch cam	17 N·m (13 ft. lbs.)
Bolt, O/D to trans.	34 N·m (25 ft. lbs.)
Bolt, O/D piston retainer	17 N·m (13 ft. lbs.)
Plug, pressure test port	14 N·m (10 ft. lbs.)
Bolt, reaction shaft support	20 N·m (15 ft. lbs.)
Locknut, rear band	41 N·m (30 ft. lbs.)
Bolt. speedometer adapter	11 N·m (8 ft. lbs.)
Screw, fluid filter	4 N·m (35 in. lbs.)
Bolt, valve body to case	12 N·m (100 in. lbs.)



Snap-ring Plier—6823

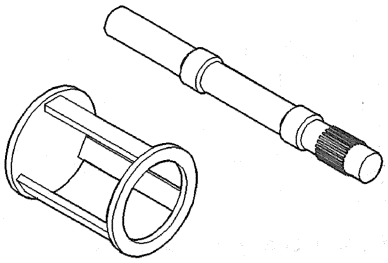


7700-8011c9c4

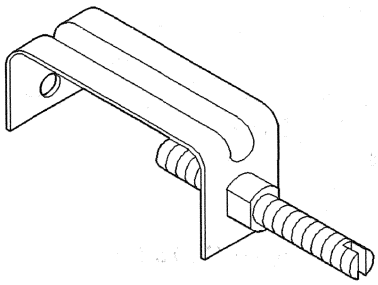
Pressure Tester—7700

SPECIAL TOOLS

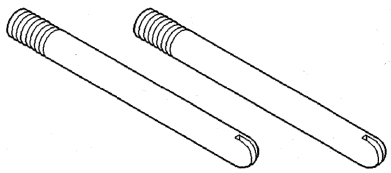
30RH AUTOMATIC TRANSMISSION



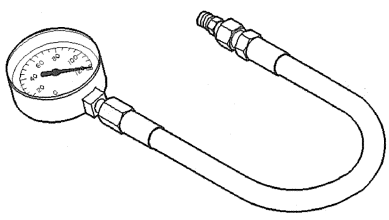
Spring Compressor and Alignment Shaft—6227



Retainer, Detent Ball and Spring—6583

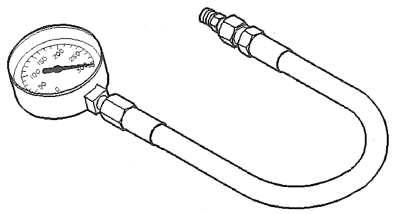


Extension Housing Pilot—C-3288-B

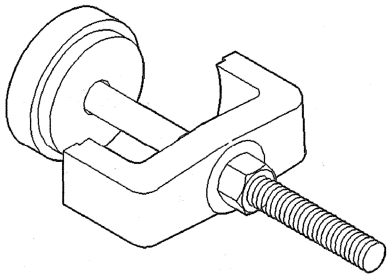


Pressure Gauge—C-3292

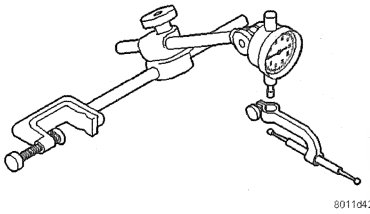
SPECIAL TOOLS (Continued)



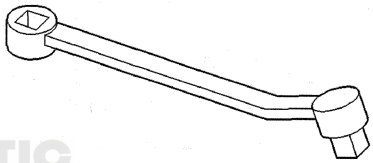
Pressure Gauge—C-3293SP



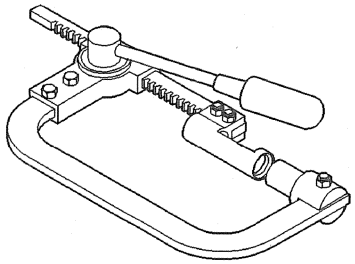
Spring Compressor—C-3575-A



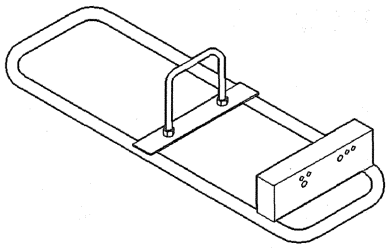
Dial Indicator—C-3339



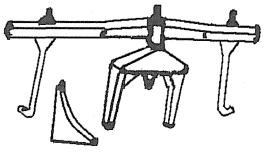
Adapter, Band Adjuster—C-3705



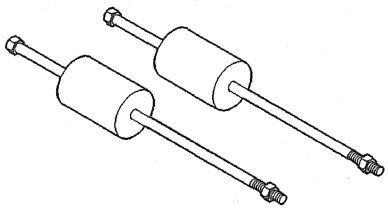
Spring Compressor—C-3422-B



Transmission Repair Stand—C-3750-B

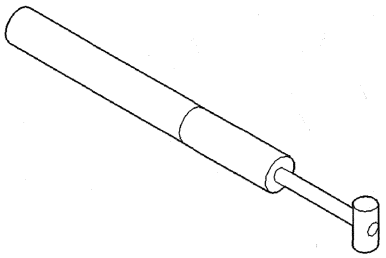


Fixture, Engine Support—C-3487-A

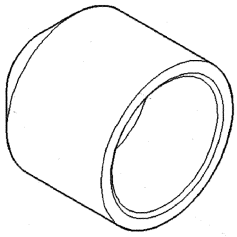


Puller, Slide Hammer—C-3752

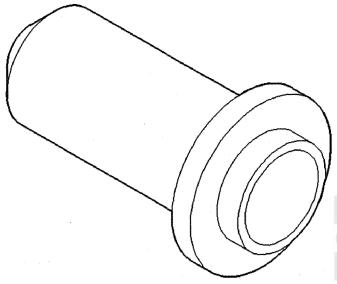
SPECIAL TOOLS (Continued)



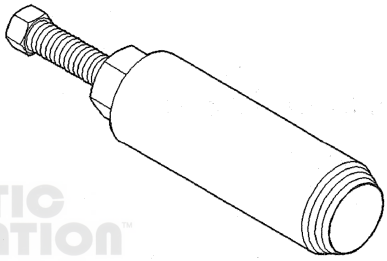
Gauge, Throttle Setting—C-3763



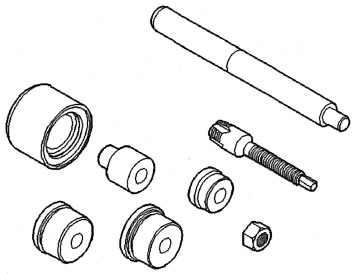
Seal Installer—C-3972-A



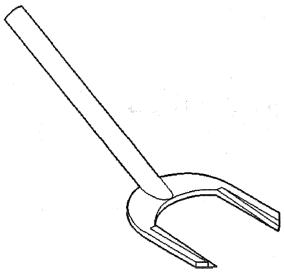
Seal Installer—C-3860-A



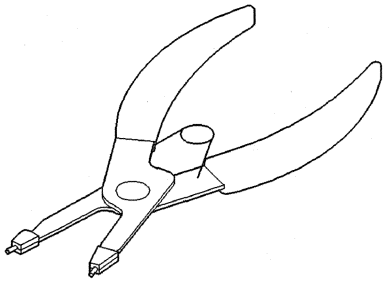
Seal Puller—C-3981-B



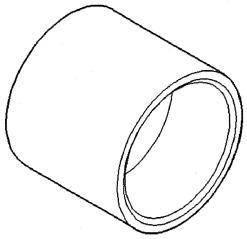
Bushing Remover/Intsaller Set—C-3887-B



Seal Remover—C-3985-B

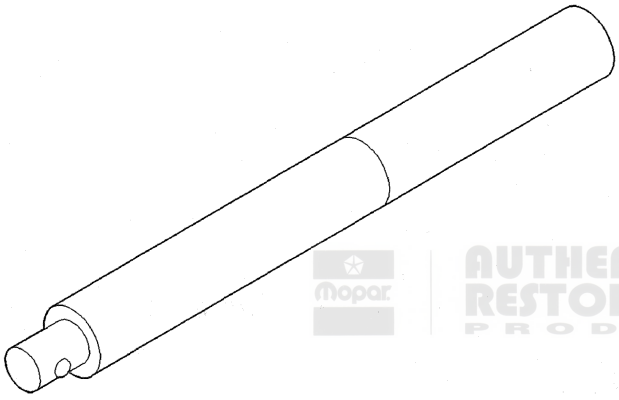


Snap-ring Plier—C-3915

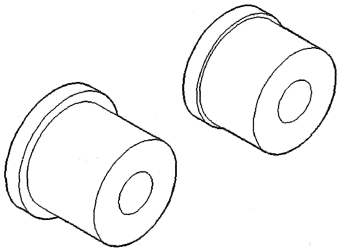


Installer—C-3995-A

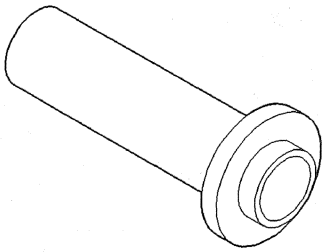
SPECIAL TOOLS (Continued)



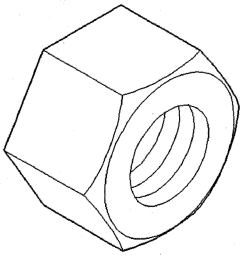
Universal Handle—C-4171



Remover/Installer—C-4470



Seal Installer—C-4193-A



Nut, Bushing Remover—SP-1191

Mopar AUTHENTIC RESTORATION PRODUCT

AUTOMATIC TRANSMISSION—AW4

INDEX

page

GENERAL INFORMATION
RECOMMENDED FLUID CAPACITY 170
TRANSMISSION IDENTIFICATION 170
TRANSMISSION RANGES AND SHIFT LEVER POSITIONS 170
DESCRIPTION AND OPERATION
ELECTRONIC CONTROLS 170
FIRST/SECOND/THIRD/REVERSE GEAR COMPONENTS 172
FORTH GEAR OVERDRIVE COMPONENTS . . . 172
GEARTRAIN OPERATION AND APPLICATION CHARTS 173
HYDRAULIC SYSTEM 174
OIL PUMP 174
SENSORS 171
TORQUE CONVERTER 171
TRANSMISSION CONTROL MODULE (TCM) . . 170
TRANSMISSION DESCRIPTION 170
TRANSMISSION VALVE BODY COMPONENTS . . . 174
TRANSMISSION VALVE BODY SOLENOIDS . . 171
DIAGNOSIS AND TESTING
FLOW TESTING TRANSMISSION MAIN COOLER . 186
GENERAL DIAGNOSIS INFORMATION 180
HYDRAULIC PRESSURE TEST 180
MANUAL SHIFTING TEST 180
PARK/NEUTRAL POSITION SWITCH 186
PRELIMINARY INSPECTION AND ADJUSTMENT 180
PRESSURE TEST ANALYSIS 181
SERVICE DIAGNOSIS 184
SPEED SENSOR TESTING 186
STALL SPEED TEST ANALYSIS 182
TEST PROCEDURE 182
TIME LAG TEST ANALYSIS 183
TIME LAG TEST 182
TORQUE CONVERTER STALL TEST 182
TORQUE CONVERTER STATOR CLUTCH INSPECTION 186
SERVICE PROCEDURES
CHECKING FLUID CONDITION 187
CHECKING FLUID LEVEL 187
REFILLING AFTER OVERHAUL OR FLUID/FILTER CHANGE 188
REVERSE FLUSHING MAIN AND AUXILIARY COOLERS AND COOLER LINES 189
TRANSMISSION CONTROL MODULE (TCM) SERVICE 188
TRANSMISSION COOLER LINE FITTINGS 189
TRANSMISSION COOLER 188

page

REMOVAL AND INSTALLATION
ACCUMULATOR PISTONS AND SPRINGS 196
ADAPTER HOUSING SEAL REPLACEMENT . . 199
MANUAL VALVE SHAFT SEAL REPLACEMENT . . . 195
OIL PUMP SEAL 204
PARK ROD AND PAWL SERVICE 199
PARK/NEUTRAL POSITION SWITCH 190
SECOND COAST BRAKE SERVO OVERHAUL . 198
SOLENOID HARNESS ADAPTER SEAL 192
SPEED SENSOR REPLACEMENT 200
SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR 200
THROTTLE POSITION SENSOR (TPS) SERVICE . 201
TRANSMISSION AND TORQUE CONVERTER . 202
TRANSMISSION CONTROL MODULE 191
TRANSMISSION THROTTLE CABLE REPLACEMENT 201
TRANSMISSION VALVE BODY SOLENOIDS . . 191
TRANSMISSION VALVE BODY 193
DISASSEMBLY AND ASSEMBLY
DIRECT CLUTCH OVERHAUL 251
FIRST/REVERSE BRAKE PISTON AND TRANSMISSION CASE OVERHAUL 272
FORWARD CLUTCH OVERHAUL 256
FRONT PLANETARY GEAR OVERHAUL 261
MANUAL VALVE SHAFT OVERHAUL 239
OIL PUMP OVERHAUL 237
OVERDRIVE PLANETARY GEAR AND CLUTCH OVERHAUL 241
OVERDRIVE SUPPORT OVERHAUL 248
PLANETARY/BRAKE PACK/OUTPUT SHAFT . . 268
SECOND BRAKE OVERHAUL 265
SUN GEAR AND NO. 1 ONE–WAY CLUTCH OVERHAUL 263
TRANSMISSION VALVE BODY OVERHAUL . . . 275
TRANSMISSION 205
CLEANING AND INSPECTION
TRANSMISSION PARTS CLEANING AND INSPECTION 277
ADJUSTMENTS
PARK INTERLOCK CABLE ADJUSTMENT 279
SHIFT CABLE ADJUSTMENT 278
TRANSMISSION THROTTLE CABLE REPLACEMENT 277
SPECIFICATIONS
AW-4 AUTOMATIC TRANSMISSION 279
SPECIAL TOOLS
OVERHAUL SERVICE TOOLS 287
AW-4 287

GENERAL INFORMATION

TRANSMISSION RANGES AND SHIFT LEVER POSITIONS

The AW–4 transmission has six ranges and shift lever positions. Park, Reverse and Neutral are conventional and mechanically operated. The 1–2, 3 and D ranges provide electronically controlled shifting.

The 1–2 position provides first and second gear only. The 3 position provides first, second and third gear.

The D range provides first through fourth gear. Overdrive fourth gear range is available only when the shift lever is in D position (Fig. 1).

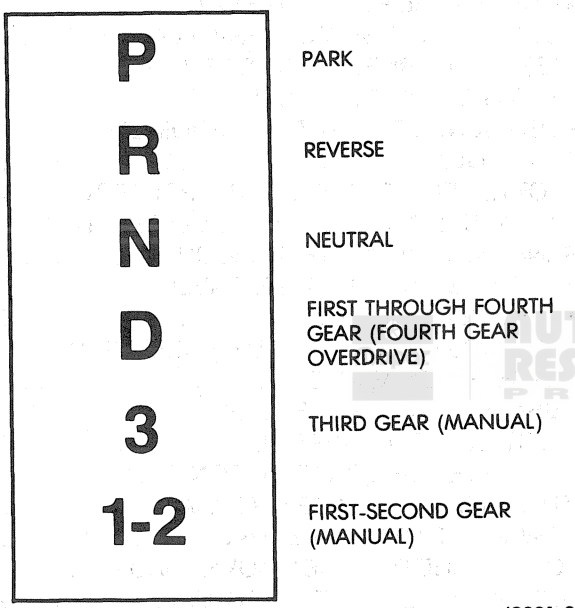


Fig. 1 AW–4 Shift Lever Positions And Transmission Ranges

TRANSMISSION IDENTIFICATION

The transmission I.D. plate is attached to the case (Fig. 2). The plate contains the transmission serial and model numbers. Refer to the information on this plate when ordering service parts.

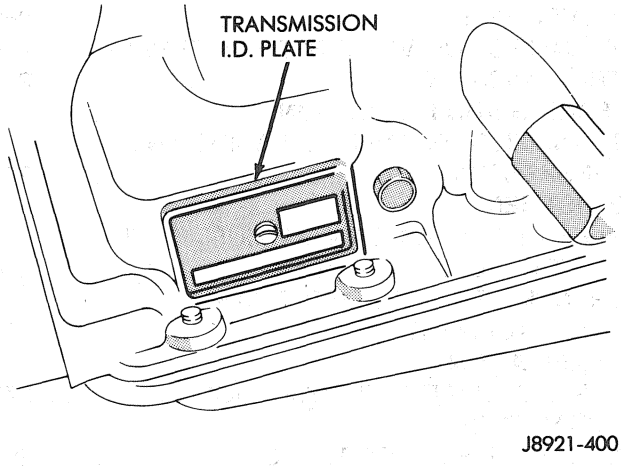


Fig. 2 Transmission Identification

RECOMMENDED FLUID CAPACITY

Recommended and preferred fluid for the AW–4 transmission is Mopar Dexron IIE/Mercon.

Mopar Dexron II can be used but only in emergency situations where Mercon fluid is not available.

Approximate refill capacity for the AW–4 is 8.0 liters (16.9 pints).

DESCRIPTION AND OPERATION

TRANSMISSION DESCRIPTION

The AW–4 is a 4–speed, electronically controlled automatic transmission (Fig. 3). The AW–4 is used with the 4.0L engine.

Running gear consists of an oil pump, planetary gear sets, clutch and brake units, hydraulic accumulators, a valve body with electrical solenoids and a transmission control module (TCM). Cables are used for shift and throttle pressure control. A park/neutral position switch permits engine starting in Park and Neutral range only.

The valve body solenoids are controlled by signals from the transmission control module (TCM). Signal sequence is determined by vehicle speed and throttle position.

Fourth gear is an 0.75:1 ratio overdrive range. First, second, third and reverse gear are conventional ranges. Third gear ratio is 1:1. A separate planetary gear set provides overdrive operation in fourth gear.

ELECTRONIC CONTROLS

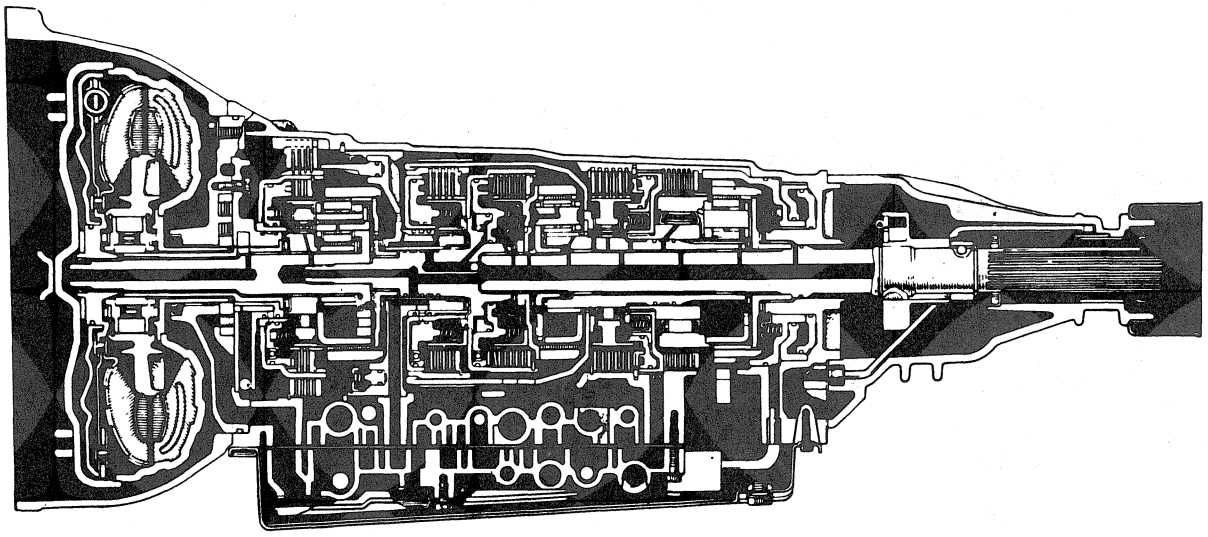
The AW–4 is electronically controlled in 1, 2, 3 and D ranges. Controls consist of the transmission control module (TCM), valve body solenoids and various sensors. The sensors monitor vehicle speed, throttle opening, shift lever position and brake pedal application.

TRANSMISSION CONTROL MODULE (TCM)

The module determines shift and converter clutch engagement timing based on signals from sensors. The valve body solenoids are activated, or deactivated accordingly.

The TCM has a self diagnostic program. Component and circuitry malfunctions can be diagnosed with the DRB scan tool. Once a malfunction is noted and stored in control module memory, it is retained even after the problem has been corrected. To cancel a stored malfunction, disconnect and reconnect the "Trans." fuse in the module harness.

DESCRIPTION AND OPERATION (Continued)



J8921-398

Fig. 3 AW–4 Automatic Transmission

TRANSMISSION VALVE BODY SOLENOIDS

The solenoids are mounted on the valve body and operated by the TCM. The solenoids control operation of the converter clutch and shift valves in response to input signals from the module.

SENSORS

Sensors include:

- throttle position sensor (TPS)
- transmission speed sensor
- vehicle speed sensor
- park/neutral position switch
- brake switch

The throttle position sensor is mounted on the throttle body. It electronically determines throttle position and relays this information to the transmission control module to determine shift points and converter clutch engagement.

The transmission speed sensor consists of a rotor and magnet on the transmission output shaft and a switch in the extension housing or adapter. The sensor switch is activated each time the rotor and magnet complete one revolution. Sensor signals are sent to the transmission control module.

The park/neutral position switch is mounted on the valve body manual shaft. The switch signals shift linkage and manual valve position to the transmission control module through an interconnecting harness. The switch prevents engine starting in all gears other than Park or Neutral.

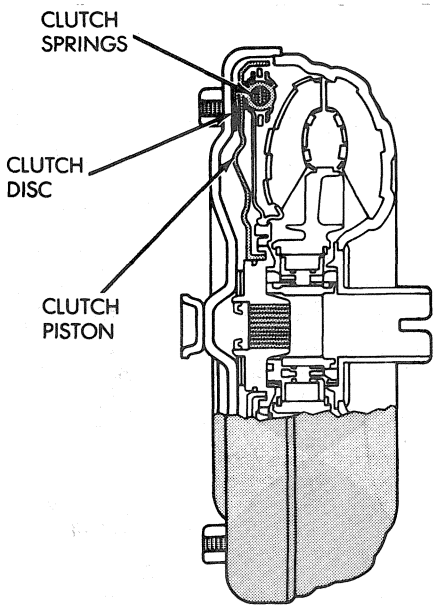
The brake switch is in circuit with the torque converter clutch solenoid. The switch disengages the converter clutch whenever the brakes are applied. The switch is mounted on the brake pedal bracket and signals the transmission control module when the pedal is pressed or released.

TORQUE CONVERTER

A three element torque converter is used for all applications. The converter contains an impeller, stator, and turbine.

The AW–4 converters are all equipped with a converter clutch mechanism. The clutch consists of a sliding clutch piston, clutch springs and the clutch disc material (Fig. 4). The clutch provides optimum torque transfer and economy when engaged.

The clutch disc is attached to the converter front cover. The clutch piston and clutch springs are attached to the turbine hub. The springs dampen engine firing impulses and loads during the initial phase of converter clutch engagement.



J8921-401

Fig. 4 Torque Converter (With Clutch)

DESCRIPTION AND OPERATION (Continued)

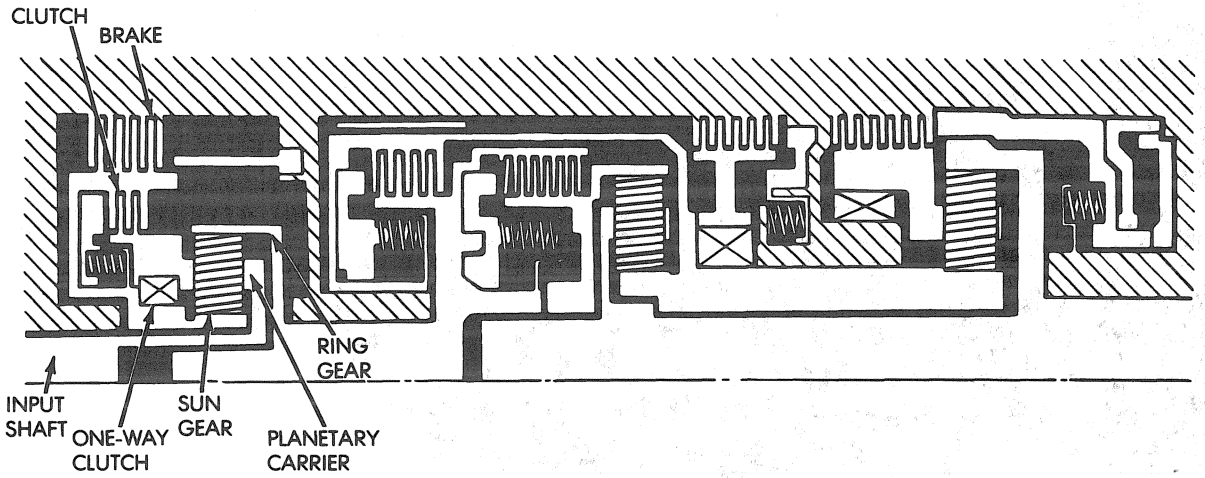


Fig. 5 Fourth Gear Overdrive Components

Clutch engagement is controlled by transmission valve body solenoid number three and by the converter clutch relay valve. The solenoid channels line pressure to the clutch through the relay valve at clutch engagement speeds.

Torque converter clutch engagement occurs in second gear in 1–2 position; third gear in 3 position and third and fourth gear in D position.

FORTH GEAR OVERDRIVE COMPONENTS

The overdrive system consists of the input shaft, one–way clutch, planetary sun gear, ring gear, planetary carrier, overdrive clutch and overdrive brake (Fig. 5). The overdrive elements are controlled and applied through transmission valve body solenoid number two.

In fourth gear, the overdrive brake prevents the overdrive sun gear from turning. The overdrive input shaft and planetary carrier rotate as a unit. The sun gear and overdrive direct clutch drum are in mesh and operate as a single unit. The direct clutch splines function as the hub for the overdrive brake. The one–way clutch outer race is in mesh with the planetary carrier. The inner race is fixed to the sun gear shaft.

FIRST/SECOND/THIRD/REVERSE GEAR COMPONENTS

First through third and reverse gear components are outlined in (Fig. 6).

The input shaft is meshed with the direct clutch hub and the forward clutch drum. These elements rotate as a unit. The forward clutch hub rotates as a unit with the front planetary ring gear. The direct clutch drum is meshed with the forward end of the planetary sun gear.

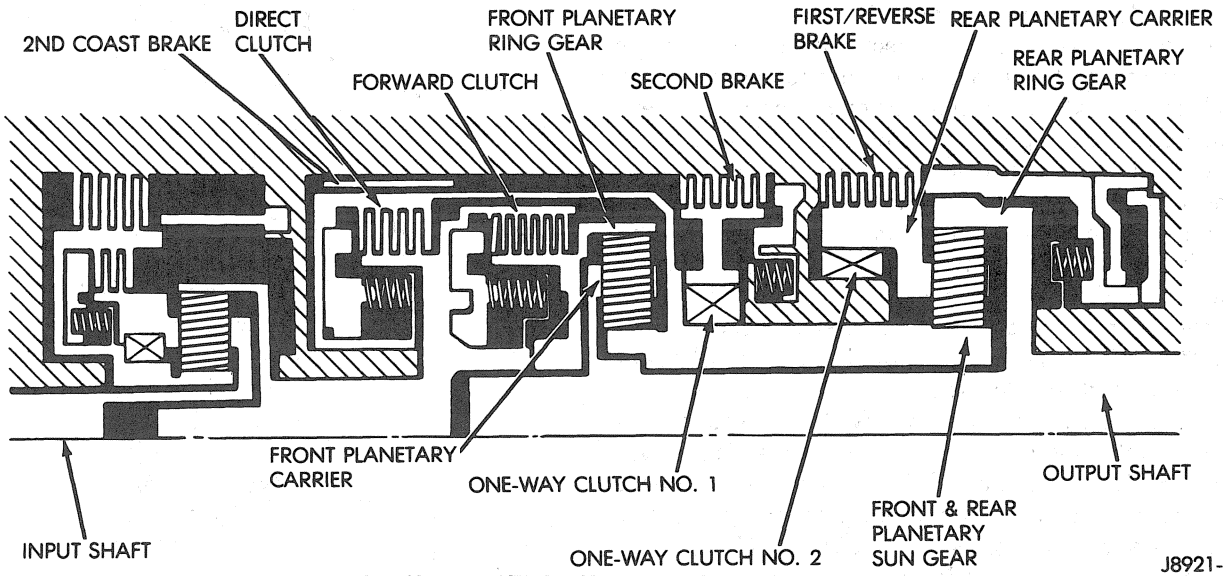


Fig. 6 First/Second/Third/Reverse Gear Components

DESCRIPTION AND OPERATION (Continued)

Shift Lever Position	Gear	Valve Body Solenoid No. 1	Valve Body Solenoid No. 2	OVERDRIVE CLUTCH	FORWARD CLUTCH	DIRECT CLUTCH	OVERDRIVE BRAKE	SECOND COAST BRAKE	SECOND BRAKE	FIRST/ REVERSE BRAKE	OVERDRIVE ONE-WAY CLUTCH	NO.1 ONE-WAY CLUTCH	NO.2 ONE-WAY CLUTCH
P	Park	ON	OFF	•									
R	Reverse	ON	OFF	•		•				•	•		
N	Neutral	ON	OFF	•									
D	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•				•		•	•	
	Third	OFF	ON	•	•	•			•		•		
	OD	OFF	OFF		•	•	•		•				
3	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•			•	•		•	•	
	Third	OFF	ON	•	•	•			•		•		
1-2	First	ON	OFF	•	•					•	•		•
	Second	ON	ON	•	•			•	•		•	•	

• = Applied J8921-405

Component Application Chart

The second brake hub serves as the outer race of one–way clutch No. 1. The clutch inner race is locked with the front/rear sun gear. The inner race of one–way clutch No. 2 is splined to the transmission case and is locked. The outer race rotates as a unit with the rear planetary carrier.

The rear planetary ring gear is splined to the output shaft. The front planetary carrier and rear carrier ring gear are meshed and rotate as a unit with the output shaft.

GEARTRAIN OPERATION AND APPLICATION CHARTS

Operation and application of the first through fourth and reverse gear elements are outlined in the function and application charts.

The Component Function Chart describes basic function of various geartrain elements. The Component Application Chart indicates which elements (including valve body solenoids), are applied in the various gear ranges.

NOMENCLATURE	FUNCTION
Overdrive Direct Clutch	Connects overdrive sun gear and overdrive carrier
Overdrive Brake	Prevents overdrive sun gear from turning either clockwise or counterclockwise
Overdrive One-Way Clutch	When transmission is driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch	Connects input shaft and front ring gear
Direct Clutch	Connects input shaft and front and rear sun gear
Second Coast Brake	Prevents front and rear sun gear from turning either clockwise or counterclockwise
Second Brake	Prevents outer race of No. 1 one-way clutch from turning either clockwise or counterclockwise, thus preventing front and rear sun gear from turning counterclockwise
First/Reverse Brake	Prevents rear planetary carrier from turning either clockwise or counterclockwise
One-Way Clutch No. 1	When second brake is operating, prevents front and rear sun gear from turning counterclockwise
One-Way Clutch No. 2	Prevents rear planetary carrier from turning counterclockwise

J8921-404

Component Function Chart

DESCRIPTION AND OPERATION (Continued)

HYDRAULIC SYSTEM

The hydraulic system consists of the pump, valve body and solenoids, and four hydraulic accumulators. The oil pump provides lubrication and operating pressure.

The valve body controls application of the clutches, brakes, second coast band, and the converter clutch. The valve body solenoids control sequencing of the 1–2, 2–3 and 3–4 shift valves. The solenoids are activated by signals from the transmission control module.

The accumulators are used in the clutch and brake feed circuits to control initial apply pressure. Spring loaded accumulator pistons modulate the initial surge of apply pressure for smooth engagement.

OIL PUMP

A gear–type oil pump is used. The pump gears are mounted in the pump body. The pump drive gear is operated by the torque converter hub. Drive tangs on the hub engage in drive slots in the drive gear.

TRANSMISSION VALVE BODY COMPONENTS

Transmission operating pressure is supplied to the clutch and brake apply circuits through the transmission valve body. The valve body consists of an upper body, lower body, separator plate and upper and lower gaskets (Fig. 7). The various spool valves, sleeves, plugs and springs are located within the two body sections.

The manual valve, 1–2 shift valve, primary regulator valve, accumulator control valve, check balls, solenoids and oil strainers are located in the lower body section (Fig. 8). The remaining control and shift valves plus check balls and one additional oil strainer are located in the upper body section (Fig. 9).

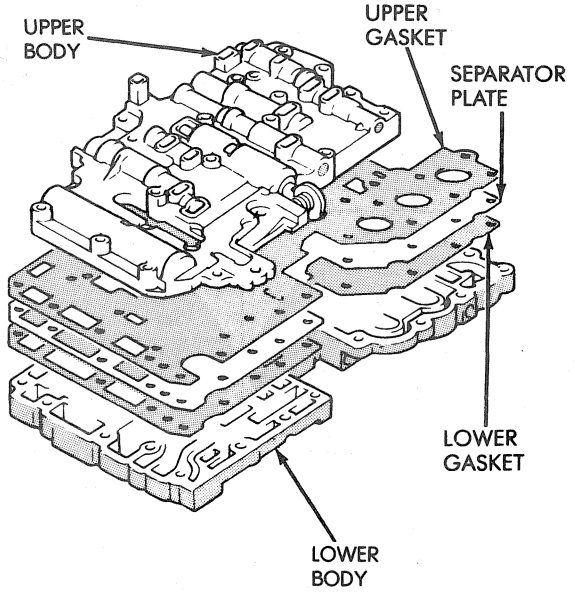


Fig. 7 Two–Section Transmission Valve Body

MANUAL VALVE

The manual valve is operated by the gearshift linkage. The valve diverts fluid to the apply circuits according to shift lever position (Fig. 10).

PRIMARY REGULATOR VALVE

The primary regulator valve (Fig. 11) modulates line pressure to the clutches and brakes according to engine load. The valve is actuated by throttle valve pressure.

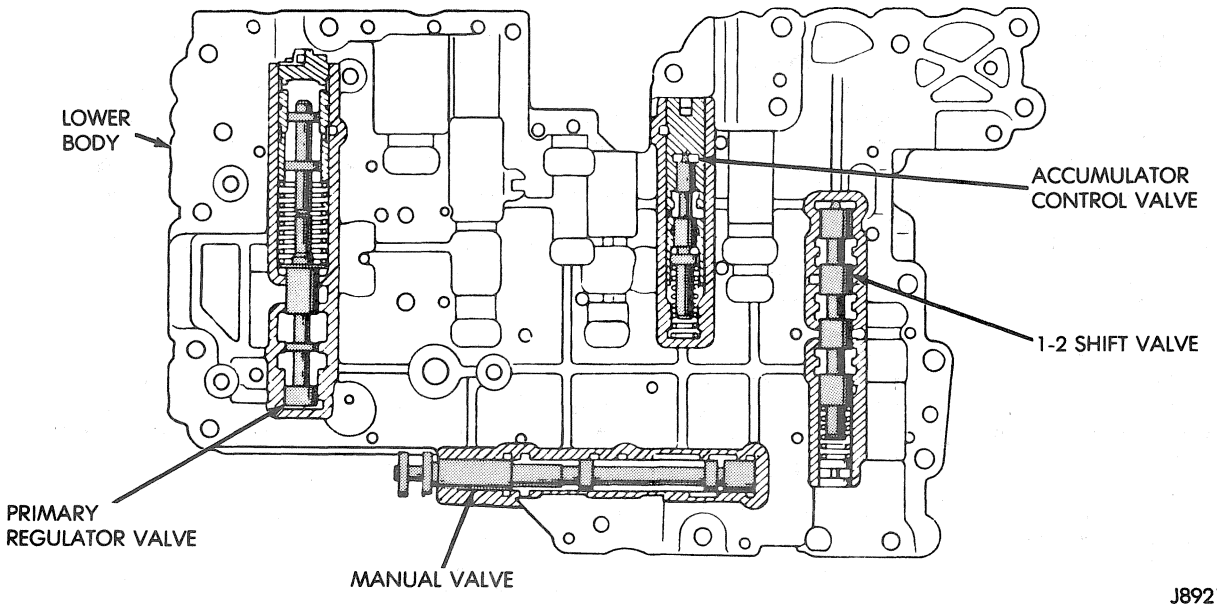


Fig. 8 Upper Body Components

DESCRIPTION AND OPERATION (Continued)

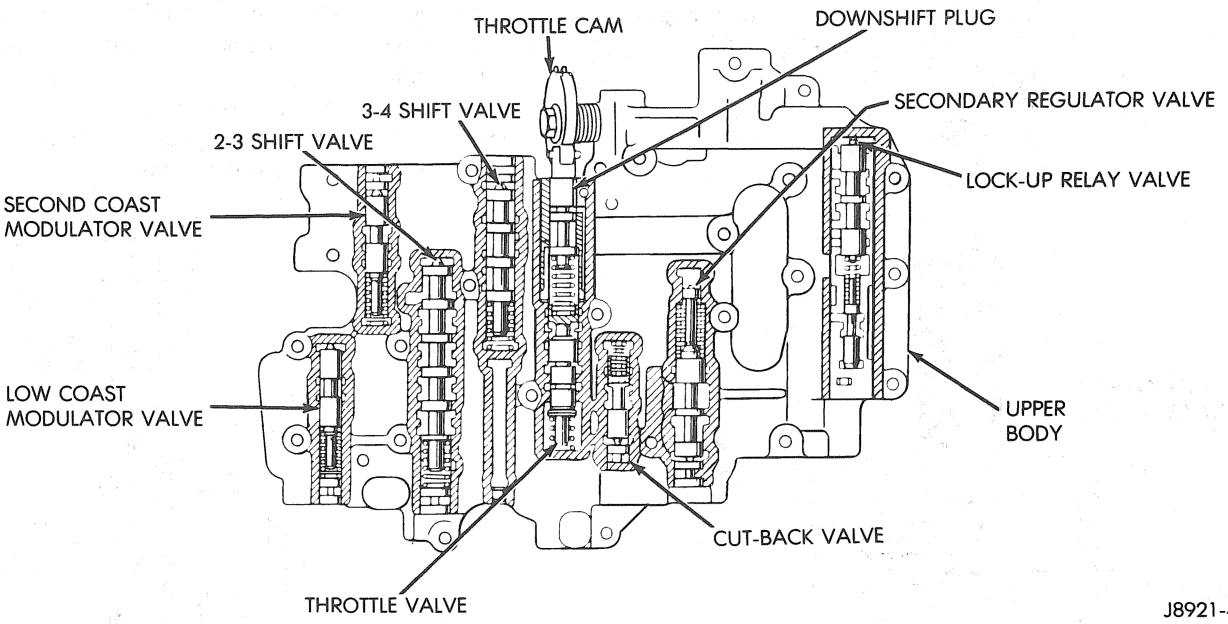


Fig. 9 Lower Body Components

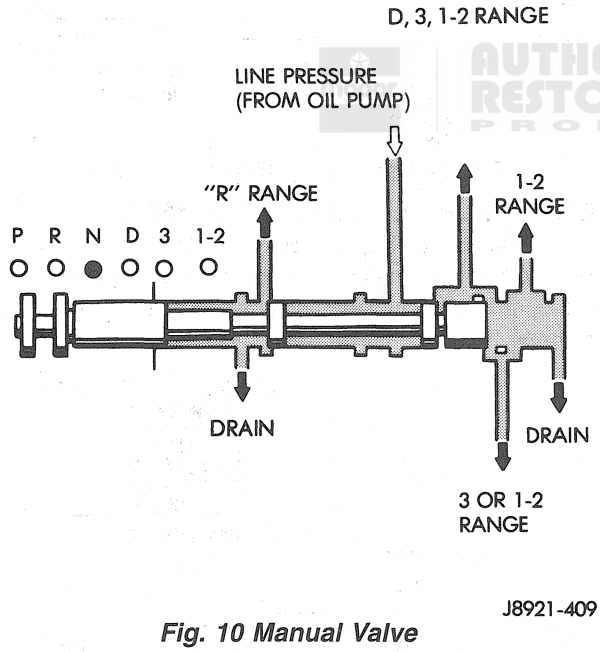


Fig. 10 Manual Valve

During high load operation, the valve increases line pressure to maintain positive clutch and brake engagement. At light load, the valve decreases line pressure just enough to maintain smooth engagement.

THROTTLE VALVE AND DOWNSHIFT PLUG

The throttle valve and downshift plug (Fig. 12) control throttle pressure to the primary regulator valve.

The downshift plug and throttle valve are operated by the throttle valve cam and throttle cable in response to engine throttle position. Throttle valve

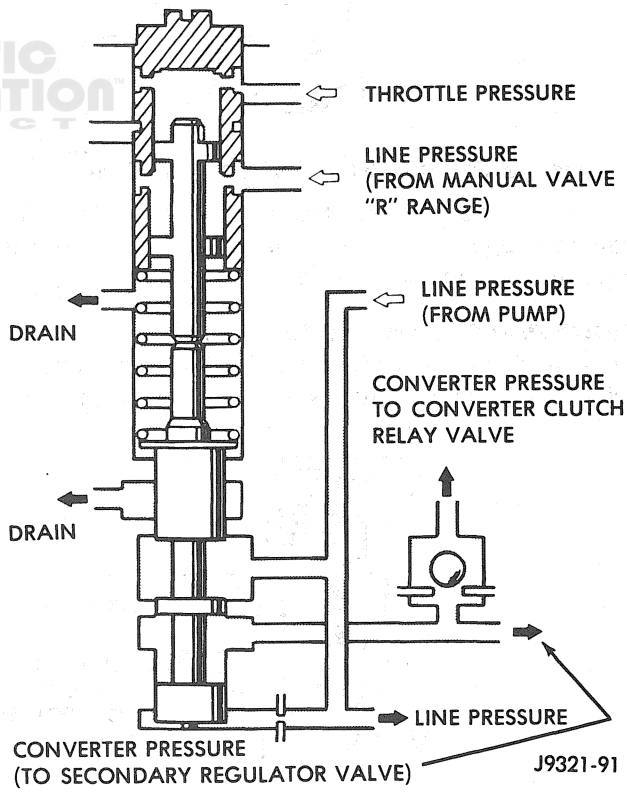


Fig. 11 Primary Regulator Valve

pressure is also modulated by the cut–back valve in second, third and fourth gear ranges.

CUT–BACK VALVE

The cut–back valve (Fig. 13) helps prevent excessive pump pressure buildup in second, third and fourth gear. The valve is actuated by throttle pressure and by line

DESCRIPTION AND OPERATION (Continued)

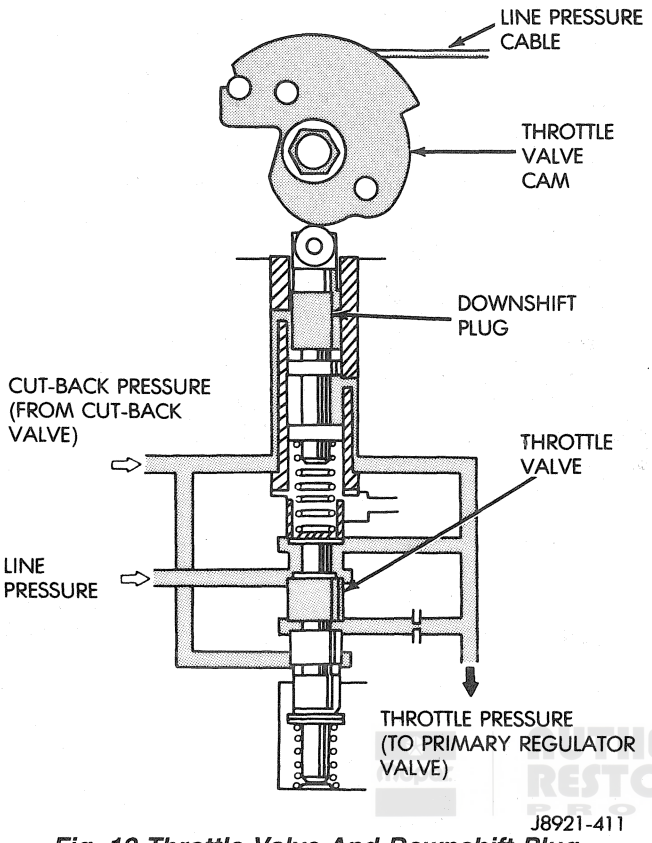


Fig. 12 Throttle Valve And Downshift Plug

pressure from the second brake. The valve also helps regulate line pressure by controlling the amount of cut–back pressure to the throttle valve.

SECONDARY REGULATOR VALVE

The secondary regulator valve (Fig. 14) regulates converter clutch and transmission lubrication pressure.

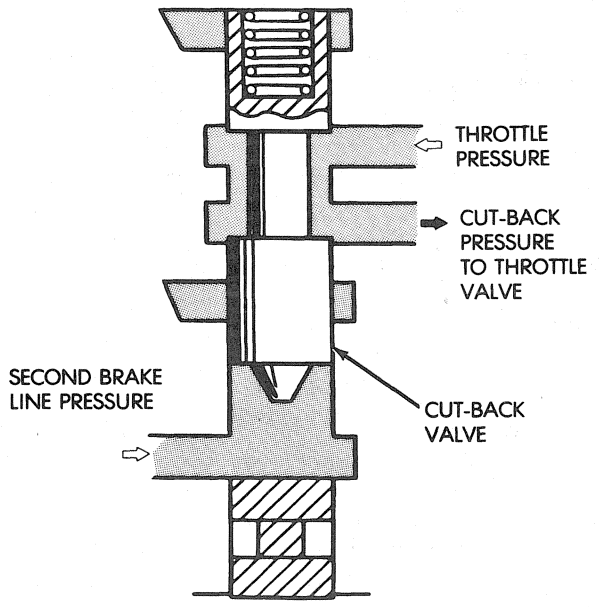


Fig. 13 Cut–Back Valve

When primary regulator valve pressure exceeds requirements for clutch engagement or transmission lubrication, the secondary regulator valve is moved upward exposing the drain port. Excess pressure then bleeds off as needed. As pressure drops, spring tension moves the valve downward closing the drain port.

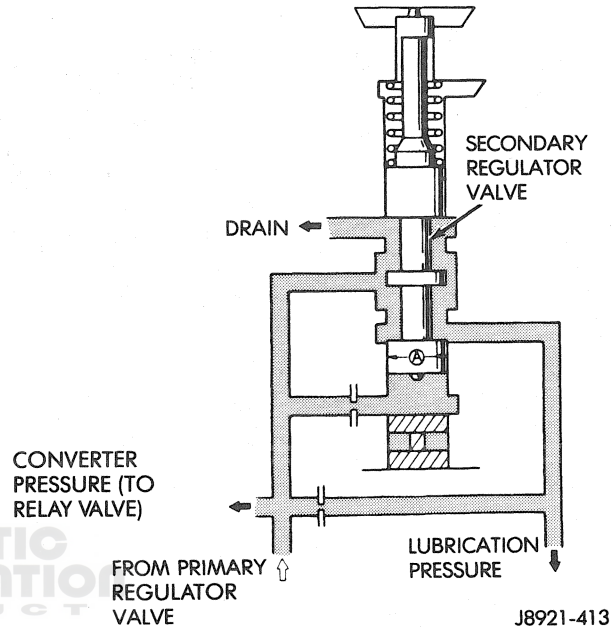


Fig. 14 Secondary Regulator Valve

CONVERTER CLUTCH RELAY VALVE

The relay valve (Fig. 15) controls fluid flow to the converter clutch. The valve is operated by line pressure from the 1–2 shift valve and is controlled by solenoid valve number three.

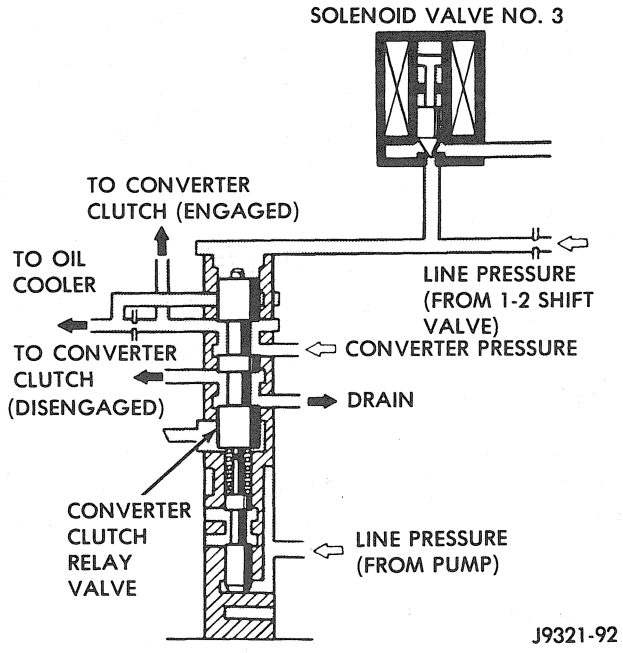
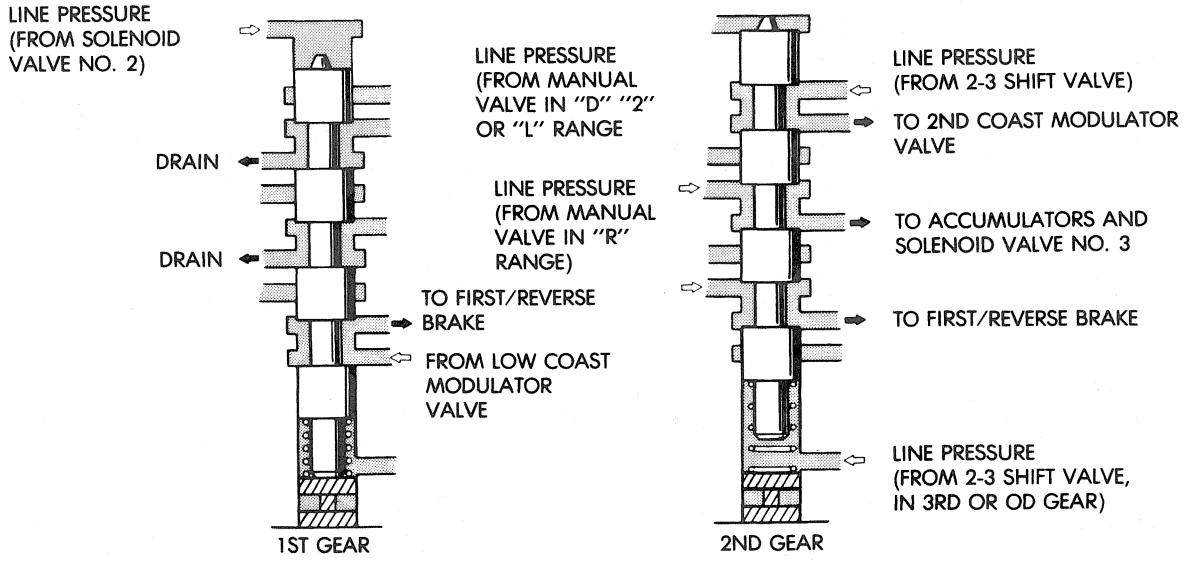


Fig. 15 Converter Clutch Relay Valve

DESCRIPTION AND OPERATION (Continued)



J8921-415

Fig. 16 1–2 Shift Valve

1–2 SHIFT VALVE

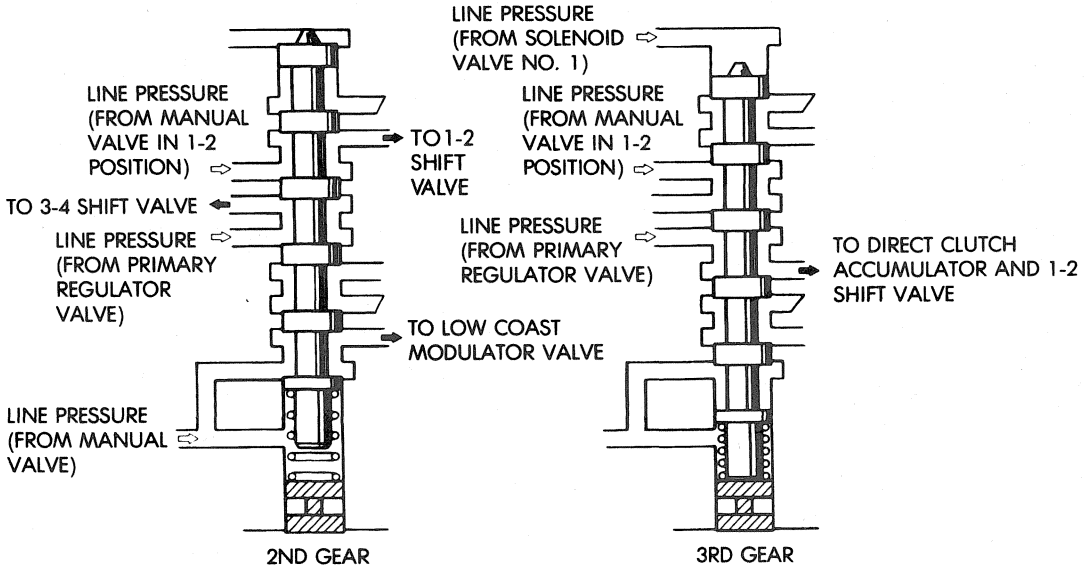
The 1–2 shift valve (Fig. 16) controls 1–2 upshifts and downshifts. The valve is operated by the No. 2 valve body solenoid and line pressure from the manual valve, second coast modulator valve and the 2–3 shift valve.

When the transmission control module deactivates the solenoid, line pressure at the top of the valve moves the valve down closing the second brake accumulator feed port. As the solenoid is activated and the drain port opens, spring force moves the valve up exposing the second brake feed port for the shift to second gear.

2–3 SHIFT VALVE

The 2–3 shift valve (Fig. 17) controls 2–3 upshifts and downshifts. The valve is actuated by the No. 1 valve body solenoid and by line pressure from the manual valve and primary regulator valve.

When the TCM activates solenoid No. 1, line pressure at the top of the 2–3 valve is released through the solenoid drain port. Spring tension moves the valve up to hold the valve in second gear position. As the solenoid is deactivated, line pressure then moves the valve down exposing the direct clutch feed port for the shift to third gear.



J8921-416

Fig. 17 2–3 Shift Valve

DESCRIPTION AND OPERATION (Continued)

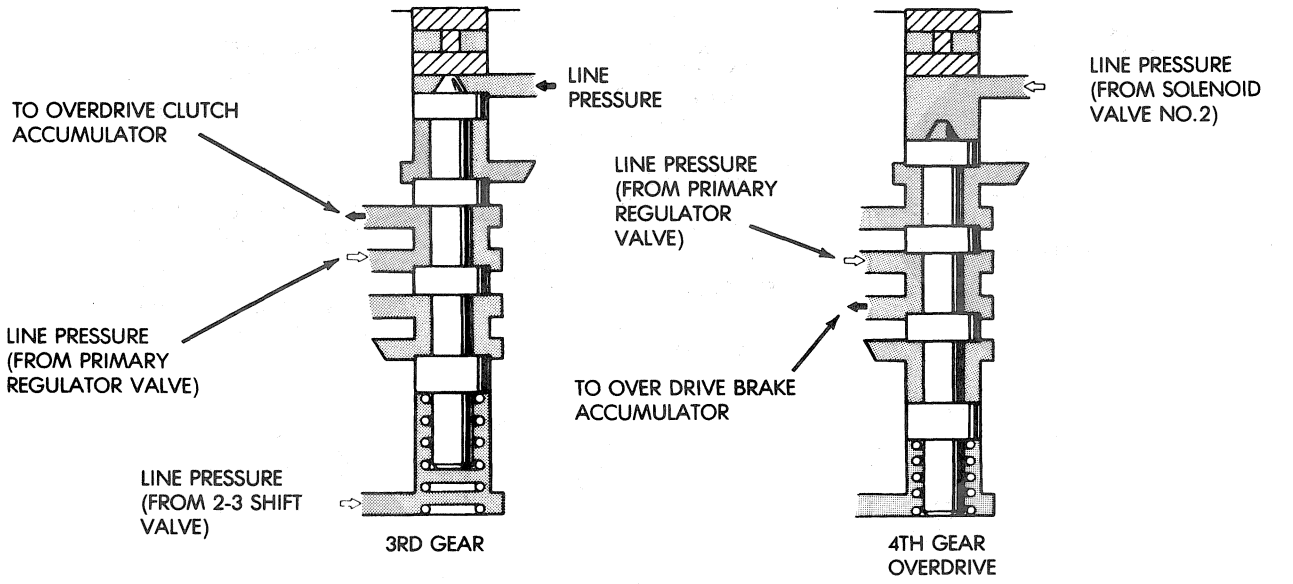


Fig. 18 3–4 Shift Valve

3–4 SHIFT VALVE

The 3–4 shift valve (Fig. 18) is operated by the No. 2 solenoid and by line pressure from the manual valve, 2–3 valve and primary regulator valve.

Energizing the No. 2 solenoid causes line pressure at the top of the 3–4 valve to be released through the solenoid valve drain port. Spring tension moves the valve up exposing the overdrive clutch accumulator feed port to apply the clutch.

De–energizing the solenoid causes the drain port to close. Line pressure then moves the valve down exposing the overdrive brake accumulator feed port for the shift to fourth gear.

In the 1–2 or 3 gearshift lever positions, line pressure from the 2–3 shift valve is applied to the lower end of the 3–4 valve. This holds the valve upward, closing off the overdrive brake feed port preventing a shift into fourth gear.

SECOND COAST MODULATOR VALVE

The second coast modulator valve (Fig. 19) momentarily reduces line pressure from the 1–2 shift valve. This cushions application of the second coast brake. The valve is operative when the shift lever and manual valve are in the 3 position.

LOW COAST MODULATOR VALVE

The low coast modulator valve (Fig. 20) momentarily reduces line pressure from the 2–3 shift valve; this action cushions application of the first/reverse brake. The modulator valve operates when the shift lever and manual valve are in the 1–2 position.

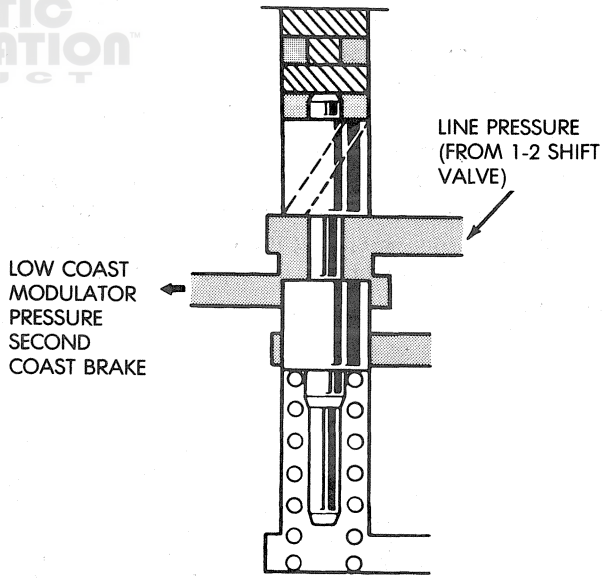


Fig. 19 Second Coast Modulator Valve

ACCUMULATOR CONTROL VALVE

The accumulator control valve (Fig. 21) cushions clutch and brake application. This is achieved by reducing back pressure to the accumulators when throttle opening is small. The valve is operated by line and throttle pressure.

ACCUMULATORS

Four accumulators are used to cushion clutch and brake application. The accumulators (Fig. 22), consist of spring loaded pistons. The pistons dampen the ini-

DESCRIPTION AND OPERATION (Continued)

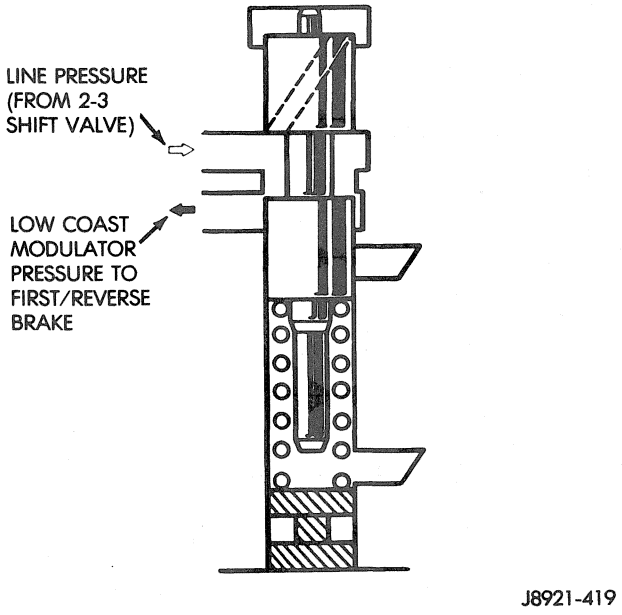


Fig. 20 Low Coast Modulator Valve

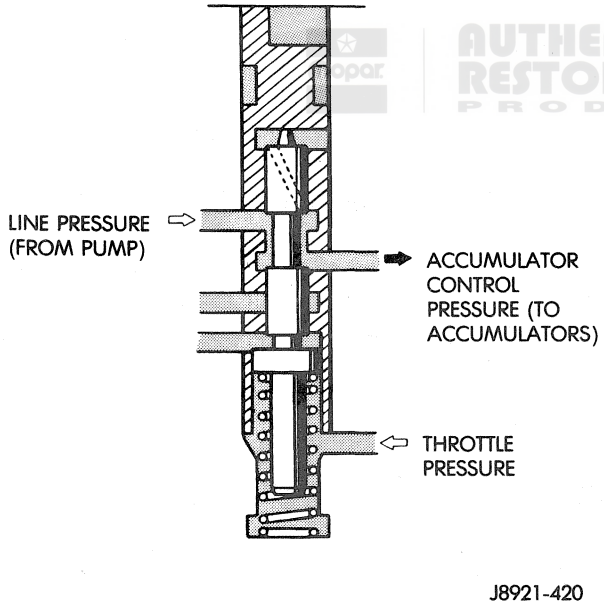


Fig. 21 Accumulator Control Valve

tial surge of apply pressure to provide smooth engagement during shifts.

Control pressure from the accumulator control valve is continuously applied to the back pressure side of the accumulator pistons. This pressure plus spring tension holds the pistons down. As line pressure from the shift valves enters the opposite end of the piston bore, control pressure and spring tension momentarily delay application of full line pressure to cushion engagement. The accumulators are all located in the transmission case (Fig. 22).

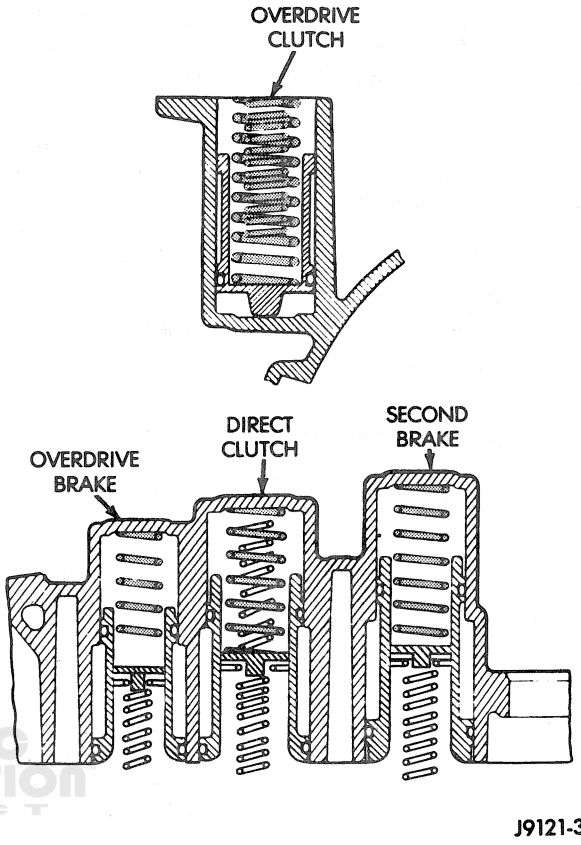


Fig. 22 Accumulators

TRANSMISSION VALVE BODY SOLENOIDS

Three solenoids are used (Fig. 23). The No. 1 and 2 solenoids control shift valve operation by applying or releasing line pressure. The signal to apply or release pressure is provided by the transmission control module.

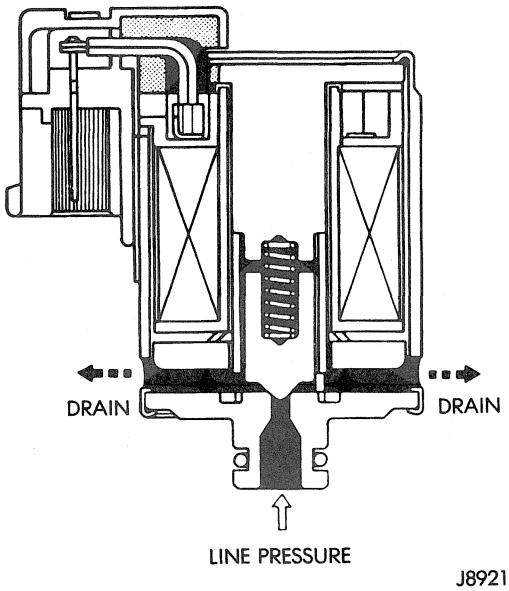


Fig. 23 Transmission Valve Body Solenoids

DESCRIPTION AND OPERATION (Continued)

The No. 3 solenoid controls operation of the torque converter clutch. The solenoid operates in response to signals from the transmission control module.

When the No. 1 and 2 solenoids are activated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When either solenoid is deactivated, the plunger closes the drain port.

The No. 3 solenoid operates in reverse. When the solenoid is deactivated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When the solenoid is activated, the plunger closes the drain port.

DIAGNOSIS AND TESTING

GENERAL DIAGNOSIS INFORMATION

Shift points are controlled by the transmission control module (TCM). Before attempting repair, determine if a malfunction is electrical or mechanical.

The TCM used with the AW–4 transmission has a self–diagnostic program compatible with the DRB scan tool. The tester will identify faults in the electrical control system.

Diagnosis should begin with the Preliminary Inspection And Adjustment procedure. It is will help determine if a problem is mechanical or electrical. The first procedure step is Initial Inspection and Adjustment.

PRELIMINARY INSPECTION AND ADJUSTMENT

(1) Check and adjust transmission shift cable if necessary.

(2) Verify transmission throttle cable operation. Repair or replace cable if necessary.

(3) Check engine throttle operation. Operate accelerator pedal and observe injector throttle plate movement. Adjust linkage if throttle plate does not reach wide open position.

(4) Check transmission fluid level when fluid is at normal operating temperature. Start engine. Shift transmission through all gear ranges then back to Neutral. Correct level is to Full or Add mark on dipstick with engine at curb idle speed.

(5) Check and adjust park/neutral position switch if necessary.

(6) Check throttle position sensor adjustment and operation. Adjust the sensor if necessary.

MANUAL SHIFTING TEST

(1) This test determines if problem is related to mechanical or electrical component.

(2) Stop engine and disconnect transmission control module or module fuse.

(3) Road test vehicle. Shift transmission into each gear range. Transmission should operate as follows:

- lock in Park
- back up in Reverse
- not move in Neutral
- provide first gear only with shift lever in 1–2 position
- operate in third gear only with shift lever in 3 position
- operate in overdrive fourth gear in D position

(4) If transmission operates as described, proceed to next step. However, if forward gear ranges were difficult to distinguish (all feel the same), or vehicle would not back up, refer to diagnosis charts. Do not perform stall or time lag tests.

CAUTION: Do not over speed the engine during the next test step. Ease off the throttle and allow the vehicle to slow before downshifting.

(5) Continue road test. Manually downshift transmission from D to 3, and from 3 to 1–2 position. Then manually upshift transmission through forward ranges again.

(6) If transmission operation is OK, perform stall, time lag and pressure tests. If transmission shifting problem is encountered, refer to diagnosis charts.

(7) If a problem still exists, continue testing with DRB scan tool.

HYDRAULIC PRESSURE TEST

Pressure Test Procedure

(1) Connect pressure test gauge to test port on passenger side of transmission (Fig. 24). Use Adapter 7554 to connect gauge. Be sure test gauge has minimum capacity of 300 psi (2100 kPa).

(2) Be sure transmission fluid is at normal operating temperature.

(3) Apply parking brakes and block wheels.

WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE WHILE PERFORMING THE FOLLOWING STEPS IN THE PRESSURE TEST.

(4) Check and adjust engine curb idle speed.

(5) Apply (and hold) service brakes.

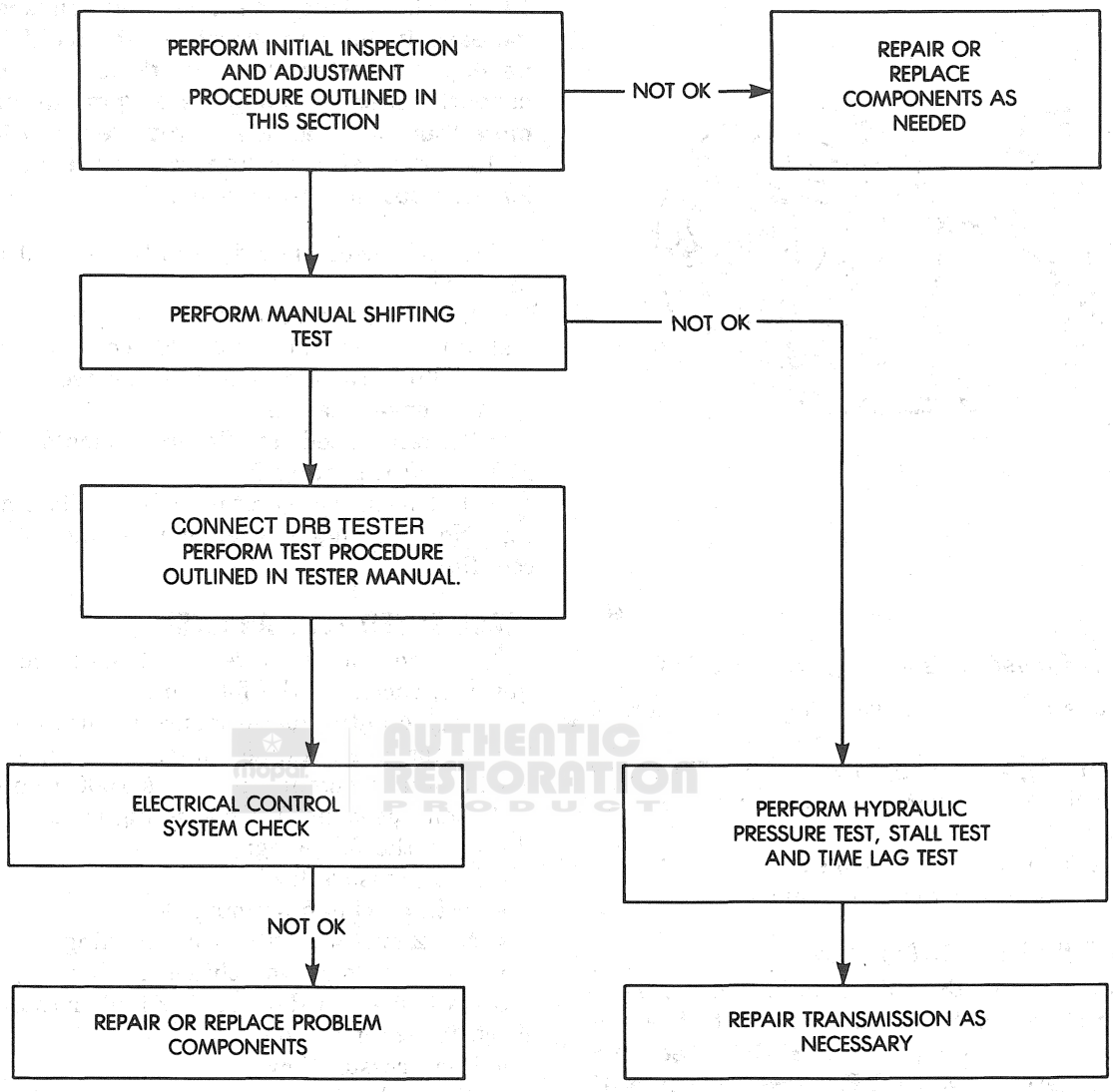
(6) Shift transmission into D range and note line pressure with engine at curb idle speed. Pressure should be 61–to–70 psi (421–to–481 kPa).

(7) Press accelerator pedal to wide open throttle position and note line pressure. Pressure should be 173–to–209 psi (1196–to–1442 kPa).

CAUTION: Do not hold wide open throttle for more than 3–4 seconds at a time.

(8) Shift transmission into Reverse and note line pressure with engine at curb idle speed. Pressure should be 75–to–90 psi (519–to–618 kPa).

DIAGNOSIS AND TESTING (Continued)



Preliminary Diagnosis Check Procedure

(9) Press accelerator to wide open throttle position and note line pressure in Reverse. Pressure should be 213–to–263 psi (1471–to–1814 kPa).

CAUTION: Do not hold wide open throttle for more than 4 seconds.

(10) If line pressure is not within specifications, adjust transmission throttle cable and repeat pressure test.

PRESSURE TEST ANALYSIS

If pressures in D and Reverse are higher than specified in test, check for the following:

- throttle cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, throttle cam, or primary regulator valve are sticking, worn or damaged

If pressures in D and Reverse are lower than specified in test, check for following:

- throttle cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, or throttle cam sticking, worn or damaged
- primary regulator valve sticking, worn, or damaged
- oil pump gears or housing worn, or damaged
- overdrive clutch worn, or damaged

If pressures are low in D range only, check for following:

- forward clutch worn or damaged
- fluid leakage in D range circuit (component seal and O–rings)

DIAGNOSIS AND TESTING (Continued)

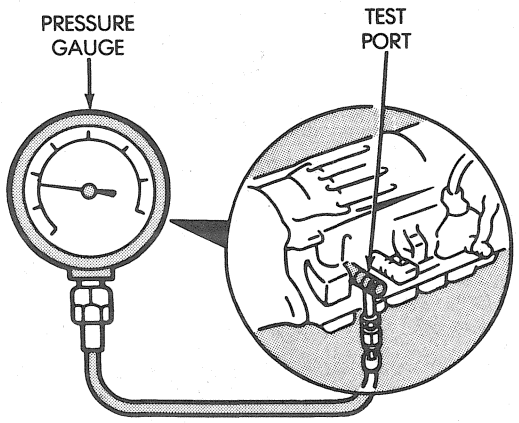


Fig. 24 Pressure Test Gauge Connection

If pressures are low in Reverse only, check for following:

- shift cable and manual valve out of adjustment
- fluid leakage in reverse circuit (component seal and O–rings)
- direct clutch worn or damaged
- first/reverse brake worn or damaged

TORQUE CONVERTER STALL TEST

Stall testing checks the holding ability of the transmission clutches and brakes and of the torque converter stator overrunning clutch. **Stall speeds are checked in both Drive and Reverse ranges with the AW–4 transmission.**

(1) Before starting test, be sure fluid level is correct and fluid is at normal operating temperature.

(2) Connect tachometer to engine. Position tachometer so it can be viewed from drivers seat.

(3) Apply parking brakes and block wheels.

(4) Apply and hold service brakes.

(5) Shift transfer case into 2H position.

(6) Start engine.

WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE DURING THE TEST.

(7) Shift transmission into D range.

(8) Open throttle completely and record maximum engine rpm registered on tachometer. It takes anywhere from 4 to 10 seconds to reach maximum rpm. However, once maximum rpm has been achieved, **do not hold wide open throttle for more than 3–4 seconds.**

CAUTION: Stalling the converter causes a rapid increase in fluid temperature. To avoid fluid overheating, hold wide open throttle for no more than 4 seconds after reaching peak rpm. In addition, if more than one stall test is required, run the engine at 1000 rpm with the transmission in Neutral for at least 20 seconds to cool the fluid.

(9) Stall speed should be in 2100–2400 rpm range in Drive.

(10) Release throttle, shift transmission into Neutral, and run engine for 20–30 seconds to cool fluid.

(11) Shift transmission into Reverse.

(12) Repeat stall test.

(13) Stall speed in Reverse should also be in 2100–2400 rpm range.

(14) Release accelerator pedal, shift transmission into Neutral, and run engine for 20–30 seconds to cool fluid.

STALL SPEED TEST ANALYSIS

If engine rpm is lower than specified in D and Reverse, check for the following:

- engine output/performance insufficient
- stator overrunning clutch in torque converter not holding if engine speed was 1500 rpm or less.

If stall speed in D range is higher than specified, check for the following:

- line pressure low
- forward clutch slipping
- No. 2 one–way clutch not holding
- overdrive one–way clutch not holding

If stall speed in Reverse was higher than specified, check for the following:

- line pressure low
- direct clutch slipping
- first/ reverse brake slipping
- overdrive one–way clutch not holding

If stall speeds were higher than specified in both D and Reverse, check for the following:

- low fluid level
- line pressure low
- overdrive one–way clutch not holding

TIME LAG TEST

This test checks general condition of the overdrive clutch, forward clutch, rear clutch and first/reverse brake. Condition is indicated by the amount of time required for clutch/brake engagement with the engine at curb idle speed. Engagement time is measured for D and Reverse positions. A stop watch is recommended for test accuracy.

TEST PROCEDURE

(1) Check and adjust transmission fluid level if necessary.

DIAGNOSIS AND TESTING (Continued)

(2) Bring transmission to normal operating temperature.

(3) Apply parking brakes and turn off air conditioning unit.

(4) Shift transfer case into 2H range.

(5) Start engine and check curb idle speed. Adjust speed if necessary. Curb idle must be correct to ensure accurate test results.

(6) Shift transmission into Neutral and set stop watch.

(7) During following test steps, start stop watch as soon as shift lever reaches D and Reverse ranges.

(8) Shift transmission into D range and record time it takes for engagement. Repeat test two more times.

(9) Reset stop watch and shift transmission back to Neutral.

(10) Shift transmission into Reverse and record time it takes for engagement. Repeat test two more times.

(11) Engagement time in D range should be a maximum of 1.2 seconds. Engagement time for Reverse should be a maximum of 1.5 seconds.

TIME LAG TEST ANALYSIS

If engagement time is longer than specified for D range, check for the following:

- shift cable misadjusted
- line pressure low
- forward clutch worn
- overdrive clutch worn or damaged

If engagement time is longer than specified for Reverse, check for the following:

- shift cable misadjusted
- line pressure low
- direct clutch worn
- first/reverse brake worn
- overdrive clutch worn or damaged

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS

DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
VEHICLE WILL NOT BACK UP OR MOVE FORWARD	Shift cable out of adjustment or damaged Valve body or primary regulator faulty Park lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust cable or replace cable Inspect/repair valve body Repair park pawl Replace torque converter Replace drive plate Clean screen Disassemble and repair transmission
SHIFT LEVER POSITION INCORRECT	Shift cable out of adjustment Manual valve and lever faulty	Adjust cable Repair valve body
HARSH ENGAGEMENT	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Repair valve body Repair pistons Disassemble and repair transmission
DELAYED 1-2, 2-3 OR 3-4 UP-SHIFT, OR DOWN-SHIFTS FROM 4-3 OR 3-2 AND SHIFTS BACK TO 4 OR 3	Electronic control problem Valve body faulty Solenoid faulty	Locate problem with DRB Tester Repair valve body Repair solenoid
SLIPS ON 1-2, 2-3 OR 3-4 UP-SHIFT, OR SLIPS OR SHUDDERS DURING ACCELERATION	Shift cable out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid faulty Transmission faulty	Adjust cable Adjust cable Repair valve body Replace solenoid Disassemble and repair transmission
DRAG OR BIND ON 1-2, 2-3 OR 3-4 UP-SHIFT	Shift cable out of adjustment Valve body faulty Transmission faulty	Adjust cable Repair valve body Disassemble and repair transmission
CONVERTER CLUTCH DOES NOT ENGAGE IN 2ND, 3RD OR 4TH	Electronic control problem Valve body faulty Solenoid faulty Transmission faulty	Check with DRB Tester Repair valve body Replace solenoid Disassemble and repair transmission
HARSH DOWN-SHIFT	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust cable Replace cable and cam Repair pistons Repair valve body Disassemble and repair transmission
NO DOWN-SHIFT WHEN COASTING	Valve body faulty Solenoid faulty Electronic control problem	Repair valve body Replace solenoid Locate problem with DRB Tester

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS TABLE CONTINUED

CONDITION	POSSIBLE CAUSE	CORRECTION
DOWN-SHIFT LATE OR EARLY DURING COAST	Throttle cable faulty Valve body faulty Transmission faulty Solenoid faulty Electronic control problem	Replace cable Repair valve body Disassemble and repair transmission Replace solenoid Locate problem with DRB Tester
NO 4-3, 3-2 OR 2-1 KICKDOWN	Solenoid faulty Electronic control problem Valve body faulty	Replace solenoid Locate problem with DRB Tester Repair valve body
NO ENGINE BRAKING IN 1-2 POSITION	Solenoid faulty Electronic control problem Valve body faulty Transmission faulty	Replace solenoid Locate problem with DRB Tester Repair valve body Disassemble and repair transmission
VEHICLE DOES NOT HOLD IN PARK	Shift cable out of adjustment Parking lock pawl cam and spring faulty	Adjust cable Replace cam and spring
OVERHEAT DURING NORMAL OPERATION (FLUID DISCOLORED, SMELLS BURNED)	Low fluid level	Add fluid and check for leaks
	Fluid cooler, lines blocked, or cooler cracked (oil in engine coolant)	Flush cooler and lines and replace radiator if transmission fluid has entered coolant
OVERHEAT DURING COMMERCIAL OPERATION OR WHILE TRAILER TOWING (FLUID DARK AND BURNED WITH SOME SLUDGE FORMATION)	Vehicle not properly equipped for trailer towing or commercial use	Be sure vehicle is equipped with recommended optional components (i.e., HD springs, transmission, axle, larger CID engine, auxiliary cooler, correct axle ratio, etc.). If vehicle is not so equipped, it should not be used for severe service operation
	Vehicle not equipped with auxiliary fluid cooler	Drain fluid, change filter, and install auxiliary cooler
	Extensive idling time or operation in heavy traffic in hot weather	Cut down on idling time; shift into neutral every so often and run engine at 1000 rpm to help circulate fluid through cooler
	Tow vehicle overloaded (exceeding vehicle tow capacity)	Be sure vehicle is properly equipped to handle load; do not tow Class III-type loads with a vehicle that is only rated for Class I or II operation
	Air flow to auxiliary cooler blocked by snow plow, front mounted spare tire, bug screen, or similar item	Remove or reposition item causing air flow blockage
OIL COMES OUT FILLER TUBE	Transmission overfilled	Drain fluid to correct level; remove neutral switch and drain through switch hole with suction gun
	Breather vent in oil pump blocked	Inspect and clear blockage
	Fluid cooler or cooler lines plugged	Flush cooler and lines

DIAGNOSIS AND TESTING (Continued)

PARK/NEUTRAL POSITION SWITCH

SWITCH TESTING

Test switch continuity with an ohmmeter. Disconnect the switch and check continuity at the connector terminal positions and in the gear ranges indicated in Figure 3. Switch continuity should be as follows:

- Continuity should exist between terminals B and C with the transmission in Park and Neutral only (Fig. 25).
- Continuity should exist between terminals A and E with the transmission in Reverse (Fig. 25).
- Continuity should exist between terminals A and G with the transmission in third gear (Fig. 25).
- Continuity should exist between terminals A and H with the transmission in first and/or second gear (Fig. 25).
- Continuity should not exist in D position.

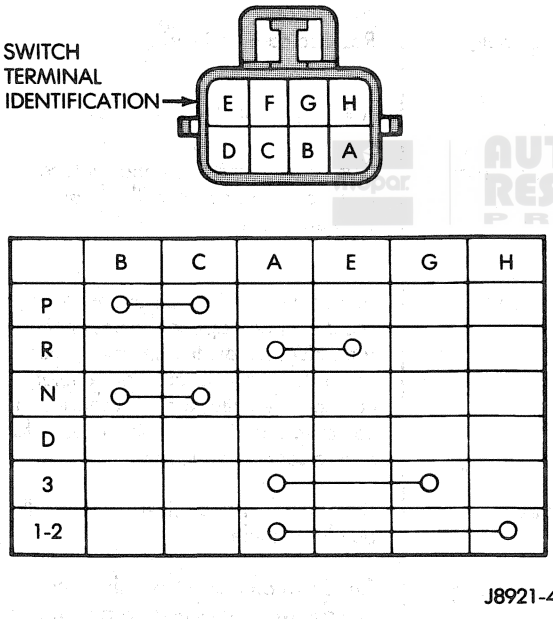


Fig. 25 Park/Neutral Position Switch Terminals And Testing

SPEED SENSOR TESTING

Test the speed sensor with an ohmmeter. Place the ohmmeter leads on the terminals in the sensor connector (Fig. 26).

Rotate the transmission output shaft and observe the ohmmeter needle. The needle should deflect indicating the switch is opening/closing as the rotor moves past the sensor (Fig. 26). Replace the sensor if the ohmmeter does not display any kind of reading.

If a digital ohmmeter is being used, the sensor should generate an ohmmeter readout each time the switch opens and closes.

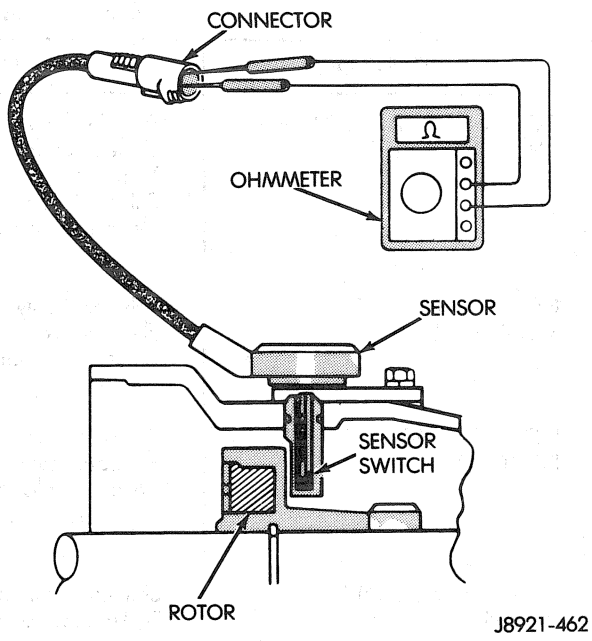


Fig. 26 Speed Sensor Testing

FLOW TESTING TRANSMISSION MAIN COOLER

Cooler flow is checked by measuring the amount of fluid flow through the cooler in a 20 second time period. The test is performed with the engine running and transmission in neutral. Fluid is then pumped through the cooler by the transmission oil pump.

(1) Disconnect cooler inlet line at transmission fitting.

(2) Securely attach hose to end of inlet line and position line in a one quart test container.

(3) Add extra quart of fluid to transmission.

(4) Use stopwatch to check flow test time.

(5) Shift transmission into neutral and set parking brake.

(6) Start and run engine at curb idle speed and immediately note cooler flow. Approximately one quart of fluid should flow into test container in 20 second period.

(7) If cooler flow is intermittent, flows less than one quart in 20 seconds, or does not flow at all, cooler is faulty and must be replaced.

TORQUE CONVERTER STATOR CLUTCH INSPECTION

(1) Insert Rotating Tool 7547 into converter hub and seat tool in one–way clutch (Fig. 27).

(2) Insert Stopper Tool 7548 in one converter hub notch and into outer race of rotating tool.

(3) Turn rotating tool clockwise. Converter clutch should rotate freely and smoothly. Less than 2.5 N·m (22 in. lbs.) of torque should be required to rotate clutch in clockwise direction.

DIAGNOSIS AND TESTING (Continued)

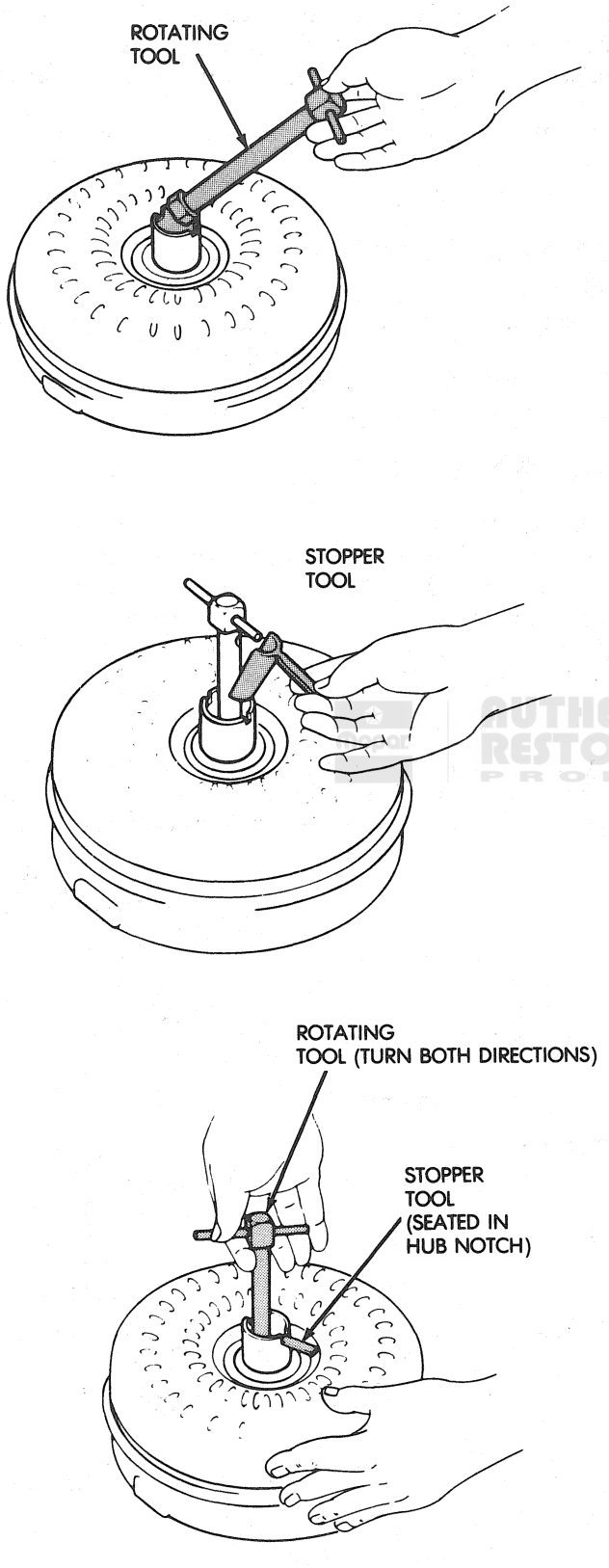


Fig. 27 Checking Operation Of Torque Converter Stator One–Way Clutch

(4) Turn rotating tool in counterclockwise direction. Converter clutch should lock.

(5) Replace converter if clutch binds or will not lock.

SERVICE PROCEDURES

CHECKING FLUID LEVEL

(1) Be sure transmission fluid is at normal operating temperature. Normal operating temperature is reached after approximately 15 miles (25 km) of operation.

(2) Position vehicle on level surface. This is important for an accurate fluid level check.

(3) Shift transmission through all gear ranges and back to Park.

(4) Apply parking brakes.

(5) Verify that transmission is in Park.

(6) Wipe off dipstick handle to prevent dirt from entering fill tube. Then remove dipstick and check fluid level and condition.

(7) Correct fluid level is **to FULL mark on dipstick when fluid is at normal operating temperature** (Fig. 28).

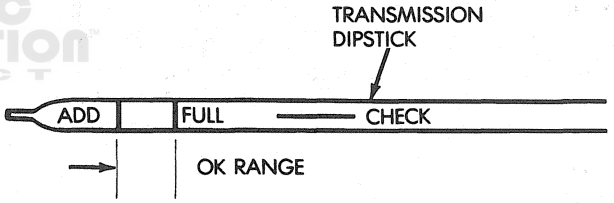


Fig. 28 Transmission Fluid Level

(8) If fluid level is low, top off level with Mopar Dexron IIE/Mercon. Mopar Dexron II can be used but only if Mercon is not available. **Do not overfill transmission. Add only enough fluid to bring level to Full mark.**

(9) If too much fluid was added, excess amount can be removed with suction gun and appropriate diameter plastic tubing. Tubing only has to be long enough to extend into oil pan.

CHECKING FLUID CONDITION

Inspect the appearance of the fluid during the fluid level check. Fluid color should range from dark red to pink and be free of foreign material, or particles. If the fluid is dark brown or black in color and smells burnt, the fluid has been overheated and must be changed.

Transmission operation should also be checked if the fluid is severely discolored and contains quantities of foreign material, metal particles, or clutch disc friction material.

A small quantity of friction material or metal particles in the oil pan is normal. The particles are usually generated during the break–in

SERVICE PROCEDURES (Continued)

period and indicate normal seating of the various transmission components.

REFILLING AFTER OVERHAUL OR FLUID/FILTER CHANGE

The best way to refill the transmission after a fluid change or overhaul is as follows:

(1) If transmission has been overhauled, install transmission in vehicle.

(2) Remove dipstick and insert clean funnel in transmission fill tube.

(3) Add following initial quantity of Mopar Dexron IIE/Mercon to transmission:

(4) If fluid/filter change was performed, add **4 pints (2 quarts)** of fluid to transmission.

(a) If transmission was completely overhauled and torque converter was replaced or drained, add **10 pints (5 quarts)** of fluid to transmission.

(b) Remove funnel and install dipstick.

(5) Operate vehicle until fluid reaches normal operating temperature.

(6) Apply parking brakes.

(7) Let engine run at normal curb idle speed, apply service brakes. Then shift transmission through all gear ranges and back to PARK (leave engine running).

(8) Remove dipstick and check fluid level. Add only enough fluid to bring level to Full mark on dipstick. Do not overfill. **If too much fluid is added, excess amount can be removed with suction gun and plastic tubing. Tubing only has to be long enough to extend into oil pan.**

(9) When fluid level is correct, shut engine off, release park brake, remove funnel, and reseat dipstick in fill tube.

TRANSMISSION CONTROL MODULE (TCM) SERVICE

Use the DRB scan tool to diagnose transmission control module function whenever a fault is suspected. Replace the module only when the scan tool indicates the module is actually faulty.

TRANSMISSION COOLER

MAIN COOLER

The transmission main cooler is located in the radiator. The main cooler can be flushed when necessary, however, the cooler is not a repairable component. If the cooler is damaged, plugged, or leaking, the radiator will have to be replaced.

AUXILIARY COOLER

The auxiliary cooler is mounted in front of the radiator at the driver side of the vehicle (Fig. 29). The cooler can be flushed when necessary, while

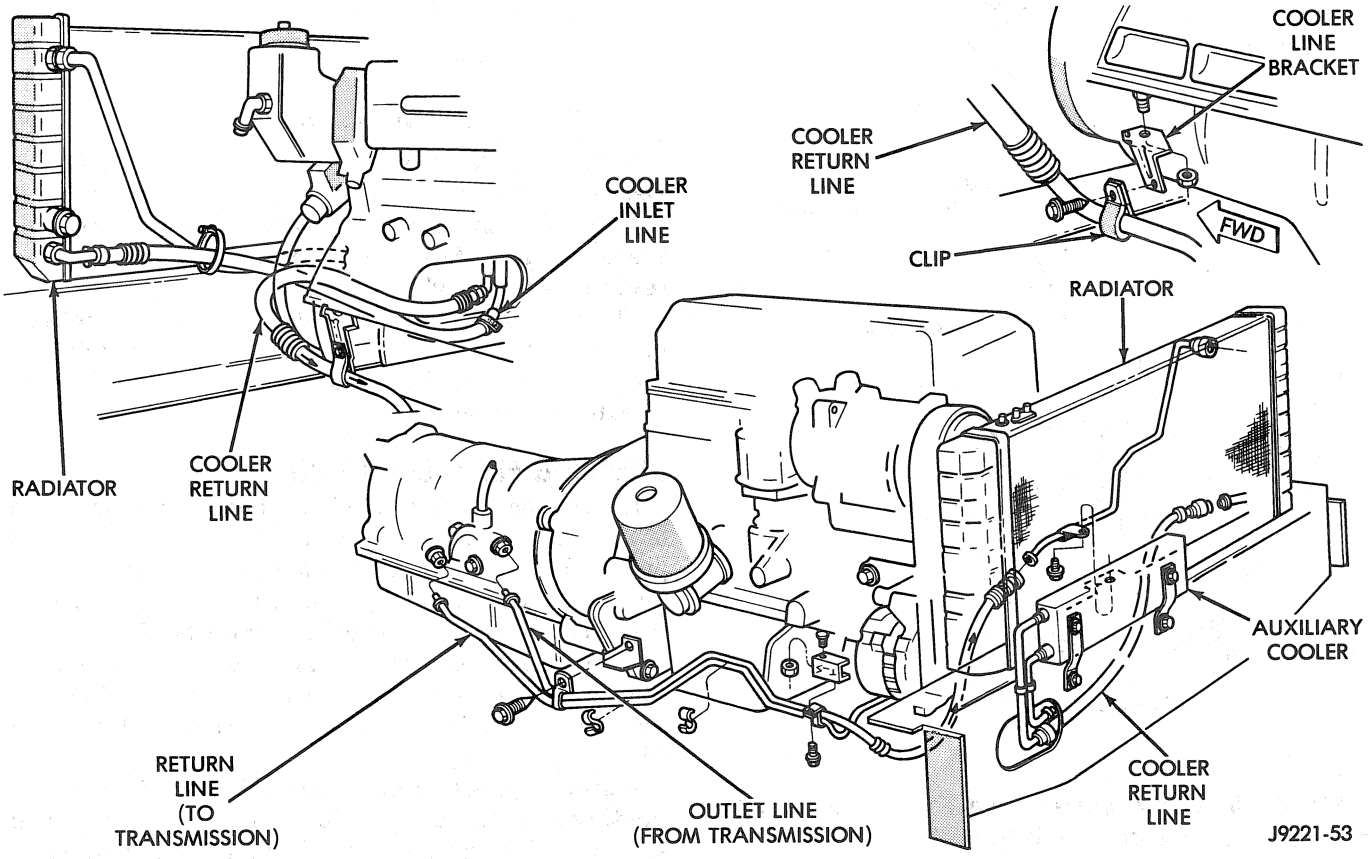


Fig. 29 Auxiliary Cooler Mounting (Left Hand Drive)

SERVICE PROCEDURES (Continued)

mounted in the vehicle. The cooler can also be removed for access, repair, or replacement as needed.

The main and auxiliary coolers should both be flushed whenever a transmission or converter clutch malfunction generates sludge, debris, or particles of clutch friction material.

COOLER SERVICE

The main cooler (and radiator) and the auxiliary cooler can be removed for service or access to other components. Auxiliary cooler removal requires that the front bumper and radiator support be removed for access to the cooler lines and attaching bracket.

REVERSE FLUSHING MAIN AND AUXILIARY COOLERS AND COOLER LINES

Reverse flushing the cooler and lines will prevent sludge and particles from flowing back into the transmission after repair. The flushing procedure applies to standard (in–radiator) coolers and auxiliary coolers equally.

Pressure equipment is preferred for reverse flushing. However, reverse flushing can be performed using hand operated equipment as described in the following procedure.

(1) Disconnect cooler lines at transmission and at auxiliary cooler (Fig. 30) and (Fig. 31).

(2) Position drain pan under cooler line to catch material flushed through coolers and lines.

(3) Reverse flush each cooler using hand operated suction gun filled with mineral spirits. Insert gun nozzle (or hose) into cooler inlet (return) line. Then force mineral spirits through into line and through cooler.

(4) Continue reverse flushing until fluid exiting inlet (pressure) line is clear and free of debris/residue.

(5) Replace radiator if fluid cannot be pumped through main cooler. Replace auxiliary cooler if leaks are evident, or if fluid cannot be pumped through it.

(6) Clear flushing materials from coolers and lines with short pulses of compressed air. Insert air gun nozzle into cooler inlet (return) line and continue short pulses of air until all fluid is cleared from cooler and lines.

(7) Pump one quart of fresh automatic transmission fluid through cooler and lines before reconnecting cooler lines.

TRANSMISSION COOLER LINE FITTINGS

Quick connect fittings are used at the transmission cooler line connections. The fitting seals and guides are serviceable.

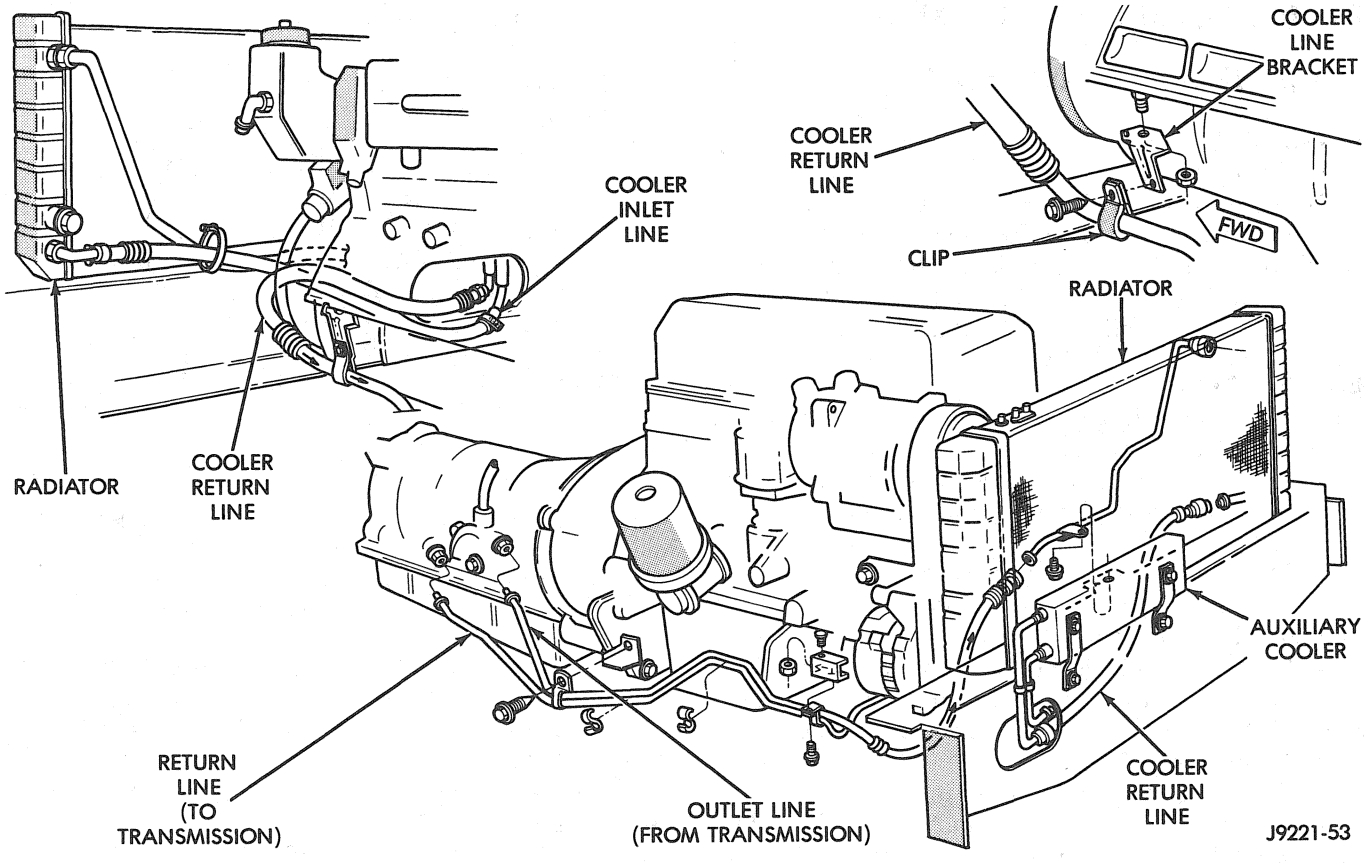


Fig. 30 Auxiliary Cooler Mounting (Left Hand Drive)

SERVICE PROCEDURES (Continued)

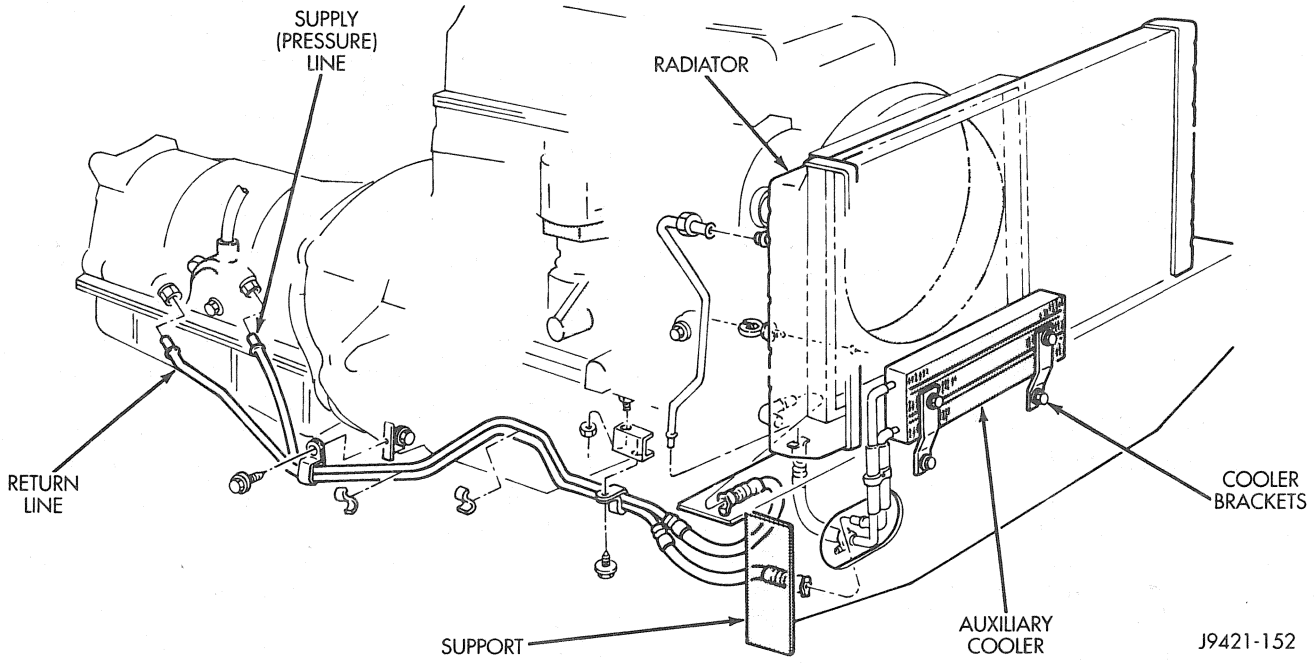


Fig. 31 Auxiliary Cooler Mounting (Right Hand Drive)

Replace the seals and guides whenever the fittings exhibit leakage, or will not properly snap into place.

REMOVAL AND INSTALLATION

PARK/NEUTRAL POSITION SWITCH

REMOVAL

(1) Raise vehicle.
(2) Disconnect switch wire harness connector.
(3) Pry washer lock tabs upward and remove switch attaching nut and tabbed washer (Fig. 32).
(4) Remove switch adjusting bolt (Fig. 32).
(5) Slide switch off manual valve shaft.

INSTALLATION

(1) Disconnect shift linkage rod from shift lever on left side of transmission.
(2) Rotate manual shift lever all the way rearward. Then rotate lever forward two detent positions to Neutral.
(3) Install switch on manual valve shaft and install switch adjusting bolt finger tight. Do not tighten bolt at this time.
(4) Install tabbed washer on manual valve shaft and install switch attaching nut. Tighten nut to 6.9 N·m (61 in. lbs.) torque but do not bend washer lock tabs over nut at this time.
(5) Verify that transmission is in Neutral.
(6) Rotate switch to align neutral standard line with vertical groove on manual valve shaft (Fig. 33).

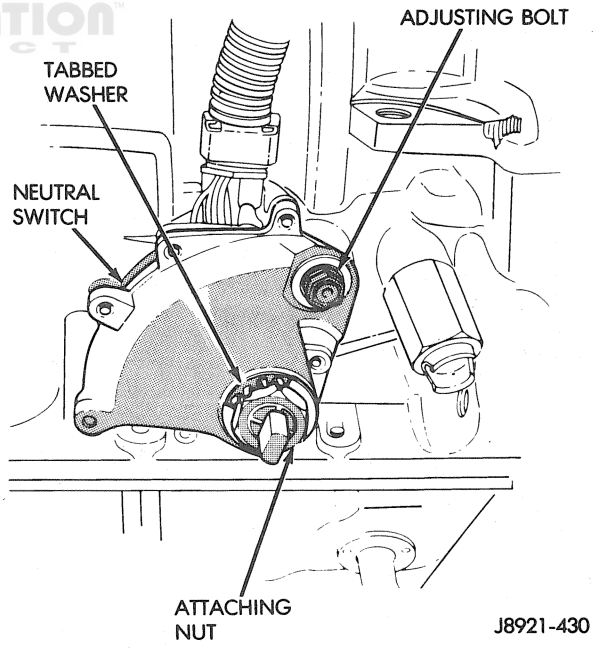


Fig. 32 Park/Neutral Position Switch Removal/ Installation

(7) Align switch standard line with groove or flat on manual valve shaft.
(8) Tighten switch adjusting bolt to 13 N·m (9 ft. lbs.) torque.
(9) Bend at least two washer lock tabs over switch attaching nut to secure it.
(10) Connect shift linkage rod to shift lever on left side of case.

REMOVAL AND INSTALLATION (Continued)

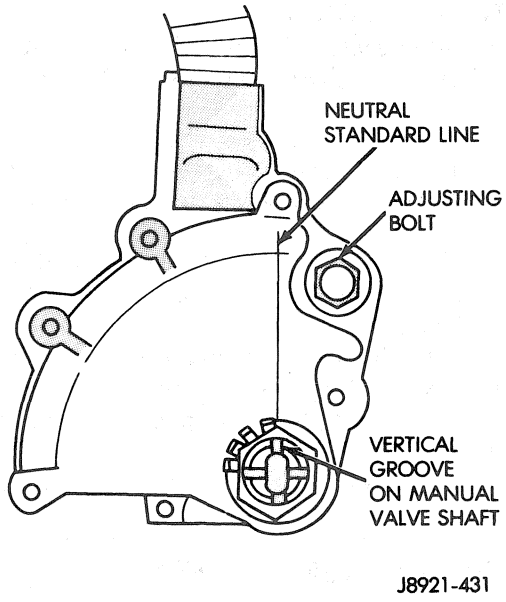


Fig. 33 Park/Neutral Position Switch Adjustment

(11) Connect switch wires to harness and lower vehicle.

(12) Check switch operation. Engine should start in Park and Neutral only.

TRANSMISSION CONTROL MODULE

The transmission control module is mounted under the instrument panel. On left hand drive models, it is at the driver side of the lower finish panel (Fig. 34). On right hand drive models, it is at the passenger side of the lower finish panel (Fig. 35).

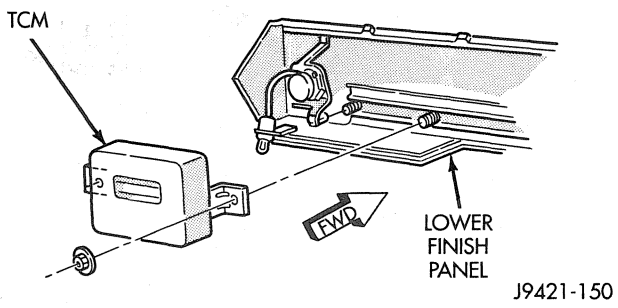


Fig. 34 TCM Location (Left Hand Drive)

To remove the module, disconnect the wire harness, remove the mounting screws and remove the module from the finish panel. Tighten the module mounting screws securely after installation. Also be sure the wire harness is not twisted, kinked or touching any body panels.

TRANSMISSION VALVE BODY SOLENOIDS

SOLENOID REMOVAL

(1) Remove transmission oil pan drain plug and drain fluid.

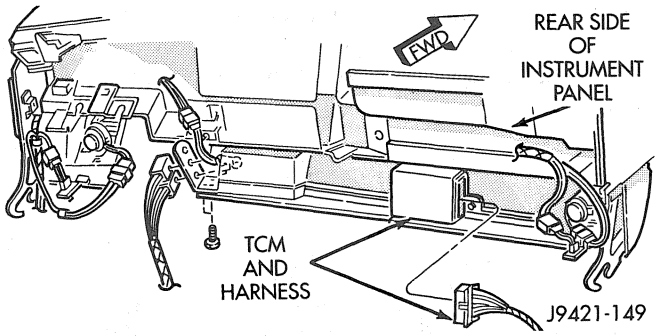


Fig. 35 TCM Location (Right Hand Drive)

(2) Remove pan bolts and remove oil pan.

(3) Remove oil screen bolts and remove screen (Fig. 36) and gasket. Discard the gasket.

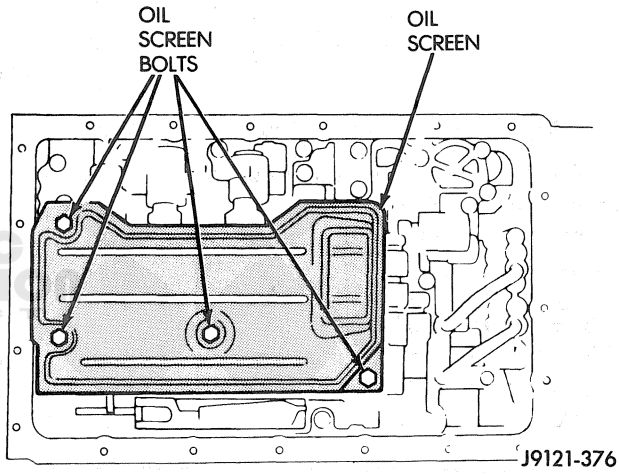


Fig. 36 Oil Screen Removal/Installation

(4) Disconnect solenoid wire connector (Fig. 37).

(5) If all solenoids are being removed, mark or tag wires for assembly reference before disconnecting them.

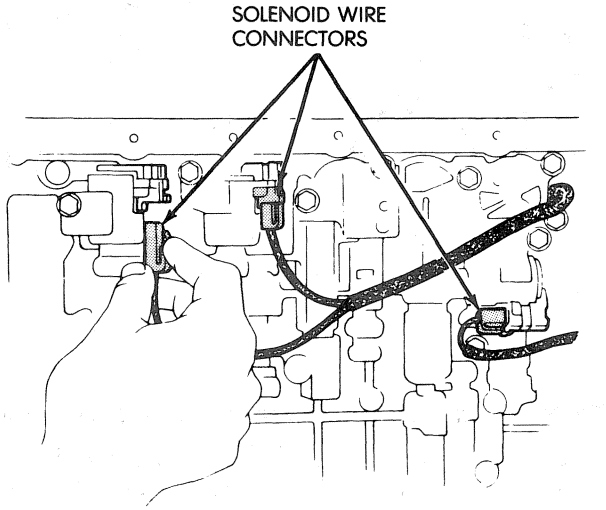


Fig. 37 Solenoid Wire Connectors

REMOVAL AND INSTALLATION (Continued)

(6) Remove bolt attaching solenoids to valve body and remove solenoids (Fig. 38). Do not allow any valve body components to fall out when solenoids are removed.

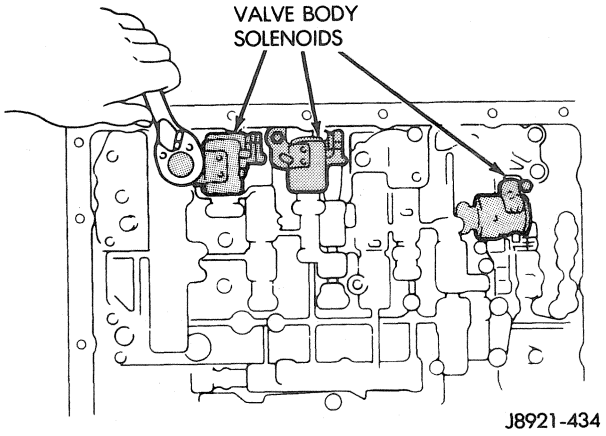


Fig. 38 Transmission Valve Body Solenoids

(7) Clean oil filter and pan with solvent and dry with compressed air.

(8) Remove old sealer material from oil pan and transmission case.

SOLENOID TESTING

Test solenoid resistance with an ohmmeter. Connect the ohmmeter leads to the solenoid mounting bracket and to the solenoid wire terminal (Fig. 39).

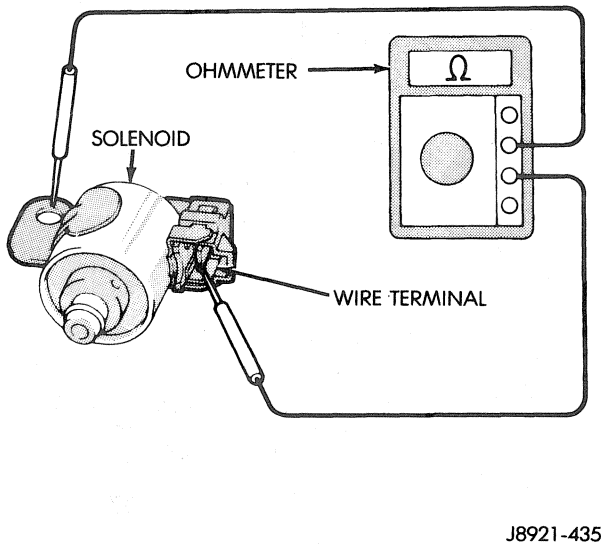


Fig. 39 Testing Transmission Valve Body Solenoid

Solenoid resistance should be 11–15 ohms. Replace the solenoid if resistance is above or below the specified range.

SOLENOID INSTALLATION

(1) Position solenoids on valve body and install solenoid bolts. Tighten bolts to 10 N·m (7 ft. lbs.) torque.

(2) Connect feed wires to solenoids.

(3) Install new gaskets on oil screen and install screen. Tighten screen bolts to 10 N·m (7 ft. lbs.) torque.

(4) Apply bead of Loctite 599 sealer to oil pan sealing surface. Sealer bead should be at least 3.0 mm (1/8 in.) wide.

(5) Install oil pan on transmission. Tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(6) Install and tighten oil pan drain plug to 20 N·m (15 ft. lbs.) torque.

(7) Fill transmission with Mopar Dexron IIE/Mercon.

SOLENOID HARNESS ADAPTER SEAL

REMOVAL

(1) Remove oil pan and oil screen. Refer to Solenoid Removal procedure.

(2) Disconnect solenoid wire connectors (Fig. 40).

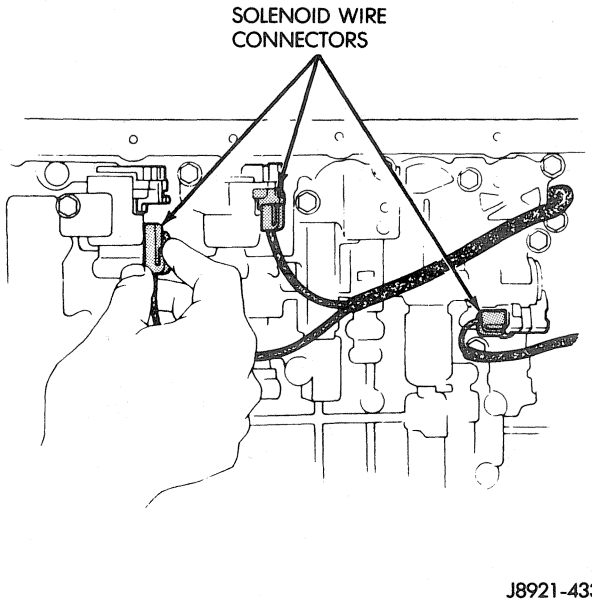


Fig. 40 Solenoid Wire Connectors

(3) Remove bracket securing solenoid harness adaptor (Fig. 41) to case.

(4) Pull harness adapter and wires out of case.

(5) Remove and discard adapter O–ring.

REMOVAL AND INSTALLATION (Continued)

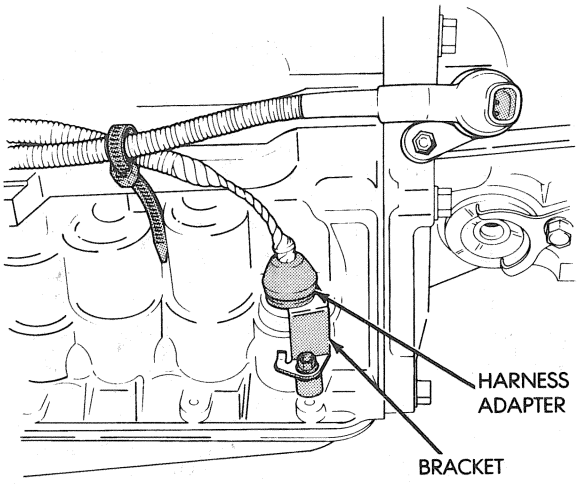


Fig. 41 Harness Adapter Removal/Installation

INSTALLATION

(1) Lubricate new O–ring and install it on adapter.
(2) Install solenoid wire harness and adapter in case.
(3) Install adapter bracket and bracket bolt.
(4) Connect wires to solenoids.
(5) Install oil screen.
(6) Apply bead of Loctite 599 to oil pan seal surface. Sealer bead should be at least 3 mm (1/8 in.) wide.
(7) Install oil pan on transmission. Tighten pan bolts to 7 N·m (65 in. lbs.) torque.
(8) Install and tighten oil pan drain plug to 20 N·m (15 ft. lbs.) torque.
(9) Fill transmission with Mopar Dexron IIE/Mercon.

TRANSMISSION VALVE BODY

REMOVAL

Removal and installation are the only valve body service procedures covered in this section. Refer to the transmission overhaul section for valve body disassembly, cleaning, inspection and reassembly.
(1) Remove oil pan plug and drain transmission fluid.
(2) Remove oil pan and oil screen. Clean pan and screen in solvent and dry them with compressed air.
(3) Disconnect solenoid wire connectors (Fig. 42). Mark wires for assembly reference.
(4) Remove valve body oil tubes (Fig. 43). Carefully pry tubes out of valve body with screwdriver.

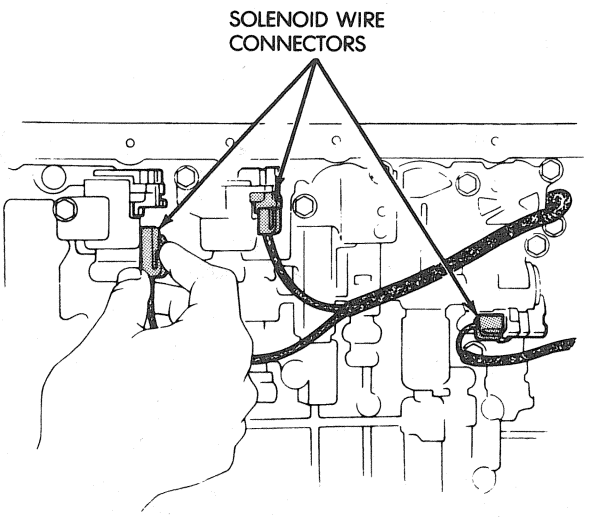


Fig. 42 Solenoid Wire Connectors

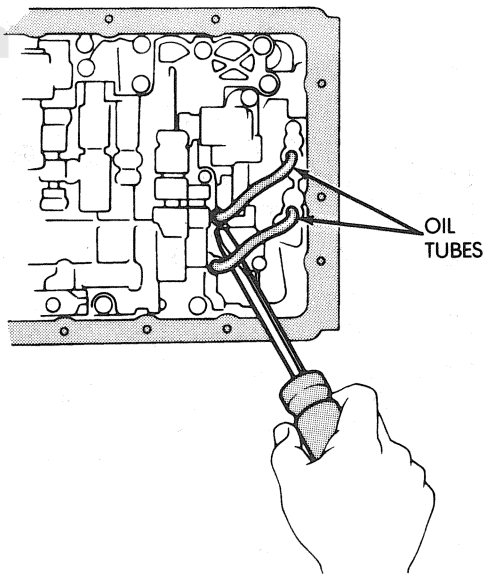


Fig. 43 Removing Transmission Valve Body Oil Tubes

REMOVAL AND INSTALLATION (Continued)

(5) Disconnect throttle cable from throttle cam (Fig. 44).

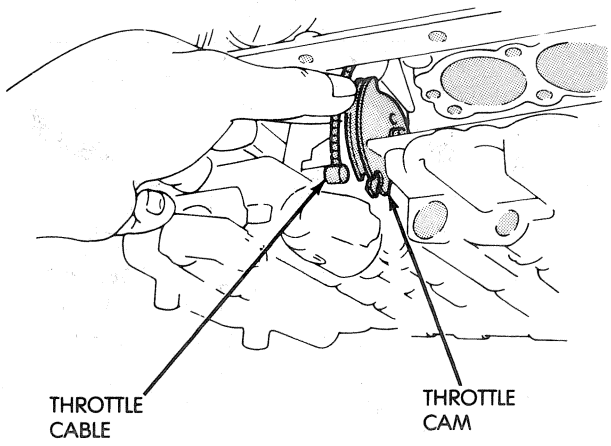


Fig. 44 Removing/Installing Throttle Cable

(6) Remove valve body bolts. Bolt locations are outlined in (Fig. 45).

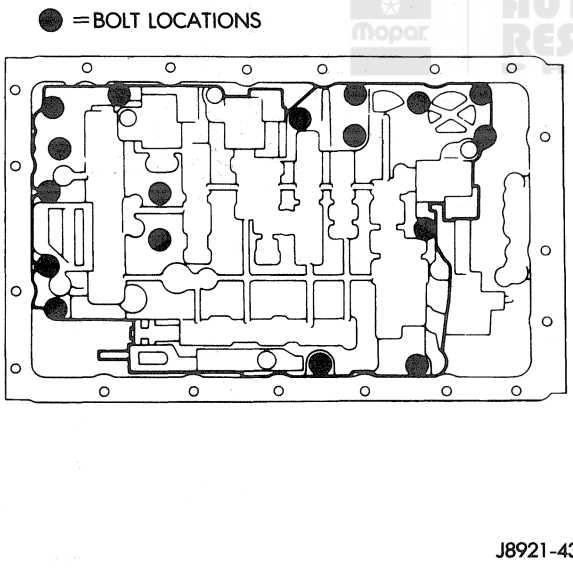


Fig. 45 Transmission Valve Body Bolt Locations

(7) Lower valve body and remove overdrive clutch accumulator springs, direct clutch accumulator springs and second brake accumulator spring (Fig. 46)

(8) Remove valve body and check ball and spring (Fig. 47).

TRANSMISSION VALVE BODY INSTALLATION

(1) Connect cable to throttle cam (Fig. 44).

(2) Install check ball and spring (Fig. 47).

(3) Position accumulator springs and spacers on valve body.

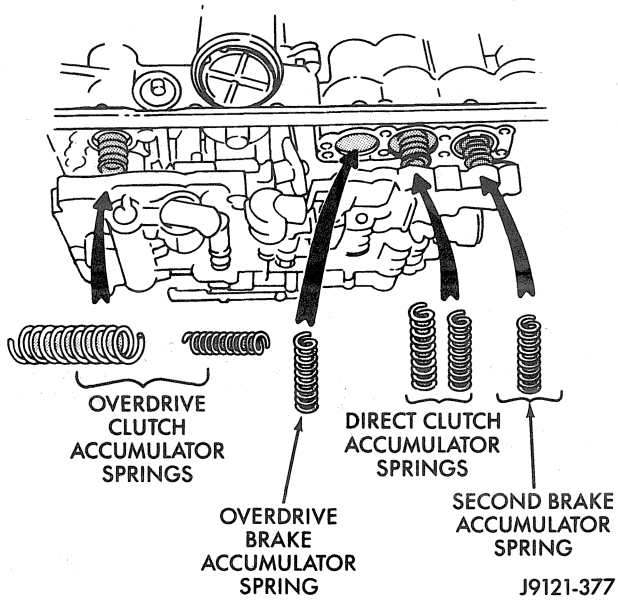


Fig. 46 Accumulator Springs

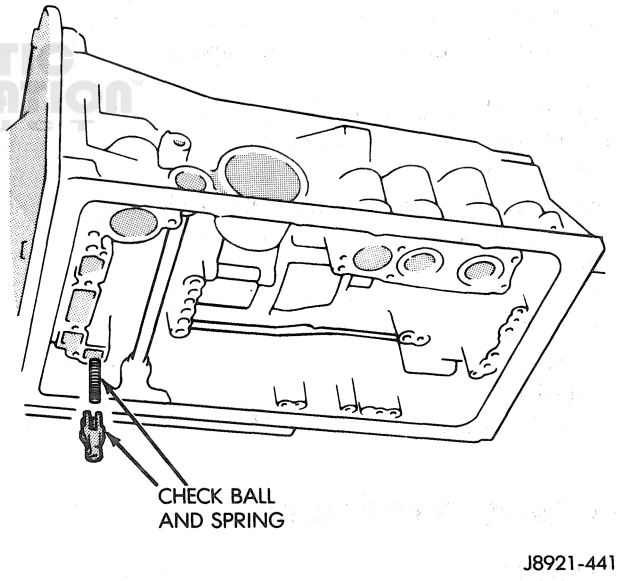


Fig. 47 Removing/Installing Check Ball And Spring

(4) Align valve body manual valve with shift sector (Fig. 48) and carefully position valve body on case.

(5) Install valve body bolts (Fig. 45). Tighten bolts evenly to 10 N·m (7 ft. lbs.) torque.

(6) Install valve body oil tubes. Be sure tube ends (L) and (M) are installed as shown in (Fig. 49).

(7) Remove old sealer material from oil pan and transmission case.

(8) Clean oil screen and oil pan with solvent (if not done previously). Dry both components with compressed air only. Do not use shop towels.

(9) Install new gaskets on oil screen and install screen on case. Tighten screen attaching bolts to 10 N·m (7 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

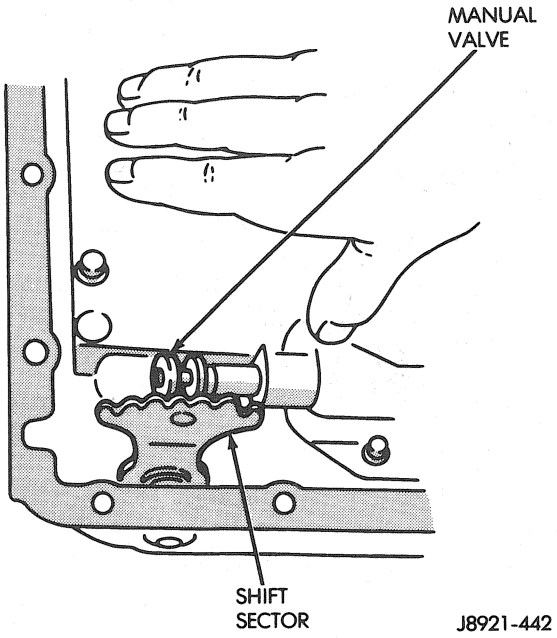


Fig. 48 Shift Sector And Manual Valve Alignment

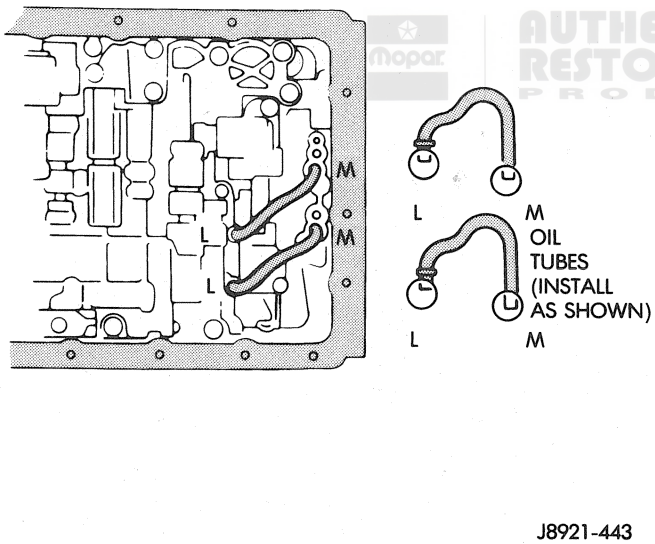


Fig. 49 Installing Transmission Valve Body Oil Tubes

(10) Apply bead of Loctite 599 sealer to sealing surface of oil pan. Sealer bead should be at least 3 mm (1/8 in.) wide. Then install oil pan and tighten pan bolts to 7.4 N·m (65 in. lbs.) torque.

(11) Install new gasket on oil pan drain plug and install plug in pan. Tighten plug to 20 N·m (15 ft. lbs.) torque.

(12) Fill transmission with Mopar Dexron IIE/Mercon.

MANUAL VALVE SHAFT SEAL REPLACEMENT

(1) Remove park/neutral position switch and disconnect transmission shift lever (Fig. 50).

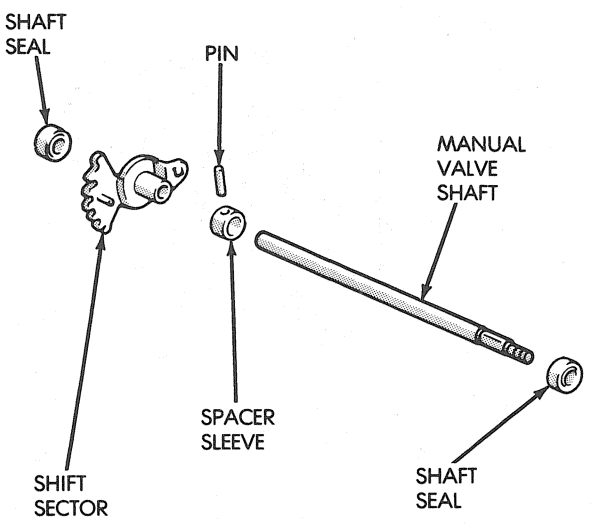


Fig. 50 Manual Valve Shaft And Seals

(2) Remove oil pan and valve body.

(3) Remove bolts attaching park rod bracket to case (Fig. 51).

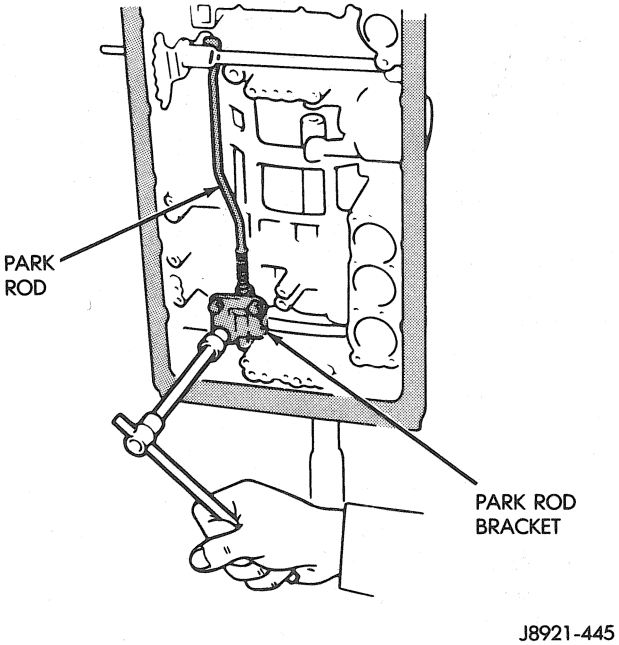


Fig. 51 Removing/Installing Park Rod Bracket

(4) Remove park rod from shift sector (Fig. 52).

(5) Cut spacer sleeve with chisel and remove it from manual valve shaft (Fig. 53).

(6) Remove pin from shaft and sector with pin punch.

(7) Remove shaft and sector from case.

(8) Pry shaft seals out of case (Fig. 54).

REMOVAL AND INSTALLATION (Continued)

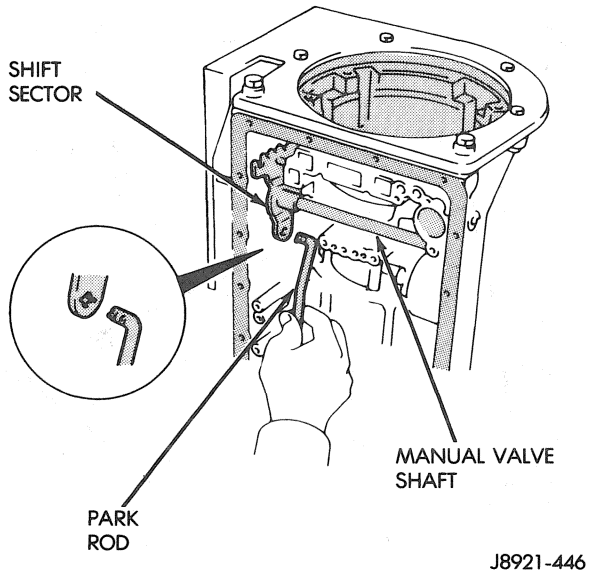


Fig. 52 Removing/Installing Park Rod

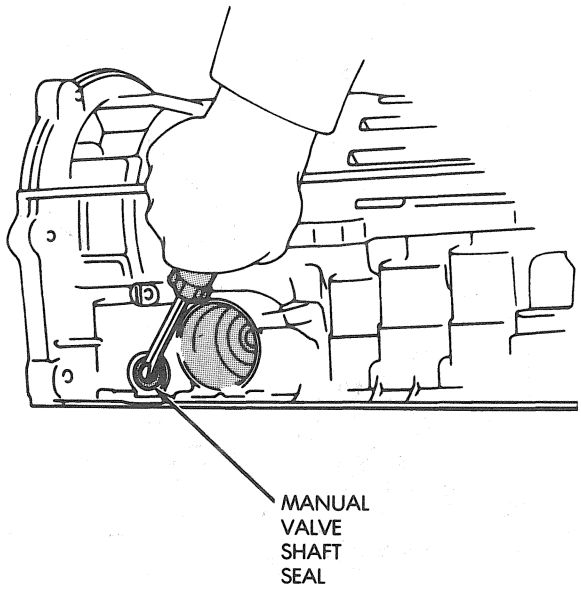


Fig. 54 Removing Manual Valve Shaft Seals

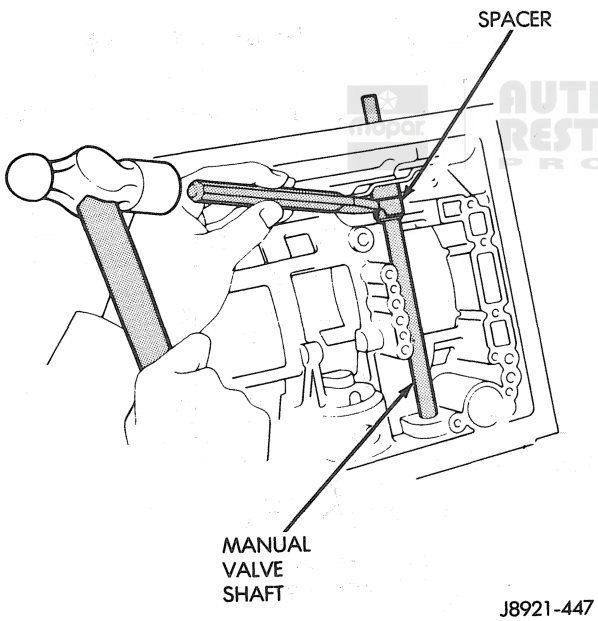


Fig. 53 Cutting Spacer Sleeve

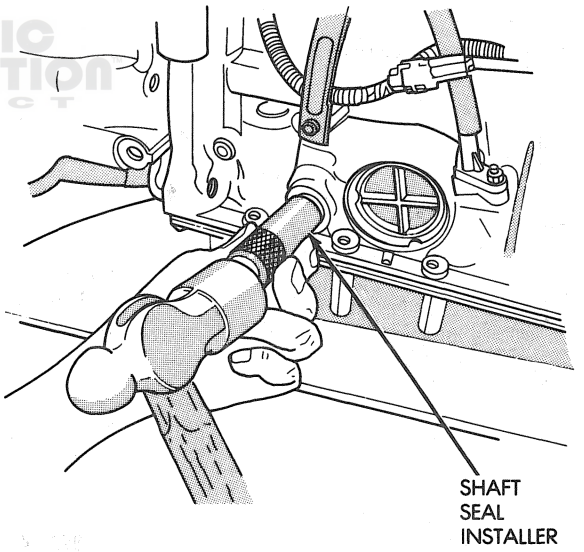


Fig. 55 Installing Manual Valve Shaft Seals

(9) Inspect the manual valve shaft and sector. Replace either component if worn or damaged.

(10) Coat replacement shaft seals with petroleum jelly and seat them in the case (Fig. 55).

(11) Install new spacer sleeve on sector (Fig. 56).

(12) Lubricate manual valve shaft with petroleum jelly and install it in case.

(13) Lubricate sector and sleeve with petroleum jelly and install them on shaft.

(14) Align hole in spacer sleeve with notch in sector. Then install shift sector roll pin. Tap pin into sector and shaft and stake sleeve to sector and shaft securely.

(15) Connect park rod to sector (Fig. 52).

(16) Install park rod bracket (Fig. 57). Tighten bracket bolts to 10 N·m (7 ft. lbs.) torque.

(17) Install valve body, oil screen and oil pan. Use Loctite 599 sealer on oil pan seal surface.

(18) Install park/neutral position switch.

ACCUMULATOR PISTONS AND SPRINGS

(1) Remove valve body. Refer to procedure in this section.

(2) Remove accumulator pistons with compressed air (Fig. 58). Apply air through small feed hole next

REMOVAL AND INSTALLATION (Continued)

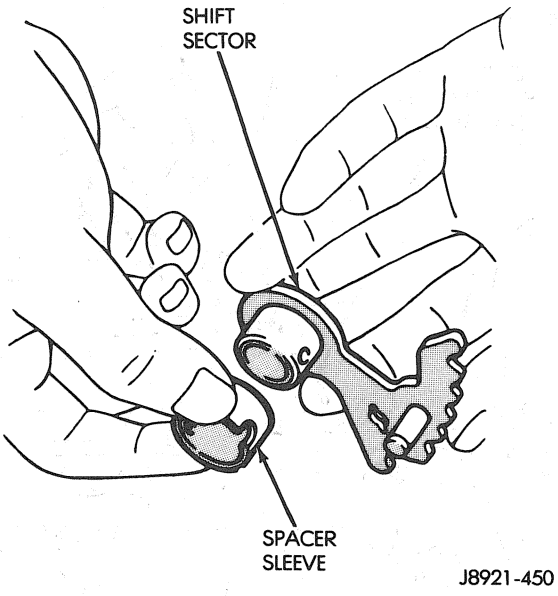


Fig. 56 Installing Spacer Sleeve On Sector

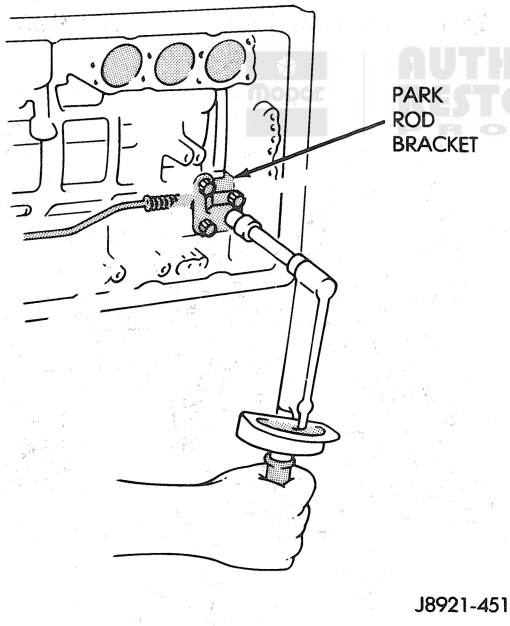


Fig. 57 Installing Park Rod Bracket

to each piston bore. Catch each piston in a shop towel as it exits bore.

CAUTION: Use only enough air pressure to ease each piston out of the bore. In addition, remove the pistons one at a time and tag the pistons and springs for assembly reference. Do not intermix them.

(3) Remove and discard piston O–ring seals. Then clean pistons and springs with solvent.

(4) Inspect pistons, springs and piston bores. Replace worn damaged pistons. Replace broken, collapsed or distorted springs. Replace case if piston bores are damaged.

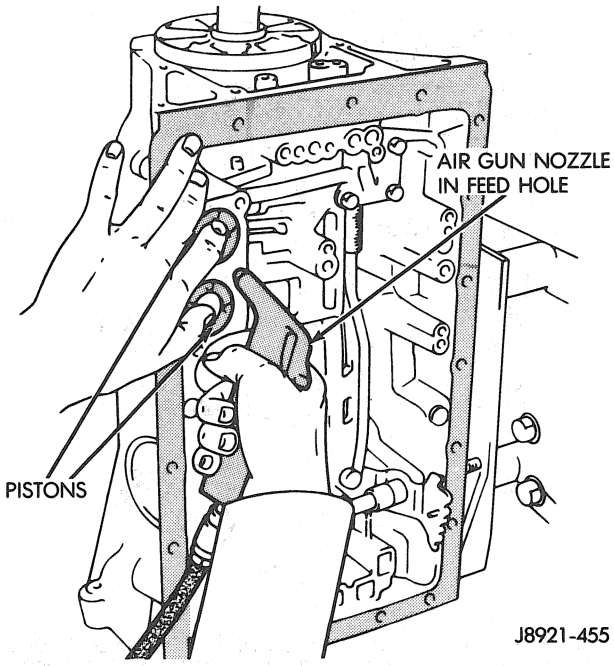


Fig. 58 Accumulator Piston Removal

(5) If small cushion spring in any piston must be replaced, remove spring retainer clip and remove spring from piston (Fig. 59). A small hooked tool or small thin blade screwdriver can be used to remove clip. A thin wall, deep socket, or pin punch can be used to seat clip after spring replacement.

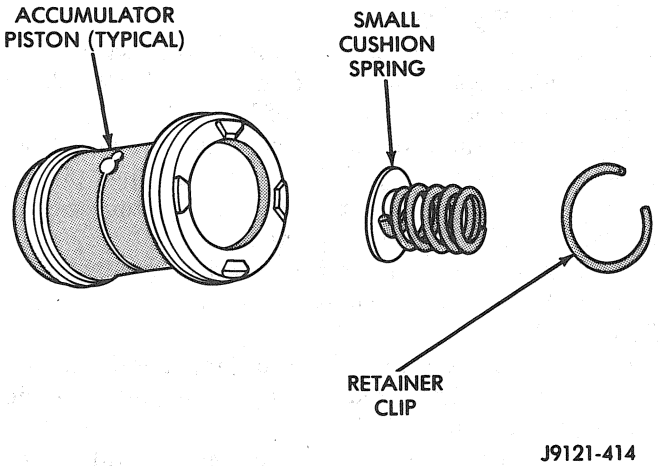


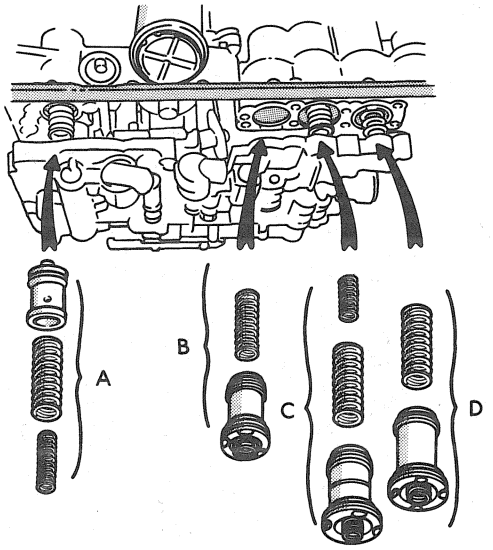
Fig. 59 Small Cushion Spring Retention

(6) Install new O–ring seals on pistons. Lubricate seals and pistons and piston bores with transmission fluid.

(7) Install pistons and springs (Fig. 60).

(8) Install valve body, oil screen and oil pan. Use Loctite 599 on oil pan sealing surface.

REMOVAL AND INSTALLATION (Continued)



A. OVERDRIVE CLUTCH ACCUMULATOR PISTON AND SPRINGS
B. OVERDRIVE BRAKE ACCUMULATOR PISTON AND SPRINGS
C. DIRECT CLUTCH ACCUMULATOR PISTON AND SPRINGS
D. SECOND BRAKE ACCUMULATOR PISTON AND SPRINGS

J9121-378

Fig. 60 Accumulator Pistons, Springs And Spacers

SECOND COAST BRAKE SERVO OVERHAUL

(1) Remove valve body as outlined in this section.

(2) Remove servo piston cover snap ring with snap ring pliers (Fig. 61).

(3) Remove servo piston and cover with compressed air. Apply compressed air through oil hole in servo boss to ease piston out of bore (Fig. 62).

(4) Remove and discard seal and O–rings from cover and piston (Fig. 63). Inspect E–ring, piston, spring and retainer, piston rod and piston spring. Replace worn or damaged parts.

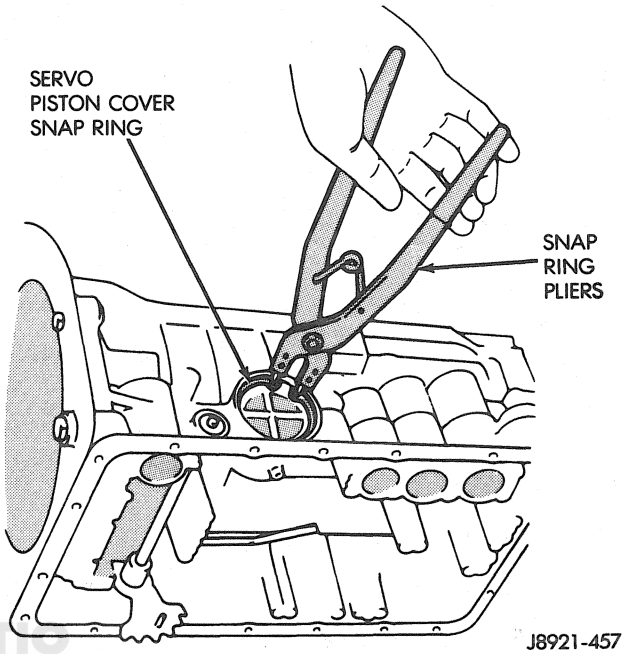
(5) Install new seals on cover and piston.

(6) Lubricate servo components with transmission fluid.

(7) Assemble and install servo components in case. Be sure servo piston rod is properly engaged in the second coast brake band.

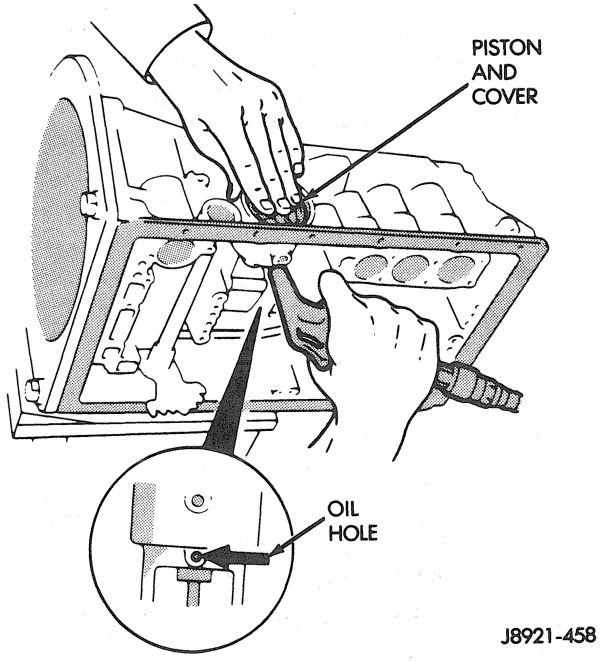
(8) Compress cover and piston and install cover snap ring.

(9) Install valve body, oil screen and oil pan. Use Loctite 599 on oil pan sealing surface.



J8921-457

Fig. 61 Removing/Installing Servo Piston Cover Snap Ring



J8921-458

Fig. 62 Removing Servo Cover And Piston

REMOVAL AND INSTALLATION (Continued)

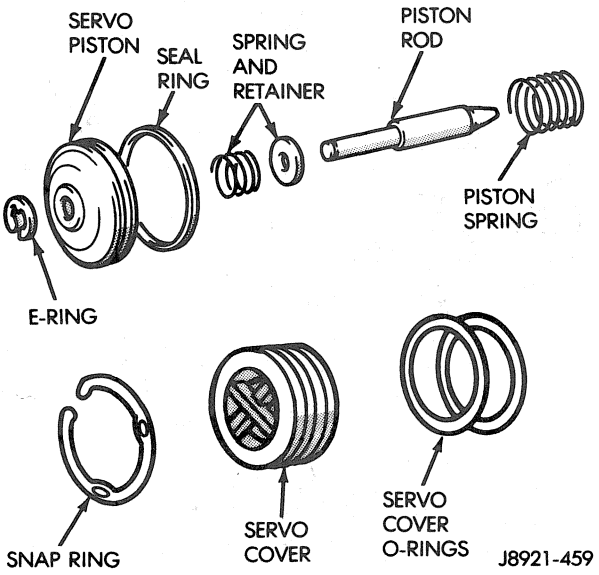


Fig. 63 Second Coast Brake Servo Components

PARK ROD AND PAWL SERVICE

(1) Remove valve body as outlined in this section.

(2) Remove bolts attaching park rod bracket to case (Fig. 64).

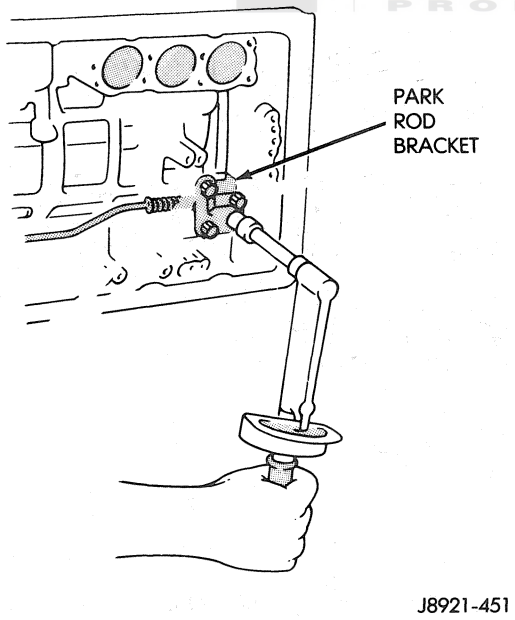


Fig. 64 Removing/Installing Park Rod Bracket

(3) Remove park rod from manual valve shaft sector (Fig. 65).

(4) Remove park rod.

(5) Remove park pawl, pin and spring (Fig. 66).

(6) Examine park rod, pawl, pin and spring. Replace any component that is worn or damaged.

(7) Install pawl in case. Insert pin and install spring. Be sure spring is positioned as shown in Figure 35.

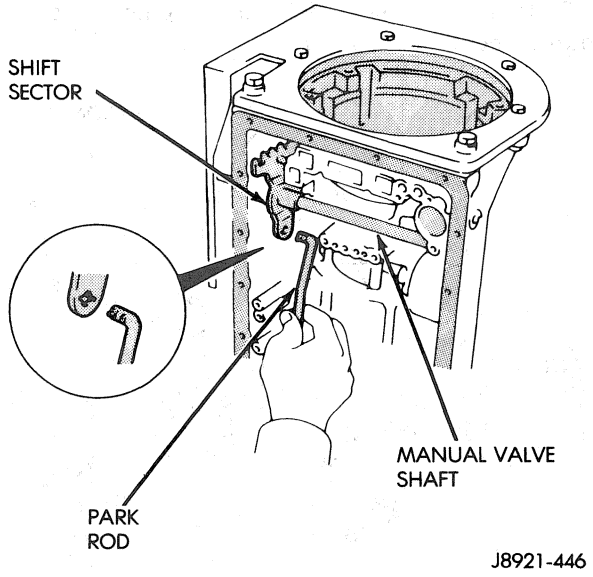


Fig. 65 Removing/Installing Park Rod

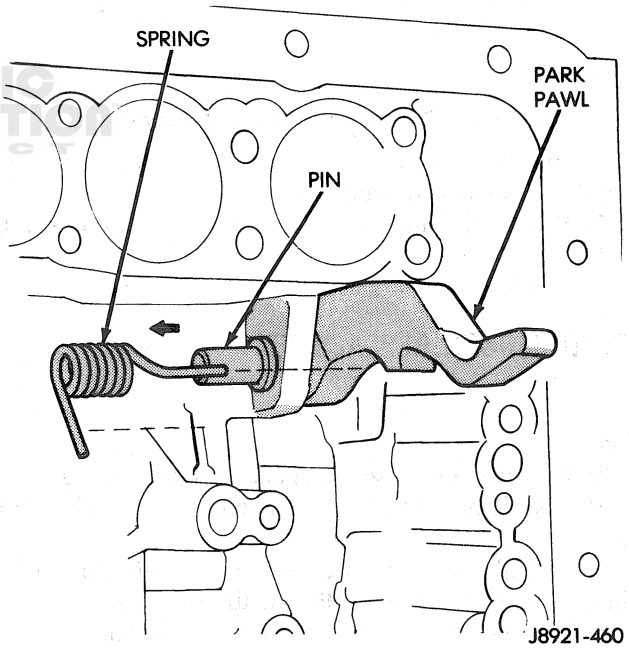


Fig. 66 Removing/Installing Park Pawl, Pin And Spring

(8) Install park rod and bracket (Fig. 64). Tighten bracket bolts to 10 N·m (7 ft. lbs.) torque.

(9) Install valve body, oil screen and oil pan as outlined in this section.

ADAPTER HOUSING SEAL REPLACEMENT

(1) Raise vehicle.

(2) Disconnect or remove components necessary to gain access to seal (e.g. propeller shaft, crossmember, shift linkage, transfer case, exhaust components, hoses, wires).

REMOVAL AND INSTALLATION (Continued)

(3) Remove dust shield and remove seal from adapter housing (Fig. 67).

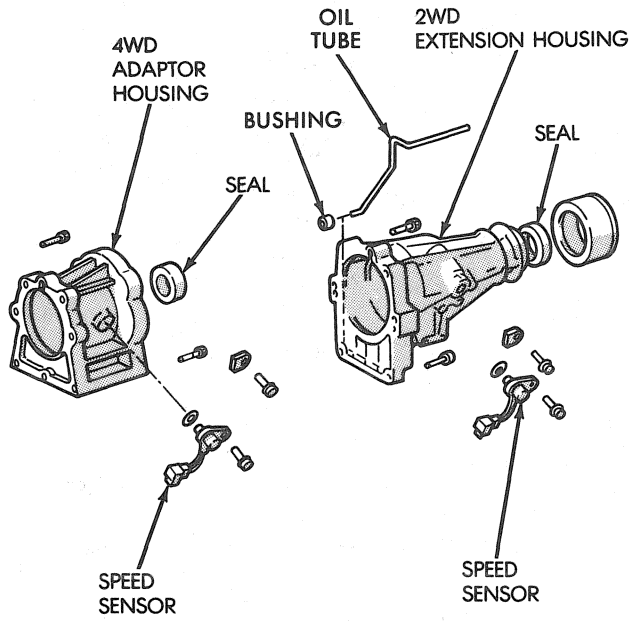


Fig. 67 Adapter Housing Seals

(4) Install new seal with appropriate size seal installer and install dust shield.

(5) Reinstall components removed to gain access to seal.

(6) Top off transmission fluid if necessary.

SPEED SENSOR REPLACEMENT

(1) Disconnect sensor wire harness connector.

(2) Remove sensor retainer bolt and remove sensor (Fig. 68).

(3) Remove and discard speed sensor O–ring.

(4) Install new O–ring on speed sensor and install sensor in transmission case.

(5) Install sensor bracket and retainer bolt. Tighten bolt to 7.4 N·m (65 in. lbs.) torque.

(6) Connect sensor wire harness connector.

SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR

ROTOR—DRIVE GEAR REMOVAL

(1) Raise vehicle.

(2) Remove components necessary to gain access to rotor and drive gear such as propeller shaft, transfer case, crossmember, and shift linkage.

(3) Disconnect speedometer cable and/or speed sensor.

(4) Remove adaptor housing.

(5) Remove speedometer drive gear snap ring (Fig. 69).

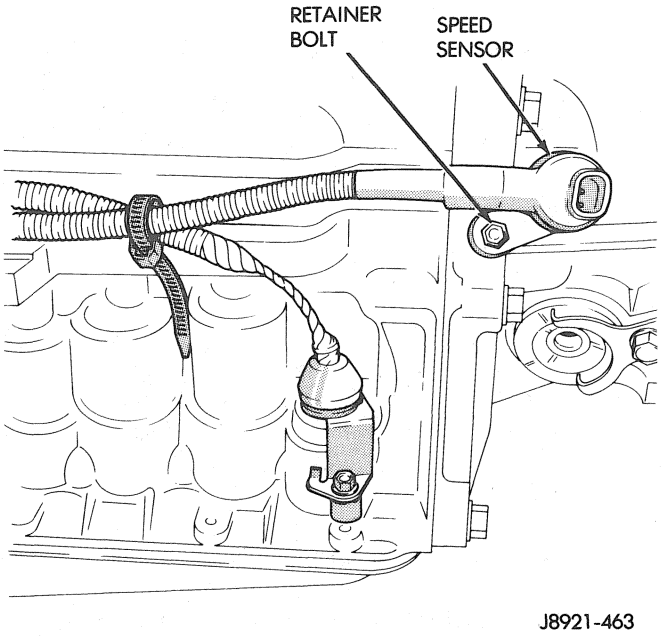


Fig. 68 Transmission Speed Sensor Removal/ Installation

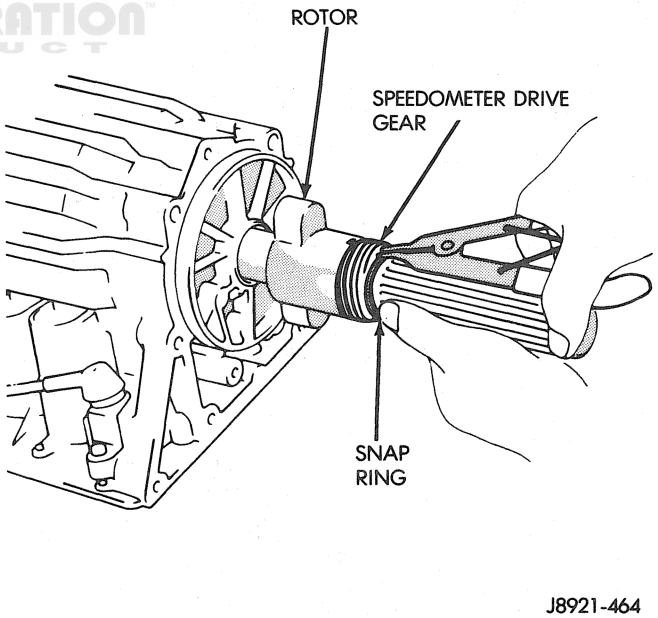


Fig. 69 Removing/Installation Speedometer Drive Gear

(6) Remove the speedometer drive gear and spacer (if equipped).

(7) Remove rotor by carefully prying it off output shaft with wood dowel or hammer handle (Fig. 70).

(8) Clean sealing surfaces of transmission case and extension/adaptor housing.

REMOVAL AND INSTALLATION (Continued)

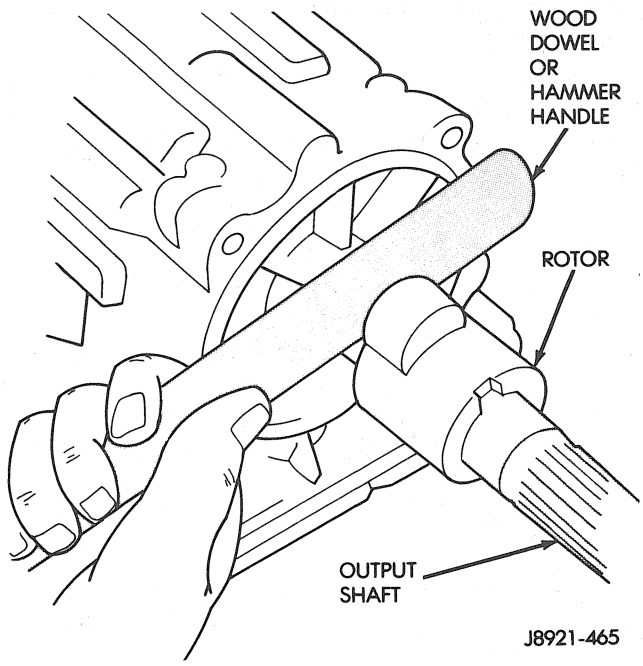


Fig. 70 Removing Speed Sensor Rotor

ROTOR AND DRIVE GEAR INSTALLATION

(1) Install rotor, spacer (if equipped) and drive gear on output shaft. Then install drive gear snap ring (Fig. 69).

(2) Apply bead of Loctite 599 sealer, to transmission case sealing surface and install extension/adapter housing on case.

(3) Tighten adaptor housing bolts to 34 N·m (25 ft. lbs.) torque.

(4) Install components removed to gain access to rotor and drive gear.

THROTTLE POSITION SENSOR (TPS) SERVICE

A separate throttle position sensor is used for automatic transmission applications. The sensor is attached to the base of the throttle body. Refer to Group 14 for TPS service and adjustment.

TRANSMISSION THROTTLE CABLE REPLACEMENT

THROTTLE CABLE REMOVAL

(1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from engine bracket (Fig. 71).

(2) Raise vehicle.

(3) Remove transmission oil pan.

(4) Disengage cable from throttle valve cam (Fig. 72).

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 73).

(6) Remove and discard cable seal.

THROTTLE CABLE INSTALLATION

(1) Lubricate and install new seal on cable.

(2) Insert cable in transmission case.

(3) Attach cable to throttle cam (Fig. 72).

(4) Install cable bracket on case and tighten attaching bolt to 10 N·m (7 ft. lbs.) torque (Fig. 73).

(5) Remove old sealer material from oil pan and transmission case. Clean oil pan with solvent and dry it with compressed air.

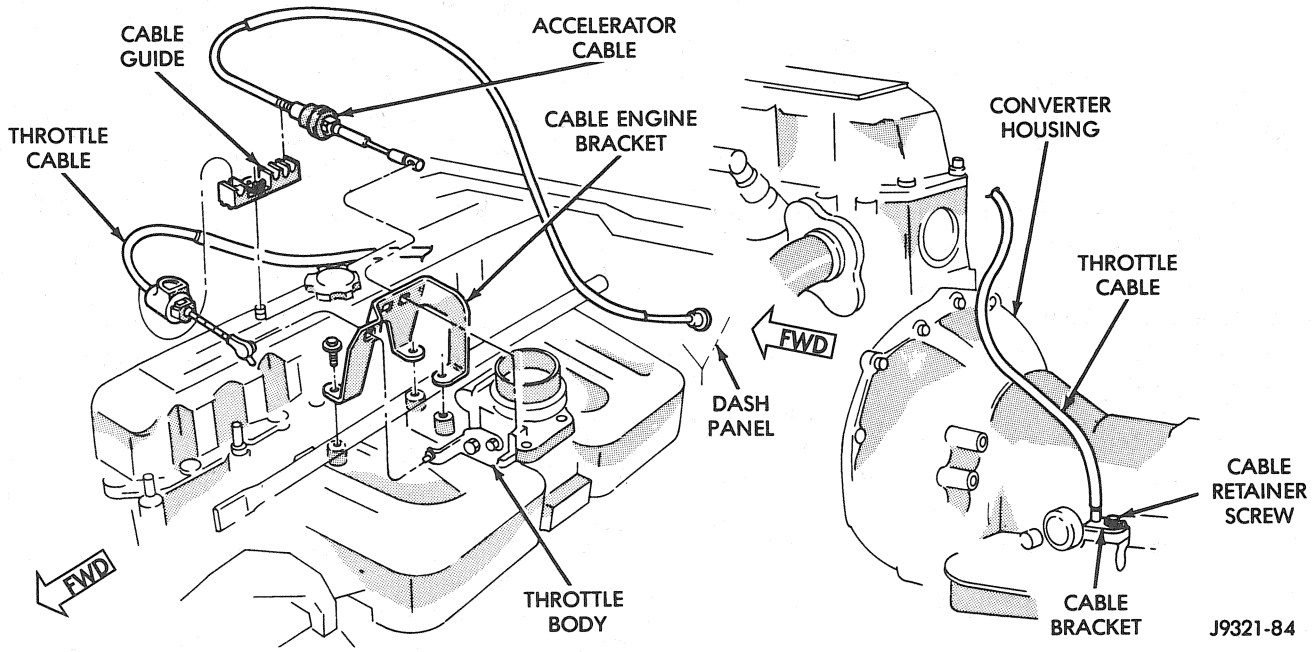


Fig. 71 Transmission Throttle Cable Attachment

REMOVAL AND INSTALLATION (Continued)

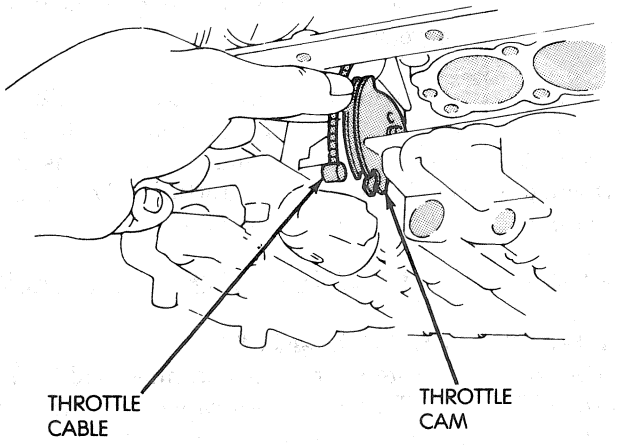


Fig. 72 Removing/Installing Transmission Throttle Cable

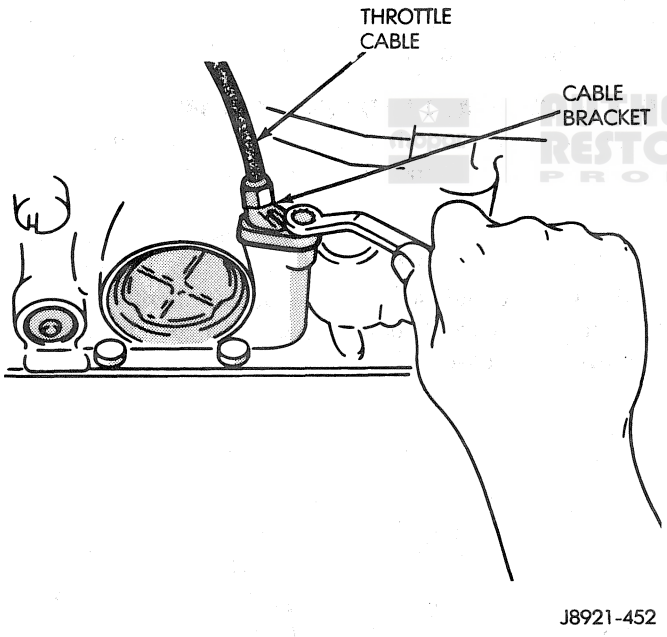


Fig. 73 Removing/Installing Transmission Throttle Cable And Bracket

(6) Apply bead of Loctite 599 sealer to oil pan sealing surface. Sealer bead should be at least 3 mm (1/8 in.) wide. Then install pan and tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(7) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N·m (15 ft. lbs.) torque.

(8) Connect cable to engine bracket and throttle linkage.

(9) Fill transmission with Mopar Dexron/Mercon IIE.

(10) Adjust the cable as described in cable adjustment procedure.

TRANSMISSION THROTTLE CABLE ADJUSTMENT

(1) Shift transmission into Park, shut engine off and raise hood.

(2) Press cable release button (Fig. 74).

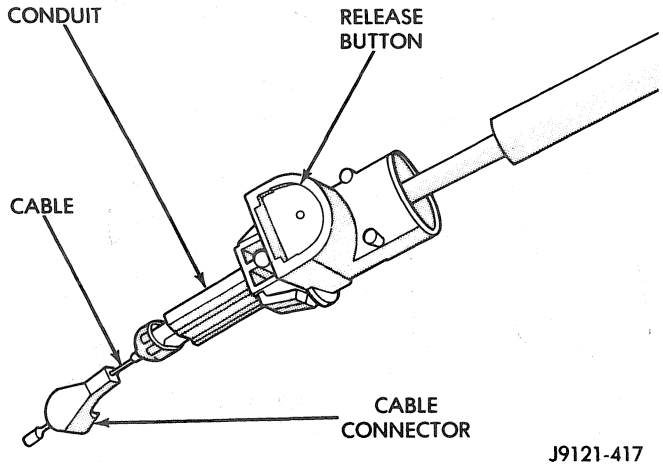


Fig. 74 Throttle Cable Components

(3) Push cable conduit back into cable sheath as far as possible (Fig. 75).

(4) Rotate lever on throttle body to wide open throttle position. Cable will ratchet to correct adjustment point as lever is rotated (Fig. 75).

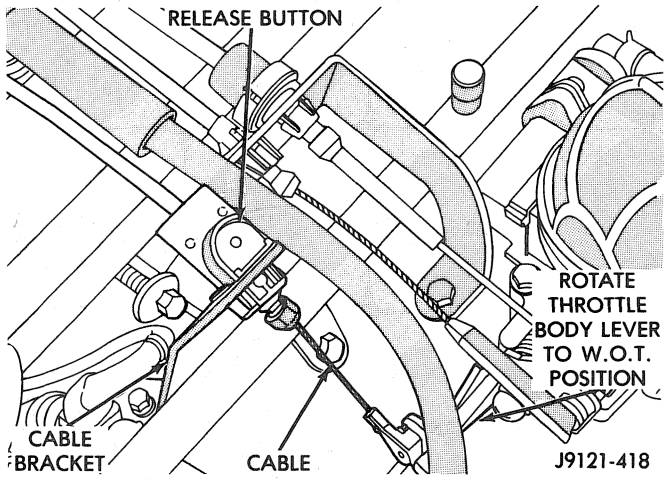


Fig. 75 Throttle Cable Adjustment

TRANSMISSION AND TORQUE CONVERTER

REMOVAL

(1) Raise vehicle.

(2) Drain transmission fluid and reinstall oil pan drain plug.

(3) On models with 2–piece fill tube, remove upper half of tube (Fig. 76).

(4) Disconnect cooler lines at transmission. Cooler lines have quick–disconnect fittings. Press fitting

REMOVAL AND INSTALLATION (Continued)

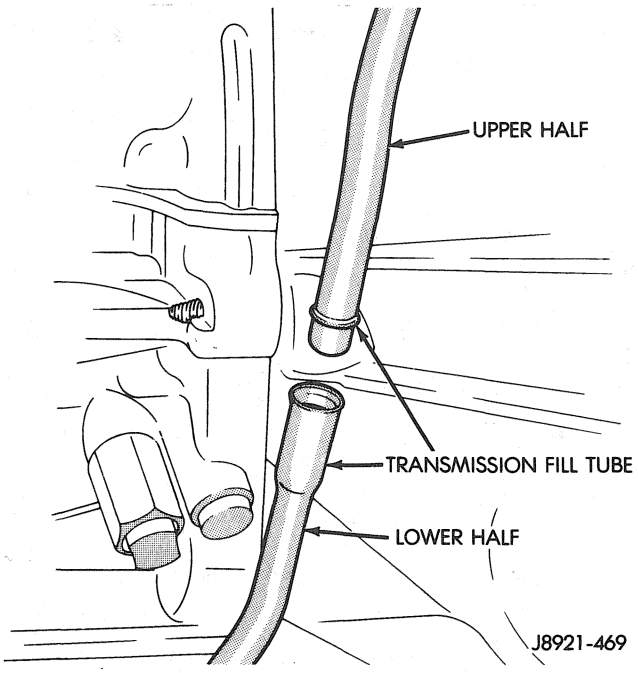


Fig. 76 Transmission Fill Tube (Two–Piece)

release tabs and pull cooler lines and fittings out of case or use Special Tool 7555 to disconnect them.

(5) Support engine with safety stand and support transmission with jack.

(6) Disconnect transmission and transfer case shift linkage.

(7) Remove necessary exhaust components.

(8) Disconnect vehicle speed sensor wires

(9) Mark position of front and rear propeller shafts for alignment reference. Then remove shafts from vehicle.

(10) Remove rear crossmember.

(11) Disconnect transmission shift cable at transmission. Then disconnect transmission throttle valve cable at engine.

(12) Disconnect necessary vacuum and fluid hoses.

(13) Remove transfer case from transmission.

(14) Disconnect and remove crankshaft position sensor (Fig. 77).

CAUTION: The crankshaft position sensor can be damaged during transmission removal (or installation) if the sensor is still bolted to the engine block. To avoid damage, remove the sensor before removing the transmission.

(15) Remove starter motor.

(16) Remove bolts attaching converter to drive plate.

(17) Remove bolts attaching converter housing to engine.

(18) Secure transmission to jack with safety chains.

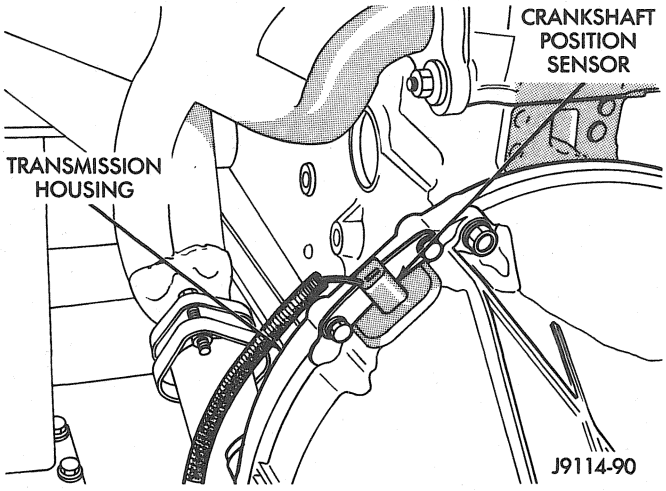


Fig. 77 Crankshaft Position Sensor

(19) Pull transmission rearward for access to converter. Then secure converter in pump with C–clamp or strap bolted to converter housing.

(20) Remove transmission from under vehicle.

(21) Remove torque converter if converter or oil pump seal are to be serviced.

INSTALLATION

(1) Mount transmission on transmission jack. Then secure transmission to jack with safety chains.

(2) Lubricate converter drive hub and oil pump seal lip with transmission fluid. Then install converter. Be sure converter is fully seated in oil pump gears before proceeding. Hold converter in place with C–clamp or strap attached to converter housing.

(3) Align and position transmission and converter on engine.

(4) Remove clamp or strap used to hold torque converter in place.

(5) Move transmission forward seat and it on engine. Be sure torque converter hub is fully seated.

(6) Install converter housing–to–engine bolts (Fig. 78).

(7) Install converter–to–drive plate bolts.

(8) Install and connect starter motor.

(9) Install and connect crankshaft position sensor.

(10) Install transfer case on transmission. Tighten transfer case attaching nuts to 41 N·m (30 ft. lbs.) torque

(11) Connect transfer case shift linkage and vacuum hoses.

(12) Connect exhaust components.

(13) Install rear crossmember and remove jack used to support transmission assembly.

(14) Connect speed sensor wire harness to sensor.

(15) Connect wire harness to park/neutral position switch.

REMOVAL AND INSTALLATION (Continued)

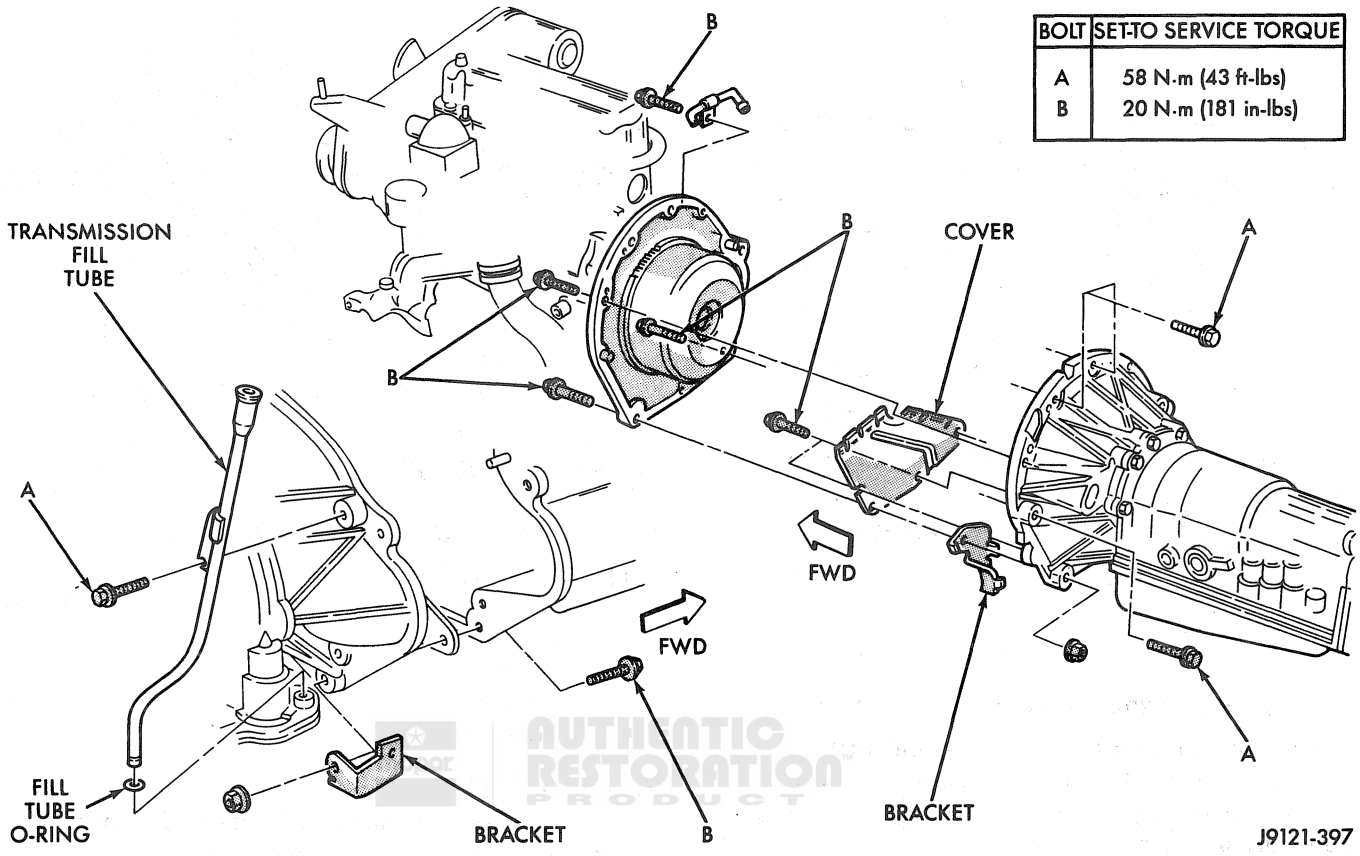


Fig. 78 Transmission Mounting

(16) Align and connect front and rear propeller shafts.

(17) Connect transmission wire harnesses and transfer case vacuum and wire harnesses.

(18) Connect transmission cooler lines.

(19) Connect transmission throttle cable at engine.

(20) Install new O–ring seal on upper half of transmission fill tube. Then connect upper and lower tube halves.

(21) Lower vehicle.

(22) Fill transmission with Mopar Dexron IIE/Mercon automatic transmission fluid.

OIL PUMP SEAL

REMOVAL

(1) Remove converter.

(2) Remove old seal. Use blunt punch to collapse seal and pry seal out of pump housing. Do not scratch or damage seal bore.

INSTALLATION

(1) Lubricate lip of new seal with transmission fluid and install seal in pump with tool 7549 (Fig. 79).

(2) Lubricate converter drive hub with transmission fluid.

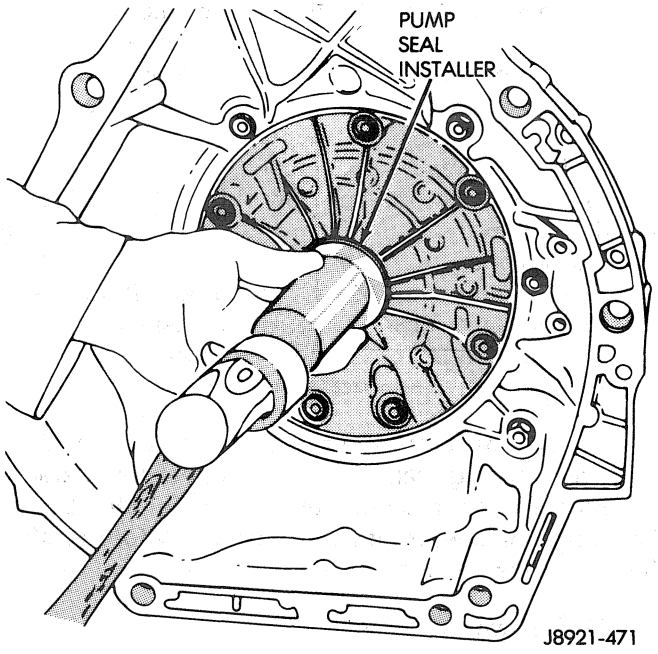


Fig. 79 Installing Oil Pump Seal

(3) Align and install converter in oil pump.

DISASSEMBLY AND ASSEMBLY

TRANSMISSION

DISASSEMBLE

(1) Remove torque converter.
(2) Remove lower half of filler tube if not previously removed.
(3) Remove clamps attaching wire harness and throttle cable (Fig. 80) to transmission.

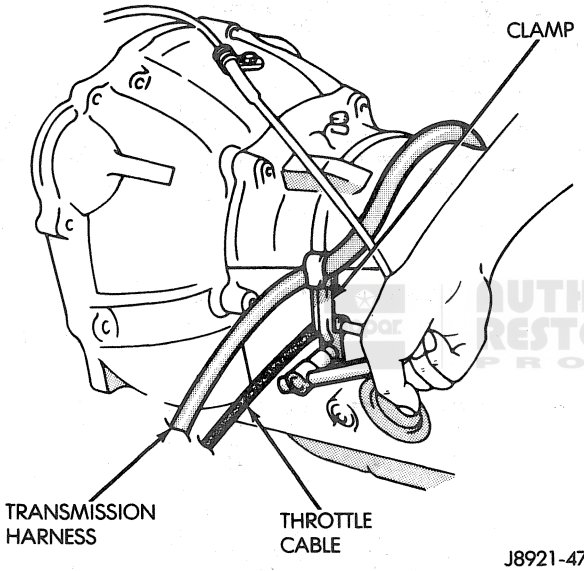


Fig. 80 Typical Harness And Cable Clamp Attachment

(4) Remove shift lever from manual valve shaft at left side of transmission.
(5) Remove park/neutral position switch.
(6) Remove speed sensor (Fig. 81).
(7) Remove converter housing bolts and remove housing (Fig. 82) from case.
(8) Remove adapter housing.

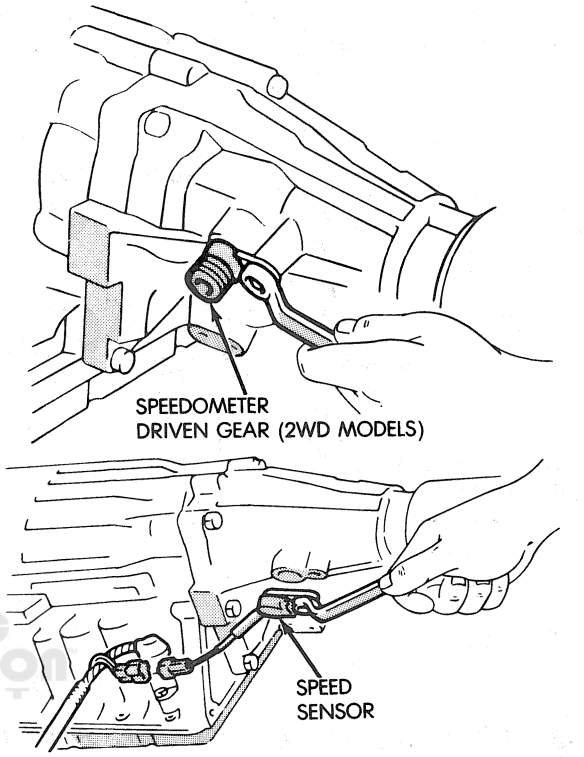


Fig. 81 Speed Sensor Removal

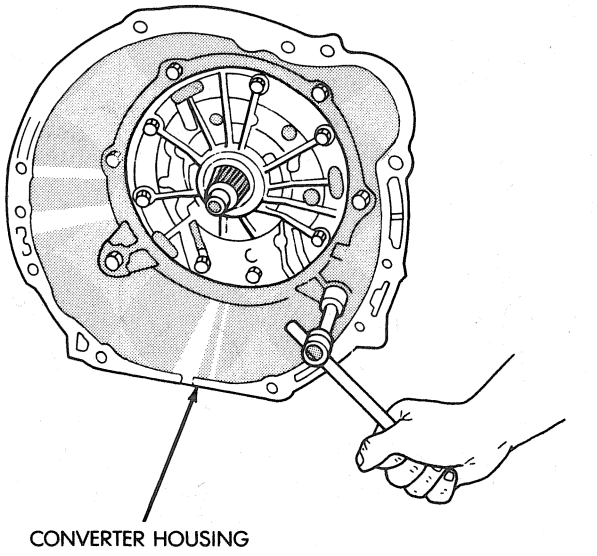


Fig. 82 Converter Housing Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Remove speedometer drive gear snap ring and remove gear and gear spacer if equipped (Fig. 83).

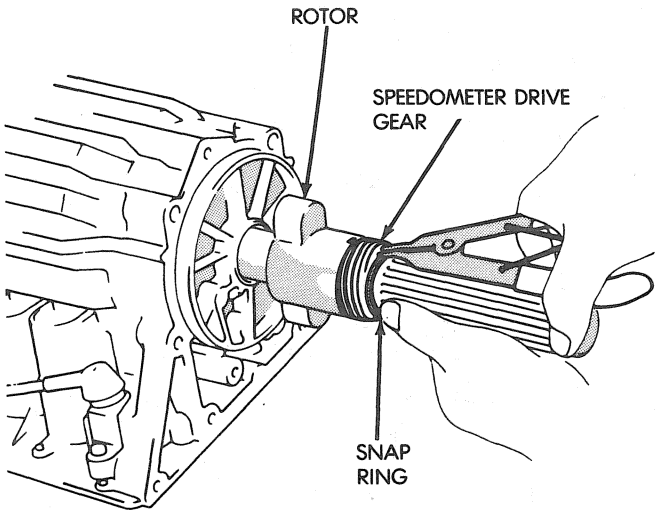


Fig. 83 Removing Speed Sensor And Speedometer Drive Gear

(10) Remove speed sensor rotor and key. Use wood dowel or hammer handle to loosen and remove rotor (Fig. 84).

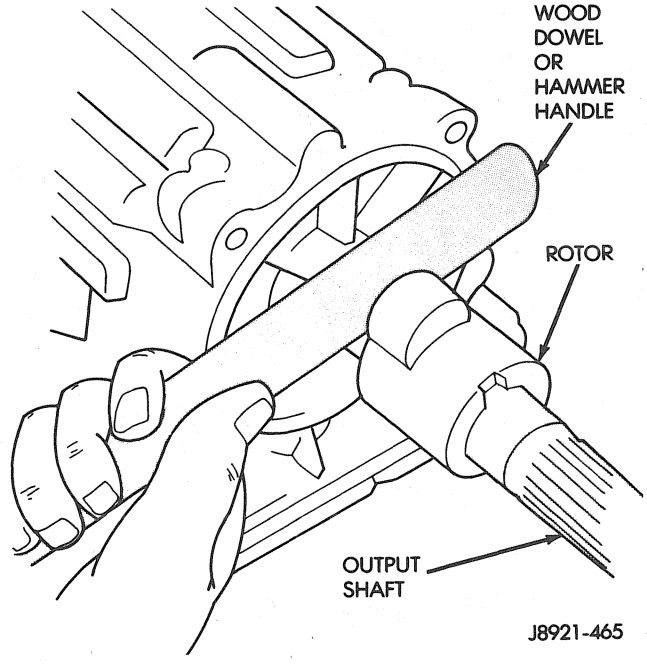


Fig. 84 Removing Transmission Speed Sensor Rotor

(11) Remove transmission oil pan, oil screen and screen gaskets (Fig. 85). Then mount transmission in holding fixture.

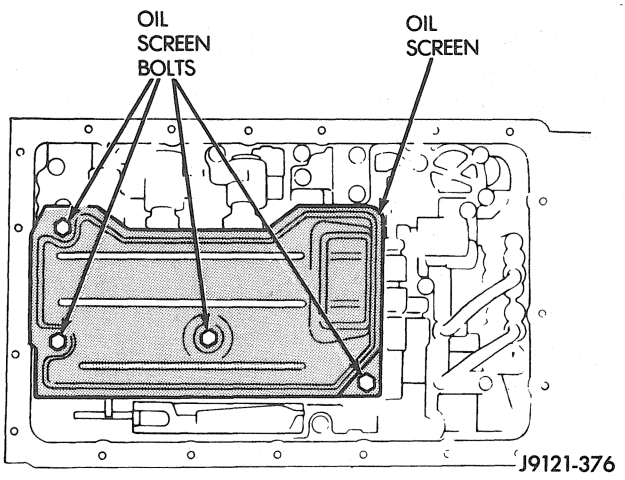


Fig. 85 Removing Oil Screen

(12) Remove valve body oil feed tubes (Fig. 86).

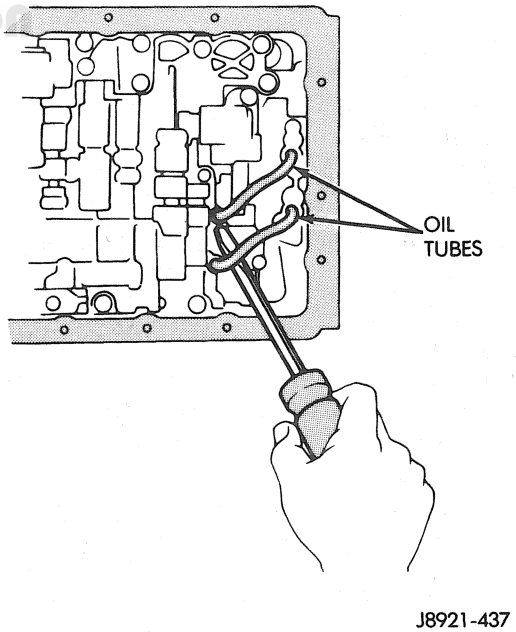


Fig. 86 Valve Body Oil Tube Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Disconnect valve body solenoid wires (Fig. 87).

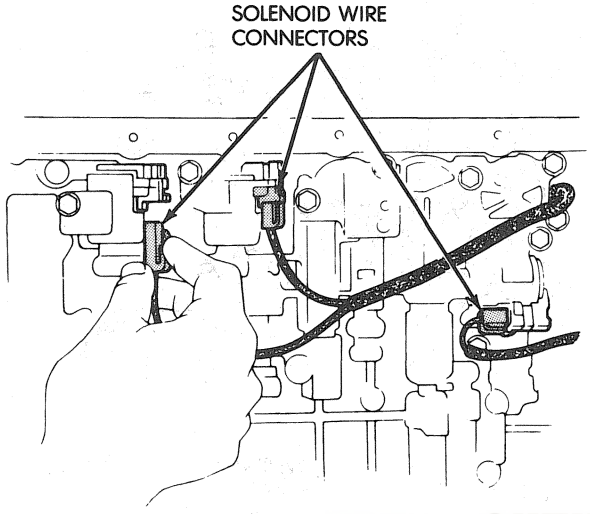


Fig. 87 Solenoid Wire Location

(14) Remove harness bracket bolt and remove harness and bracket (Fig. 88).

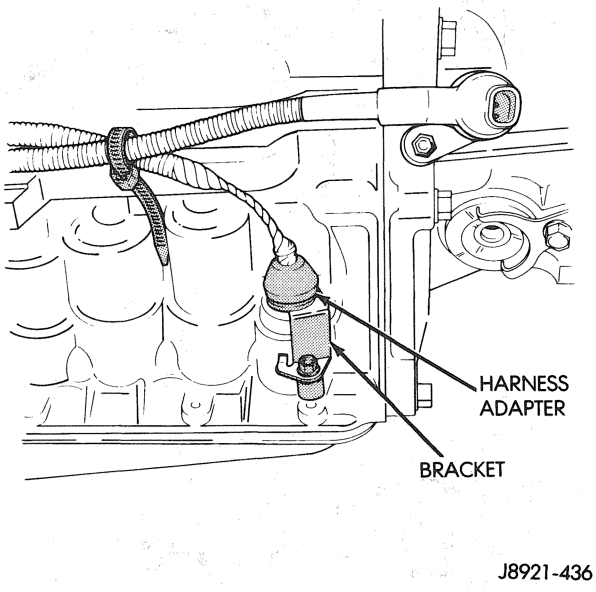


Fig. 88 Removing Bracket And Harness

(15) Remove valve body bolts (Fig. 89).

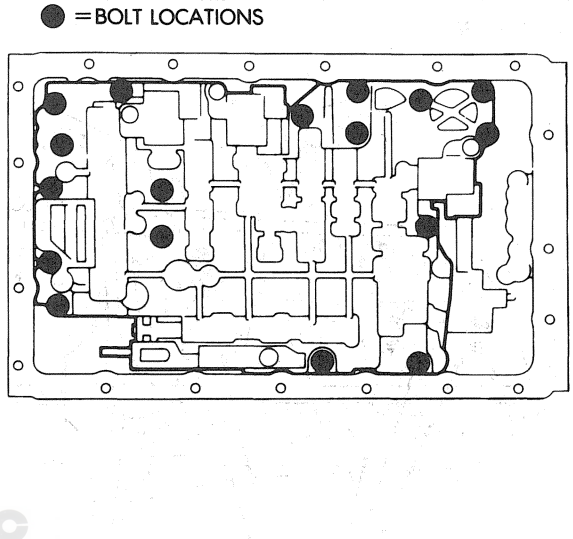


Fig. 89 Valve Body Bolt Locations

(16) Disconnect throttle cable from throttle cam (Fig. 90).

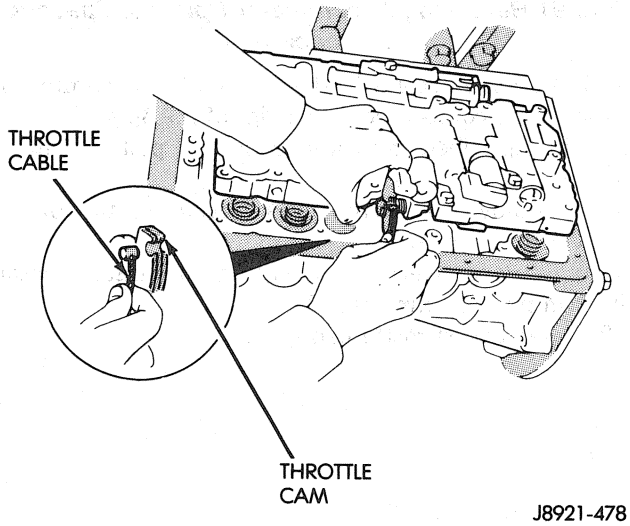


Fig. 90 Disconnecting Throttle Cable

DISASSEMBLY AND ASSEMBLY (Continued)

(17) Remove valve body from case. Then remove accumulator springs, spacers and check ball and spring (Fig. 91).

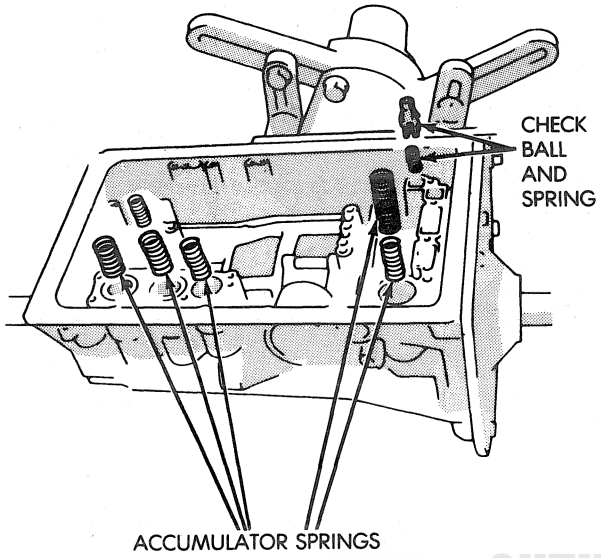


Fig. 91 Removing Accumulator Springs, Spacers And Check Ball

(18) Remove second brake and clutch accumulator pistons with compressed air (Fig. 92). Apply air pressure through feed port and ease the pistons out of the bore.

(19) Remove overdrive brake accumulator piston with compressed air (Fig. 92).

(20) Remove overdrive clutch accumulator piston with compressed air (Fig. 92).

(21) Remove throttle cable.

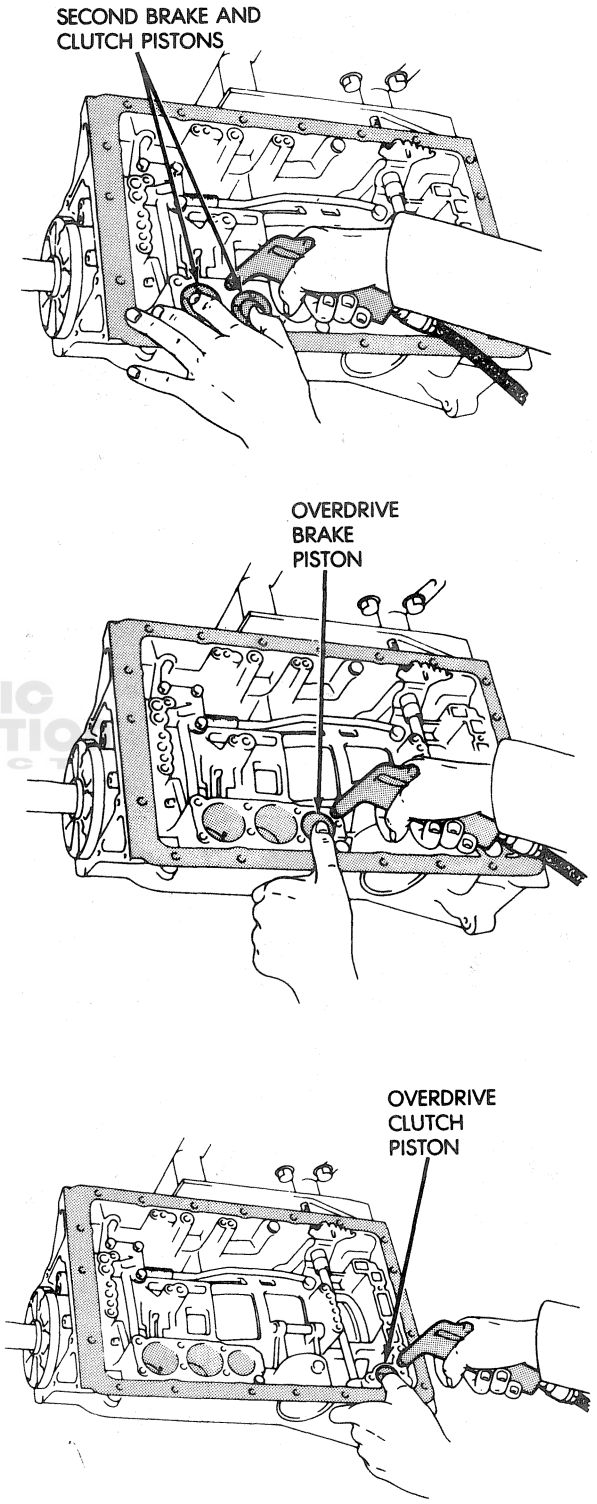


Fig. 92 Accumulator Piston Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(22) Remove oil pump bolts and remove pump with bridge–type Puller 7536 (Fig. 93).

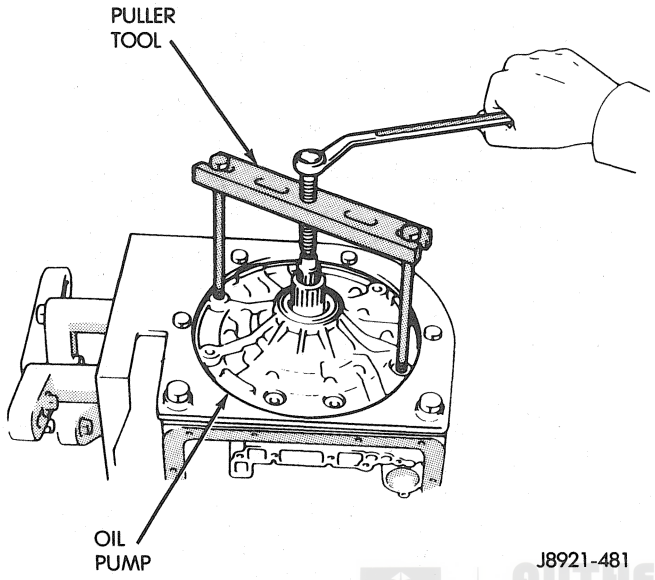


Fig. 93 Oil Pump Removal

(23) Remove race from oil pump (Fig. 94).

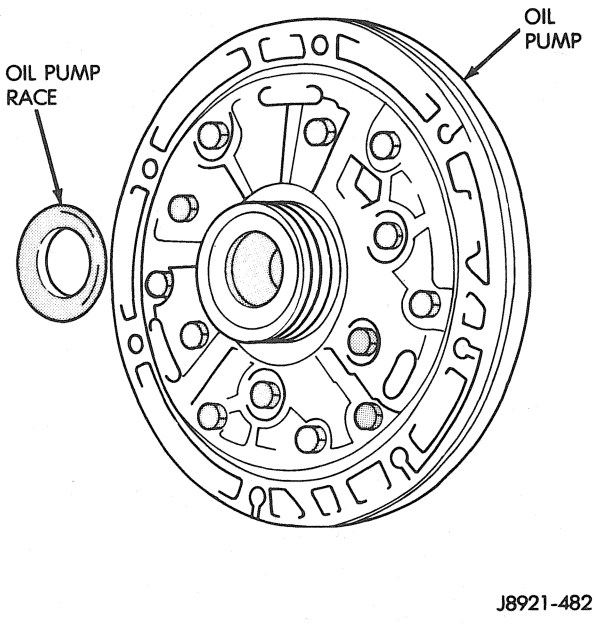


Fig. 94 Oil Pump Race Removal

(24) Remove overdrive planetary gear and clutch assembly (Fig. 95).

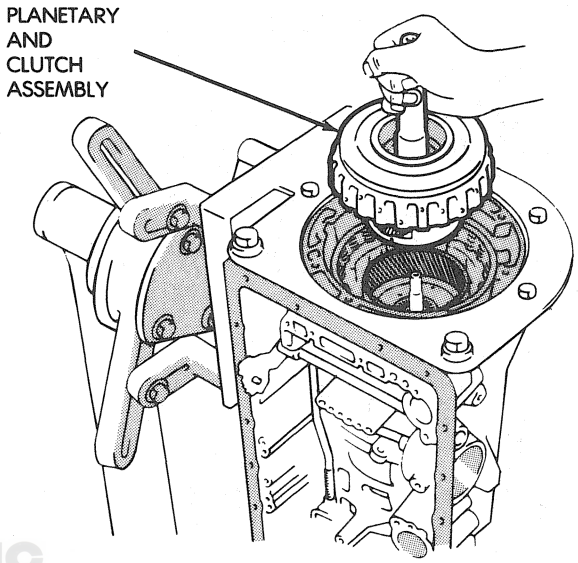


Fig. 95 Removing Overdrive Planetary And Clutch Assembly

(25) Remove race from overdrive planetary (Fig. 96).

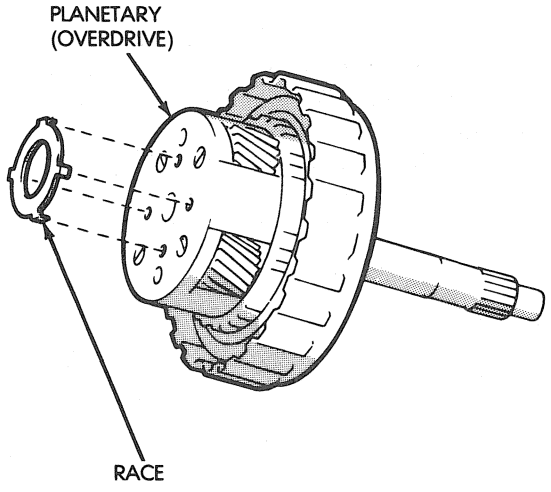


Fig. 96 Fourth Gear Planetary Race Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(26) Remove thrust bearing, race and overdrive planetary ring gear (Fig. 97).

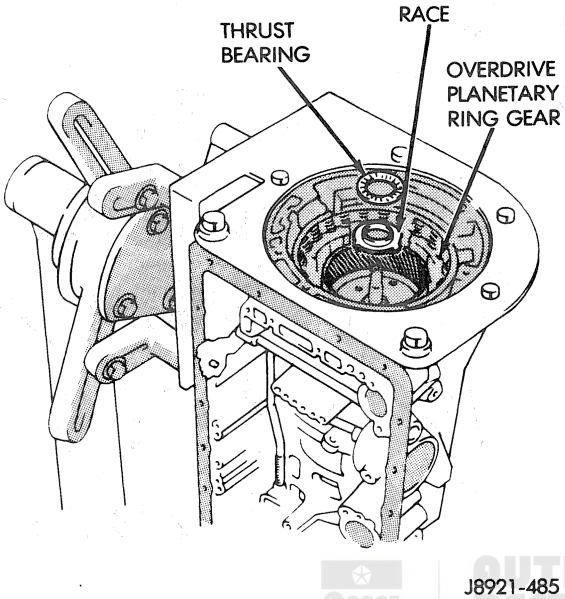


Fig. 97 Removing Bearing, Race And Planetary Ring Gear

(27) Measure stroke length of overdrive brake piston as follows:

(a) Mount dial indicator on case (Fig. 98).

(b) Mount Gauge Tool 7546 so it contacts piston (Fig. 98).

(c) Apply 57–114 psi air pressure through piston apply port and note piston stroke on dial indicator. Stroke length should be: 1.40 – 1.70 mm (0.055 – 0.0699 in.).

(d) If stroke is not within limits, replace clutch piston and retainer.

(28) Remove overdrive brake pack snap ring (Fig. 99).

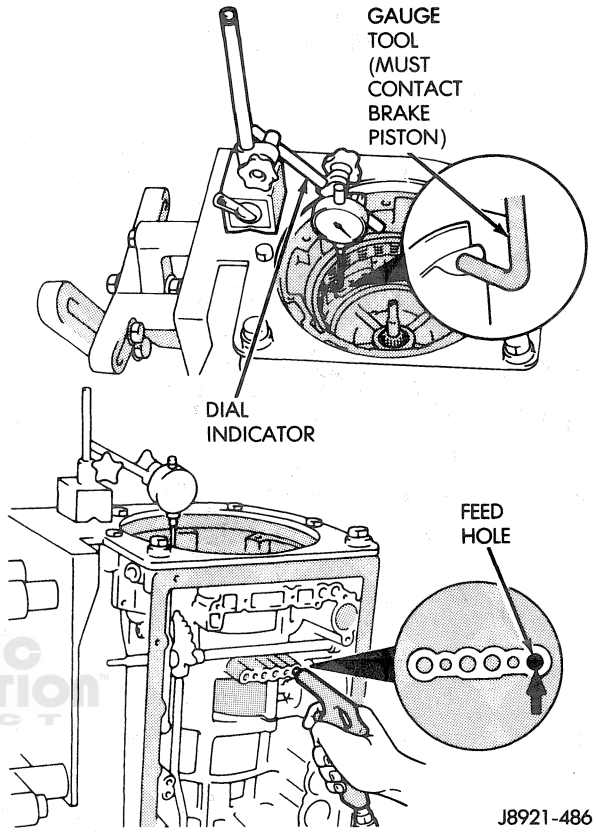


Fig. 98 Measuring Overdrive Brake Piston Stroke

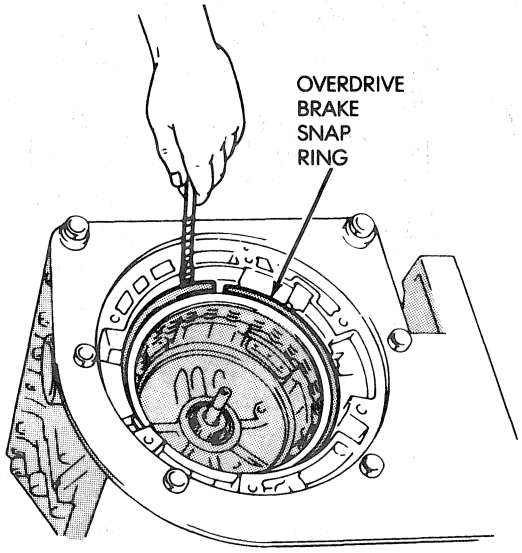


Fig. 99 Removing Overdrive Brake Pack Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(29) Remove overdrive brake pack discs and plates (Fig. 100). Measure brake pack disc thickness with micrometer. Replace brake pack if any disc thickness is less than 1.84 mm (0.0724 in.).

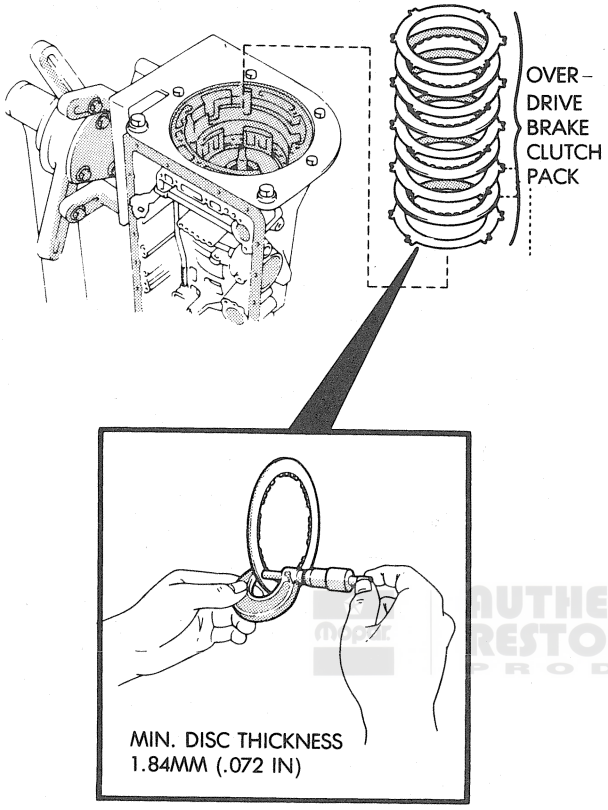


Fig. 100 Removing/Measuring Overdrive Brake Disc Thickness

(30) Remove overdrive support lower race and upper bearing and race assembly (Fig. 101).

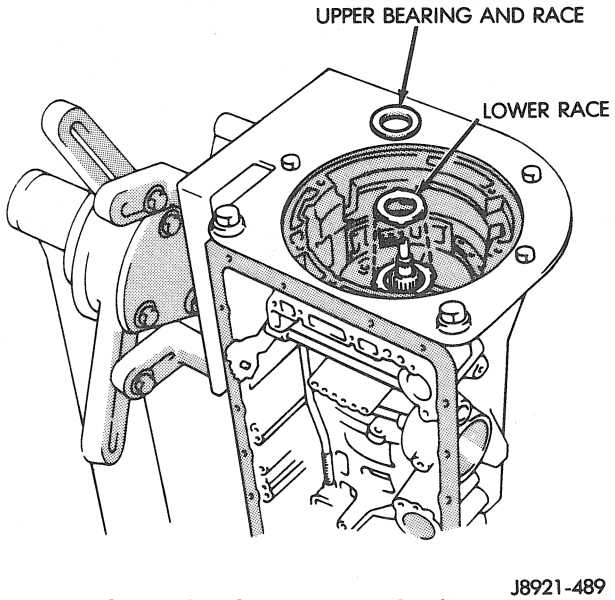


Fig. 101 Overdrive Support Bearing/Race Removal

(31) Remove overdrive support bolts (Fig. 102).

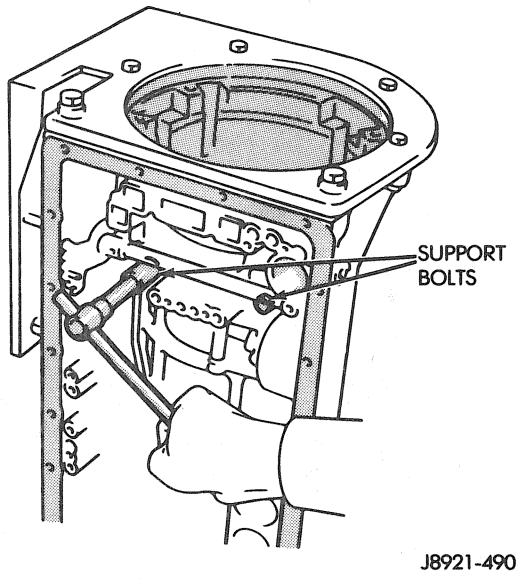


Fig. 102 Overdrive Support Bolt Removal

(32) Remove overdrive support snap ring with Snap Ring Plier Tool 7540 (Fig. 103).

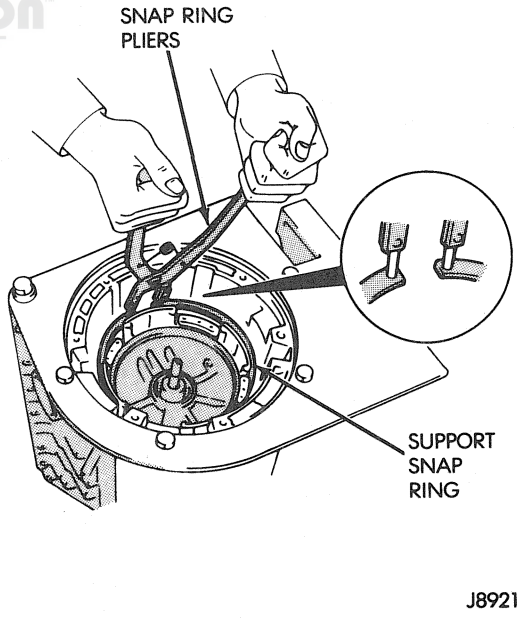


Fig. 103 Overdrive Support Snap Ring Removal/ Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(33) Remove overdrive support (Fig. 104) with bridge–type Puller 7536.

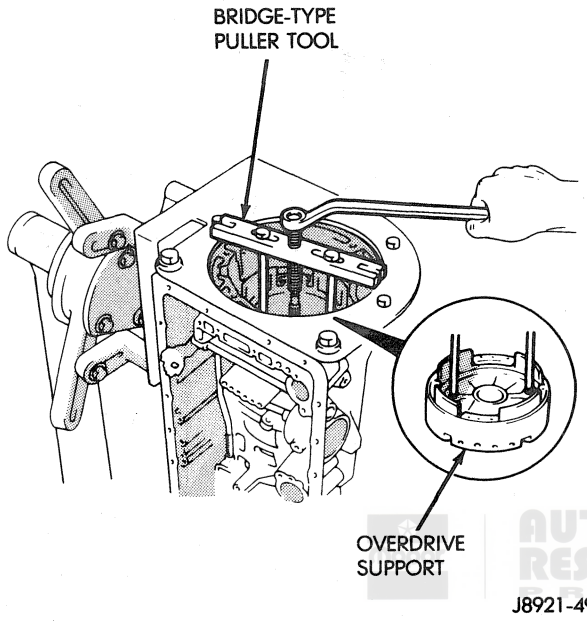


Fig. 104 Removing Overdrive Support

(34) Remove race from hub of overdrive support (Fig. 105).

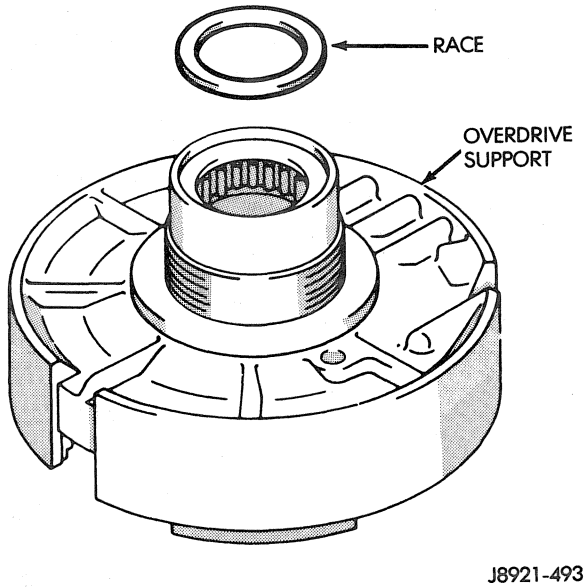


Fig. 105 Remove Overdrive Support Race

(35) Measure stroke length of second coast brake piston rod as follows:

(a) Make reference mark on piston rod (Fig. 106) as shown.

(b) Apply 57–114 psi air pressure through piston feed hole and check stroke length with Gauge Tool 7552 (Fig. 106).

(c) Stroke length should be 1.5 – 3.0 mm (0.059 – 0.118 in.).

(d) If stroke length is incorrect, install new piston rod and recheck stroke. If stroke is still incorrect, replace second coast brake band.

(e) Replacement piston rods are available in two different lengths which are: 71.4 mm (2.811 in.) and 72.9 mm (2.870 in.).

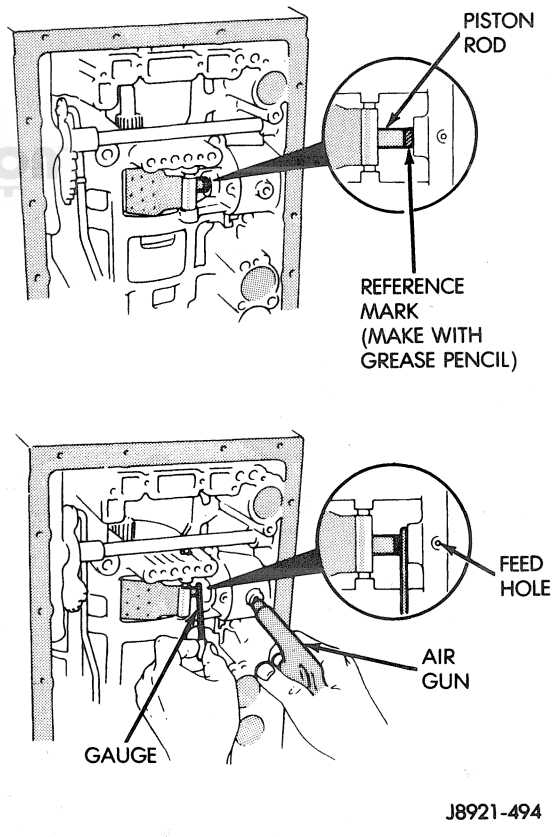


Fig. 106 Measuring Second Coast Brake Piston Rod Stroke

DISASSEMBLY AND ASSEMBLY (Continued)

(36) Remove second coast brake piston snap ring with Snap Ring Plier Tool 7540. Then remove piston cover and piston assembly with compressed air applied through piston feed hole (Fig. 107).

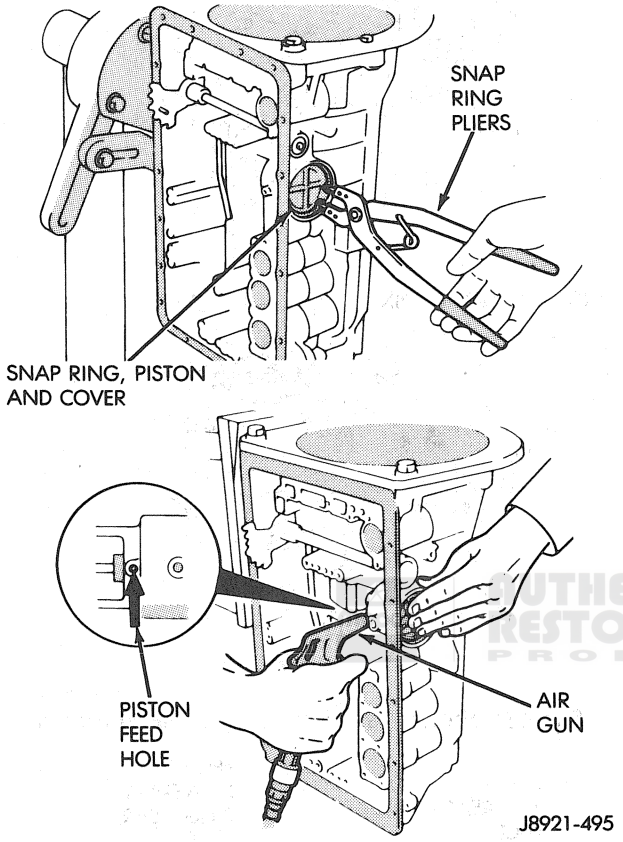


Fig. 107 Removing Second Coast Brake Cover And Piston

(37) Disassemble second coast brake piston (Fig. 108).

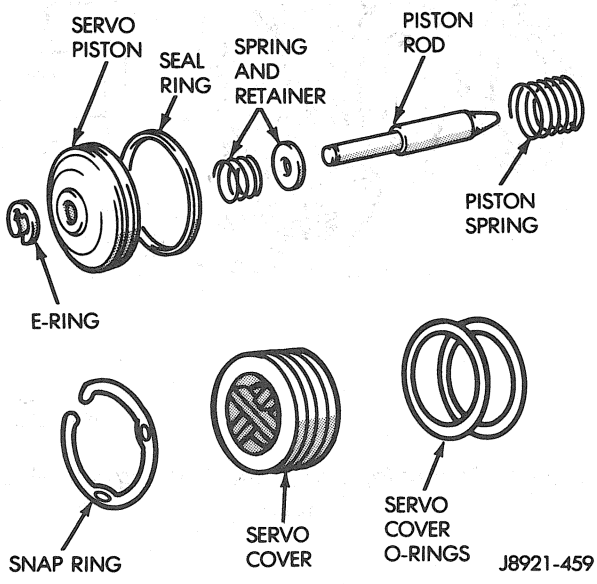


Fig. 108 Second Coast Brake Piston Components

(38) Remove direct and forward clutch assembly (Fig. 109).

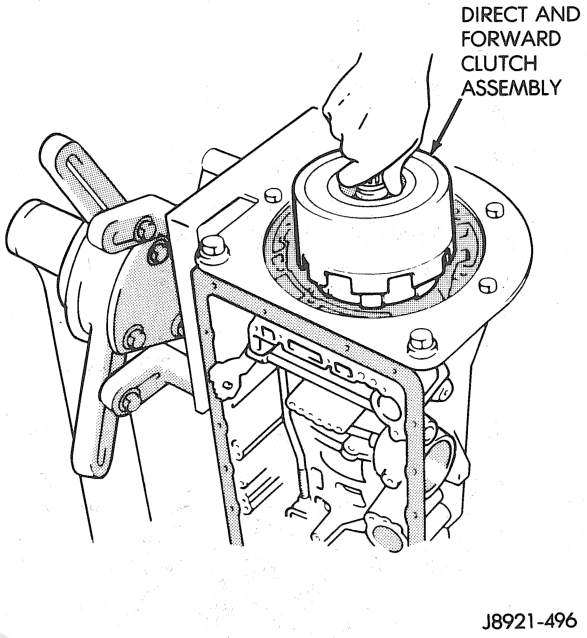


Fig. 109 Removing Direct And Forward Clutch Assembly

(39) Remove thrust bearing and race from clutch hub (Fig. 110).

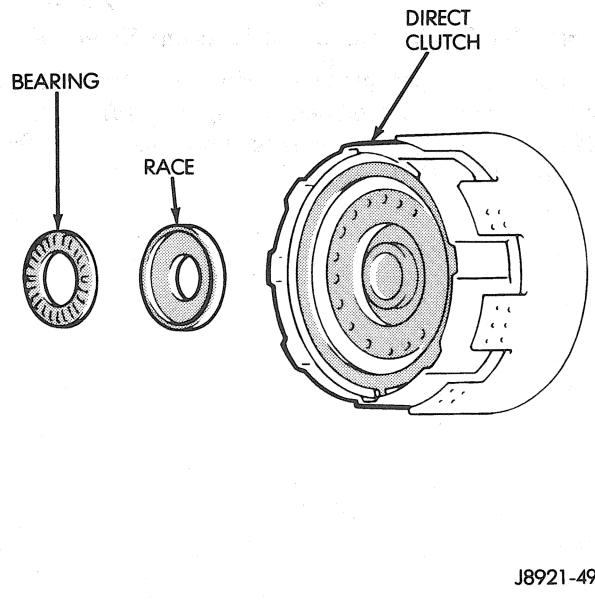


Fig. 110 Bearing And Race Removal From Clutch Hub

DISASSEMBLY AND ASSEMBLY (Continued)

(40) Remove second coast brake band E–ring from band pin and remove brake band (Fig. 111).

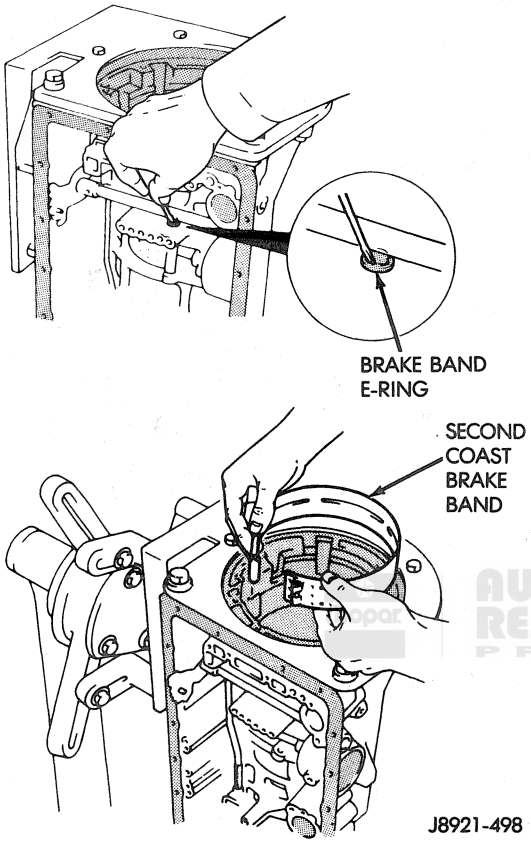


Fig. 111 Second Coast Brake Band Removal

(41) Remove front planetary ring gear front bearing race and remove front planetary ring gear (Fig. 112).

(42) Remove thrust bearing and rear race from ring gear (Fig. 113).

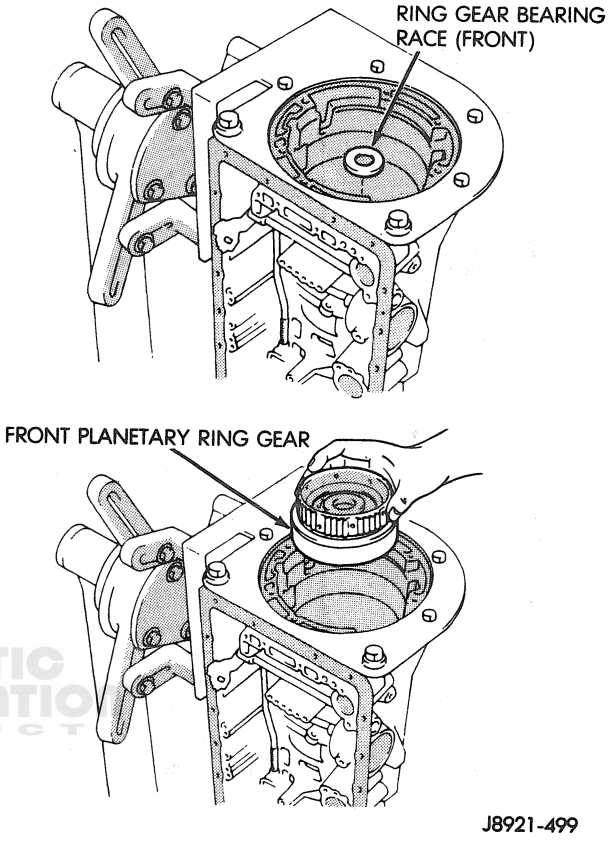


Fig. 112 Front Planetary Ring Gear Removal

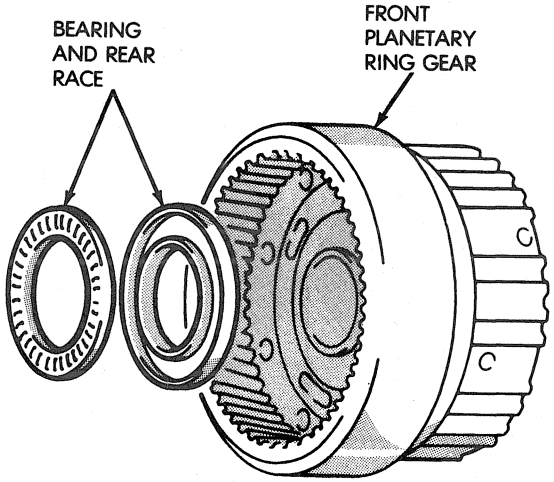


Fig. 113 Removing Ring Gear Bearing And Rear Race

DISASSEMBLY AND ASSEMBLY (Continued)

(43) Remove planetary thrust race (Fig. 114).

(44) Relieve load on planetary snap ring as follows: Loosen transmission holding fixture. Turn transmission over and allow output shaft to support transmission weight. Place wood blocks under shaft to protect splines (Fig. 114).

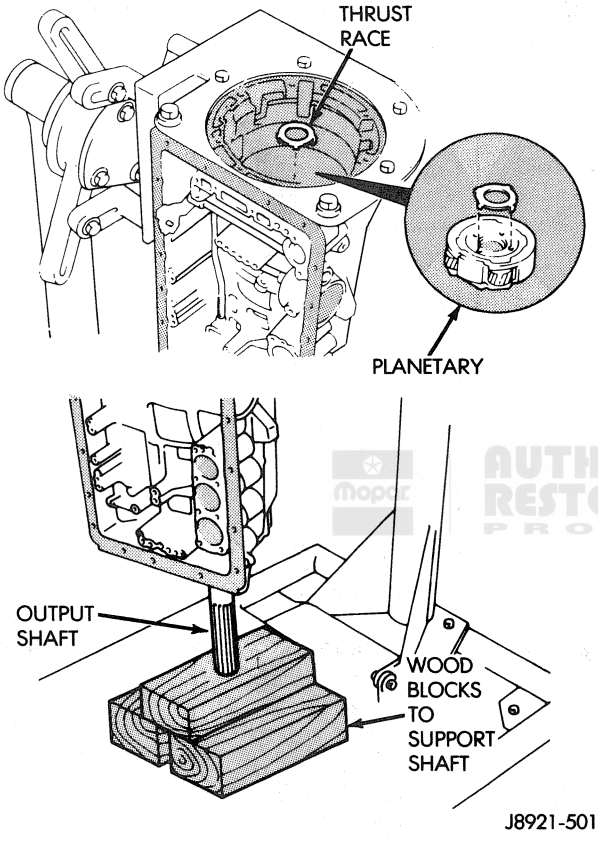


Fig. 114 Relieving Load On Planetary Snap Ring

(45) Remove planetary snap ring and remove planetary gear (Fig. 115).

(46) Remove sun gear, input drum and one–way clutch as assembly (Fig. 116).

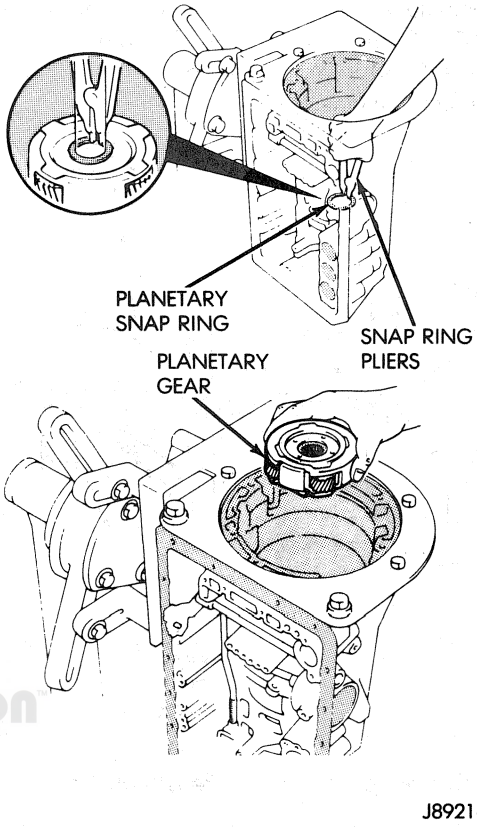


Fig. 115 Removing Planetary Snap Ring And Gear

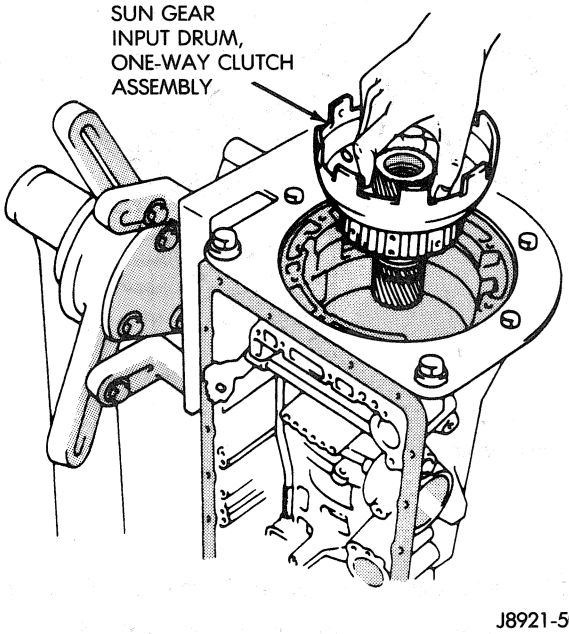


Fig. 116 Removing Sun Gear, Input Drum And One–Way Clutch

DISASSEMBLY AND ASSEMBLY (Continued)

(47) Measure second brake clutch pack clearance (Fig. 117). Clearance should be 0.62 – 1.98 mm (0.0244 – 0.0780 in.). Replace discs if clearance is not within specifications.

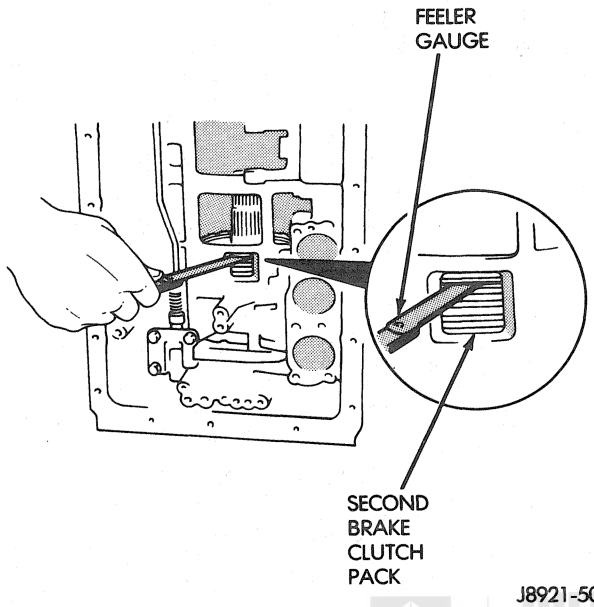


Fig. 117 Checking Second Brake Clutch Pack Clearance

(48) Remove second brake clutch pack snap ring (Fig. 118).

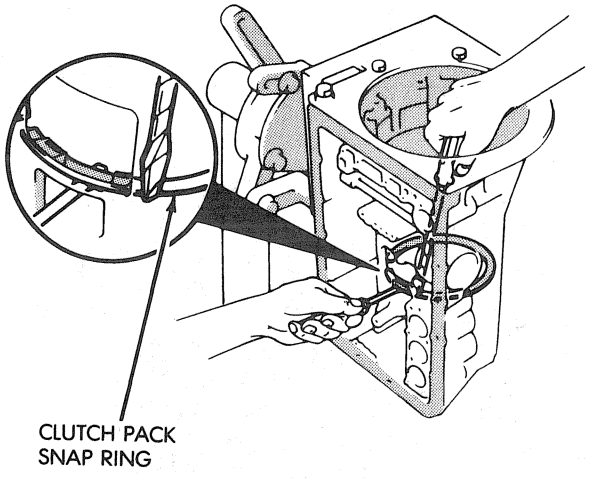


Fig. 118 Removing Second Brake Clutch Pack Snap Ring

(49) Remove second brake clutch pack (Fig. 119). Measure disc thickness with micrometer. Minimum thickness should be 1.84 mm (0.0724 in.). Replace discs if not within specifications.

(50) Remove bolts attaching park rod bracket to case. Then disconnect park rod from manual shaft lever and remove rod and bracket (Fig. 120).

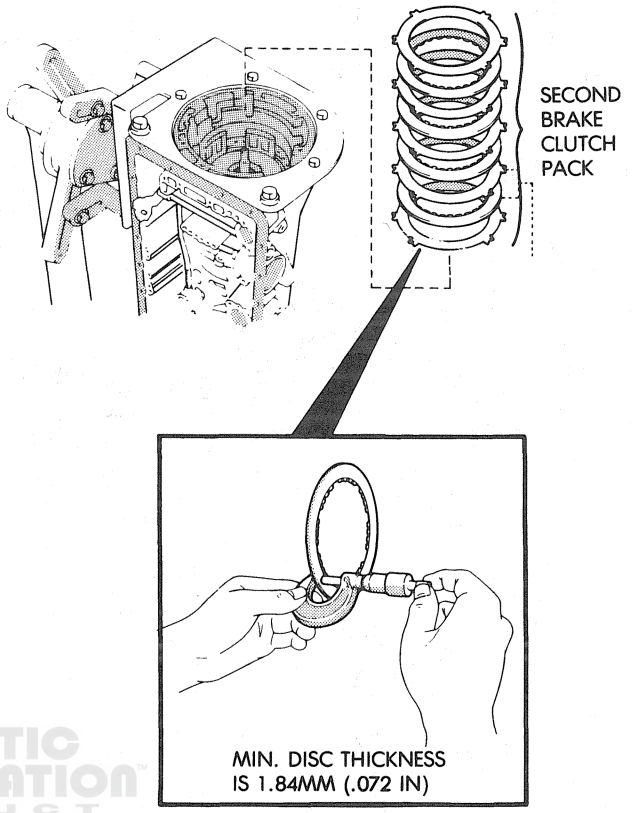


Fig. 119 Removing/Measuring Second Brake Clutch Disc Thickness

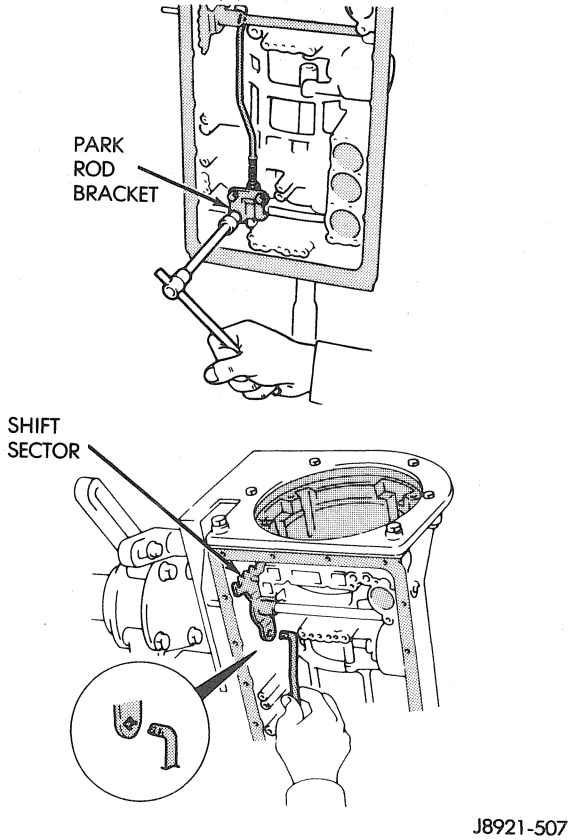


Fig. 120 Removing Park Rod And Bracket

DISASSEMBLY AND ASSEMBLY (Continued)

(51) Remove park pawl spring, pin and pawl (Fig. 121).

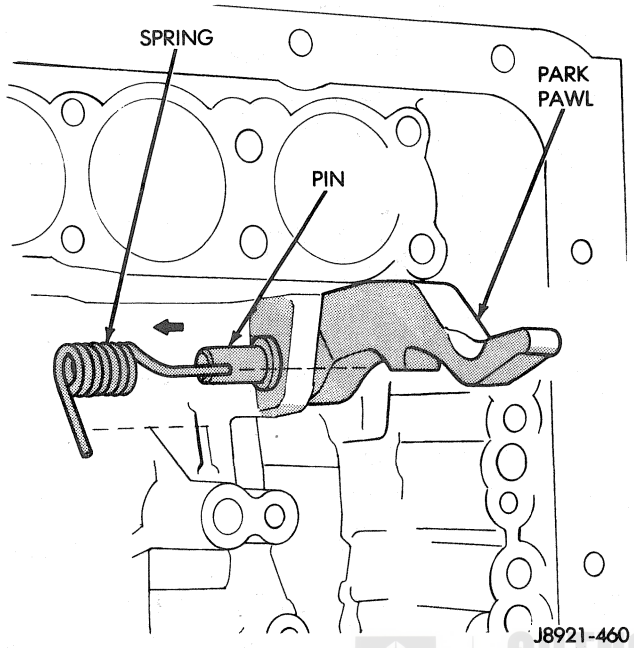


Fig. 121 Removing Park Pawl, Pin And Spring

(52) Measure clearance of first–reverse brake clutch pack (Fig. 122). Clearance should be: 0.70 – 1.2 mm (0.028 – 0.047 in.). Replace discs if clearance is not as specified.

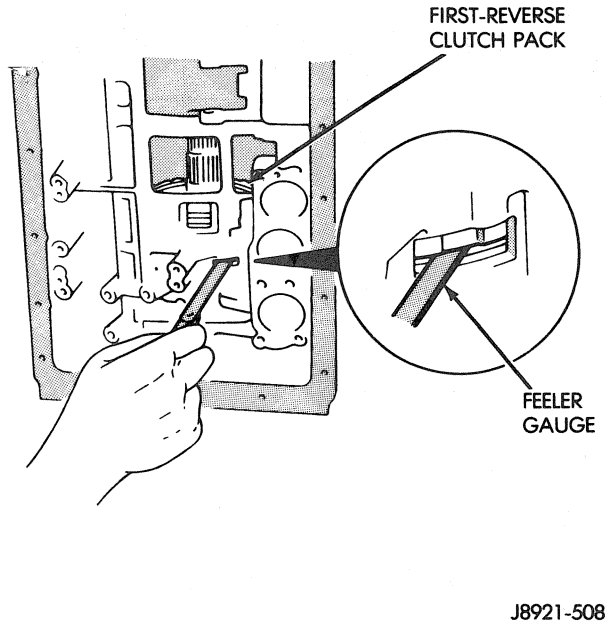


Fig. 122 Checking First–Reverse Brake Clutch Pack Clearance

(53) Remove second brake piston sleeve (Fig. 123). Cover remover tool with tape to avoid damaging case.

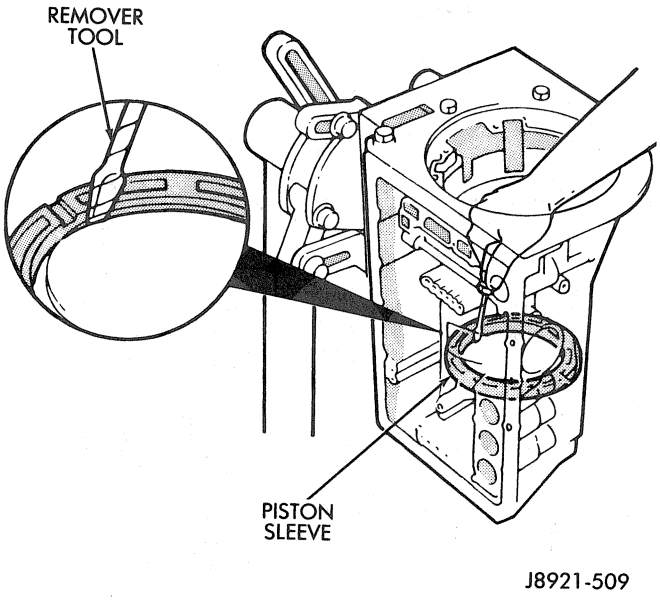


Fig. 123 Removing Second Brake Piston Sleeve

(54) Remove rear planetary gear, second brake drum and output shaft as an assembly (Fig. 124).

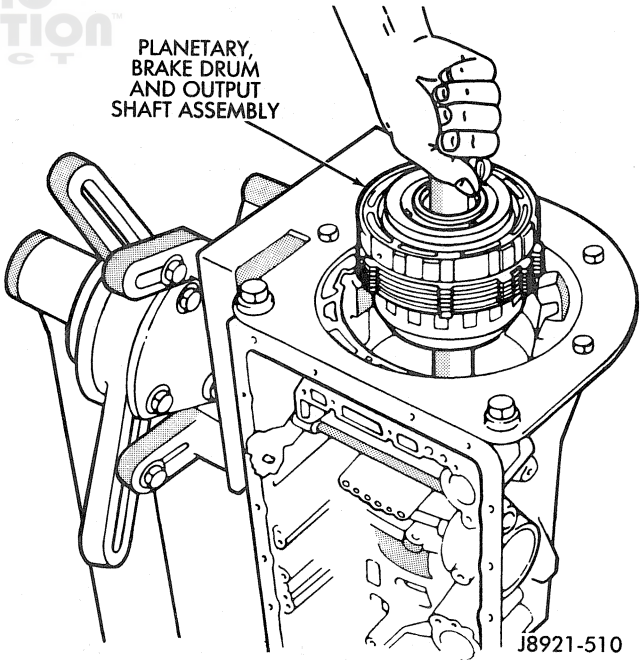


Fig. 124 Removing Rear Planetary, Second Brake Drum And Output Shaft

(55) Remove planetary and brake drum thrust bearing and race assembly (Fig. 125)

(56) .

(57) Remove second brake drum gasket from case with gasket scraper or screwdriver (Fig. 126). Retain tube shaped gasket if condition is OK.

(58) Measure inside diameter of transmission case rear bushing with bore gauge or inside micrometer

DISASSEMBLY AND ASSEMBLY (Continued)

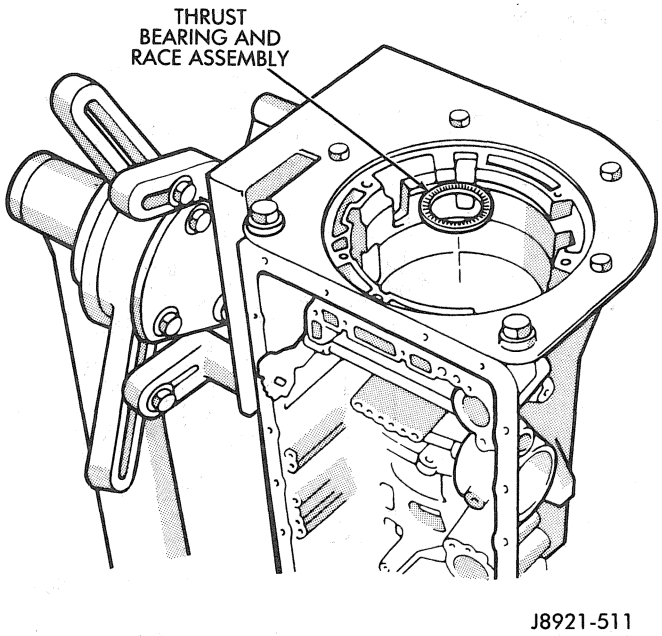


Fig. 125 Removing Planetary And Brake Drum Thrust Bearing And Race Assembly

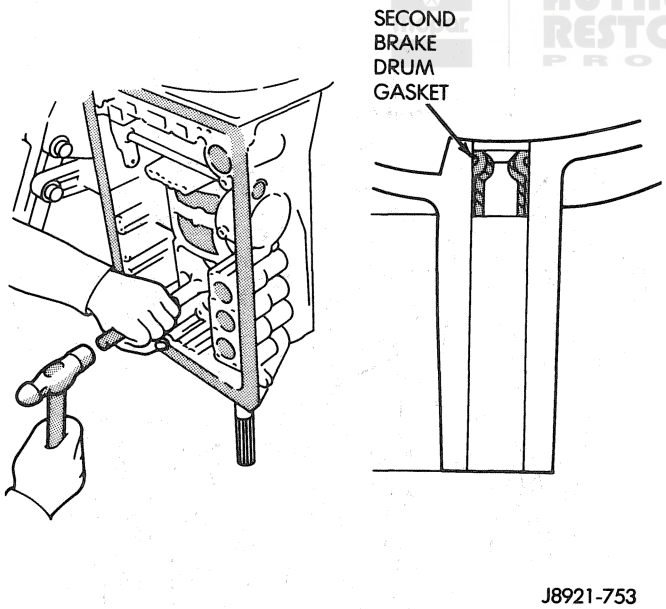


Fig. 126 Removing Brake Drum Gasket

(Fig. 127). Maximum allowable diameter is 38.18 mm (1.5031 in.). **Replace transmission case if bushing I.D. is greater than specified. Bushing is not serviceable.**

TRANSMISSION ASSEMBLY AND ADJUSTMENTS

(1) During assembly, lubricate components with transmission fluid or petroleum jelly as indicated.

(2) If any of the transmission components are still assembled after overhaul checking procedures, disassemble as necessary in preparation for transmission assembly.

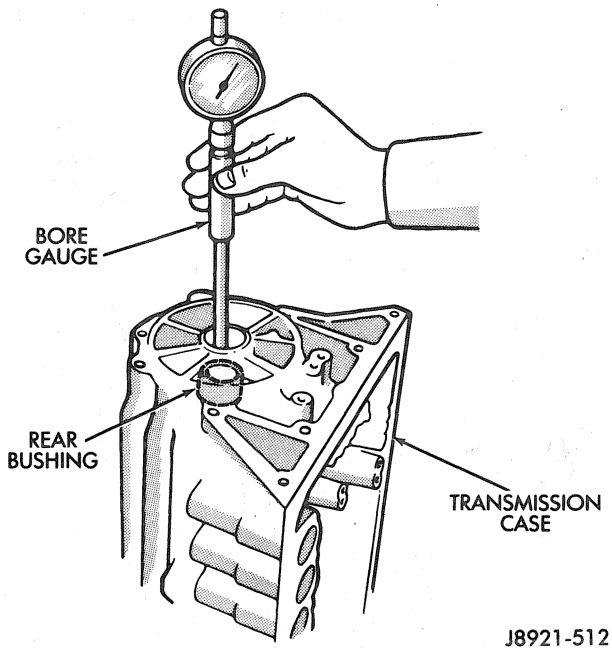


Fig. 127 Checking Rear Bushing Inside Diameter

(3) Verify thrust bearing and race installation during assembly. Refer to the Thrust Bearing Chart (Fig. 128) for bearing and race location and correct positioning.

(4) Install rear planetary gear, second brake drum and output shaft as outlined in following steps:

(5) Verify No. 10 thrust bearing and race (Fig. 128). Bearing and race outer diameter is 57.7 mm (2.272 in.) and inside diameter is 39.2 mm (1.543 in.).

DISASSEMBLY AND ASSEMBLY (Continued)

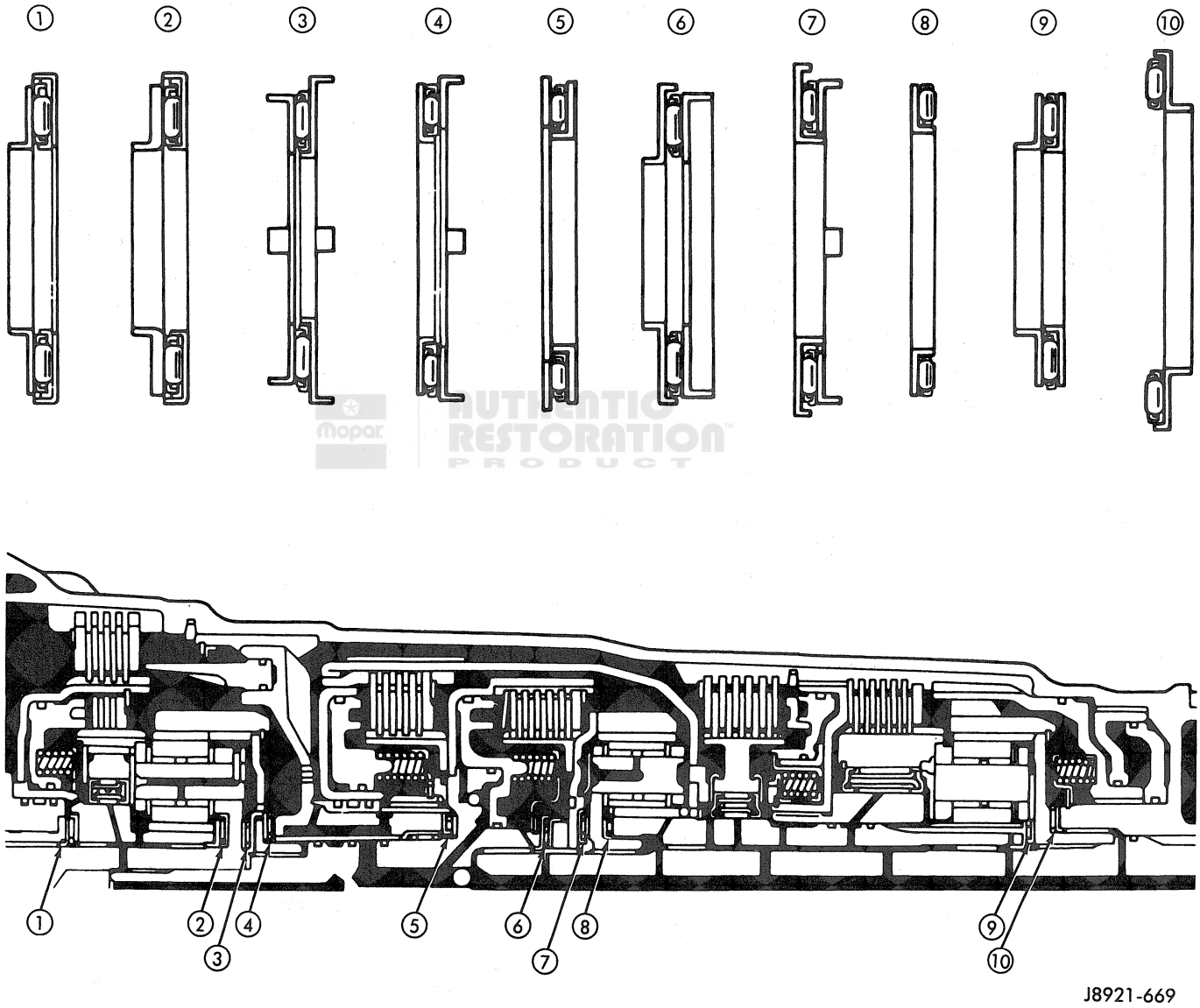


Fig. 128 Thrust Bearing Chart

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Coat thrust bearing and race assembly with petroleum jelly and install in case (Fig. 129). Race faces down. Bearing rollers face up.

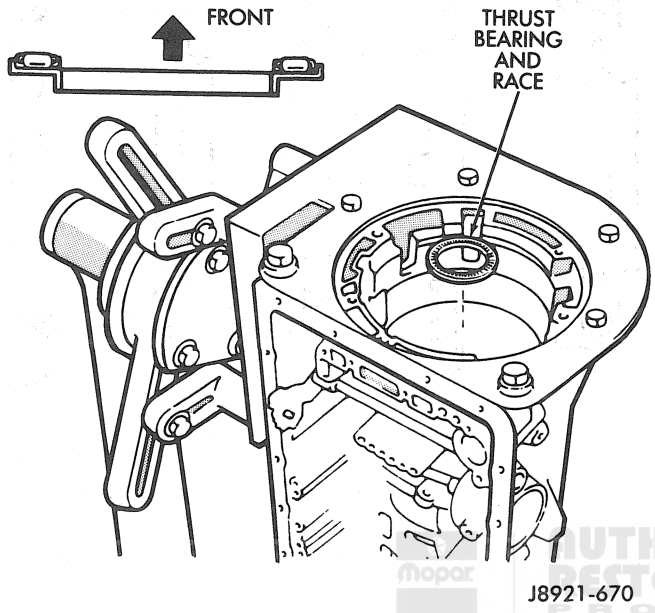


Fig. 129 Installing Thrust Bearing And No. 10 Race

(7) Align teeth of second brake drum and clutch pack (Fig. 130).

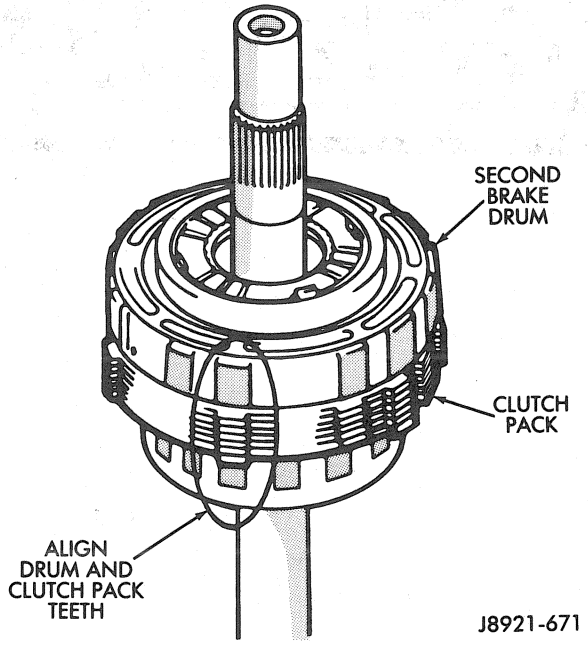


Fig. 130 Aligning Second Brake Drum And Clutch Pack Teeth

(8) Align rear planetary–output shaft assembly teeth with case slots and install assembly in case (Fig. 131).

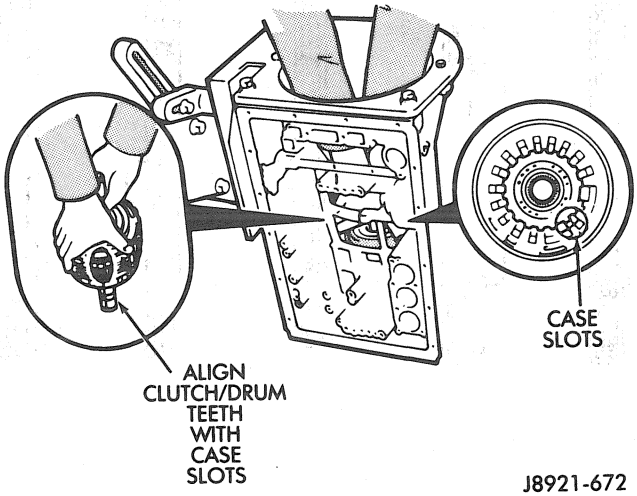


Fig. 131 Output Shaft/Rear Planetary Assembly Installation

(9) Install rear planetary snap ring with snap ring pliers. Chamfered side of snap ring faces up and toward case front (Fig. 132).

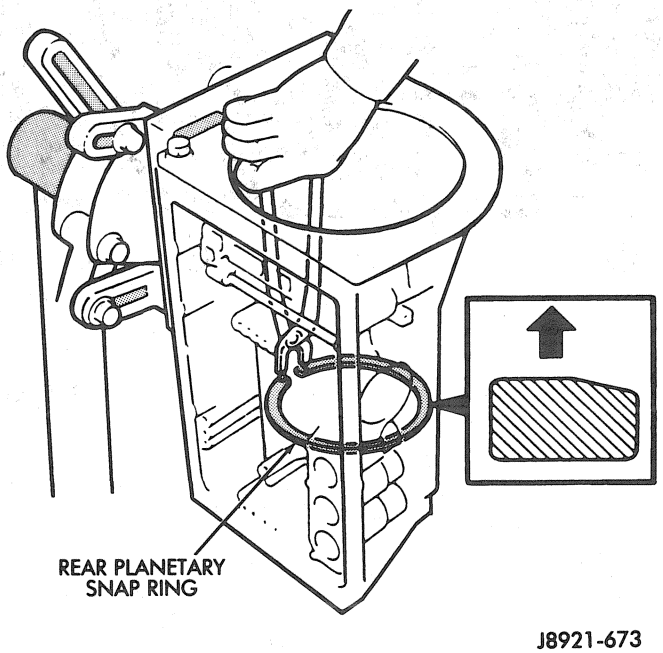
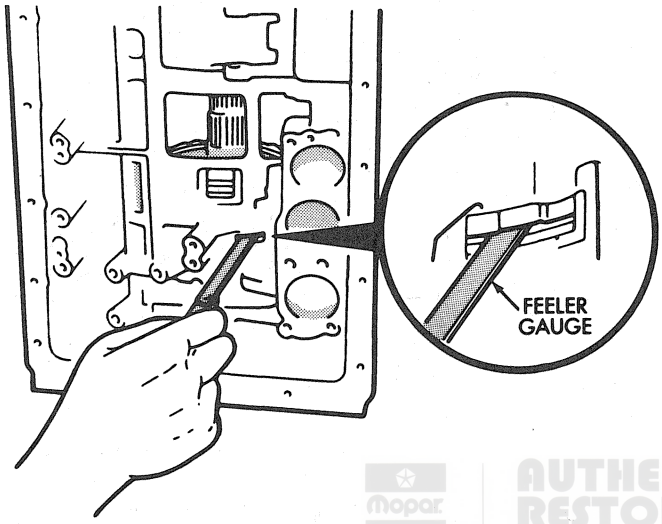


Fig. 132 Planetary Snap Ring Installation

DISASSEMBLY AND ASSEMBLY (Continued)

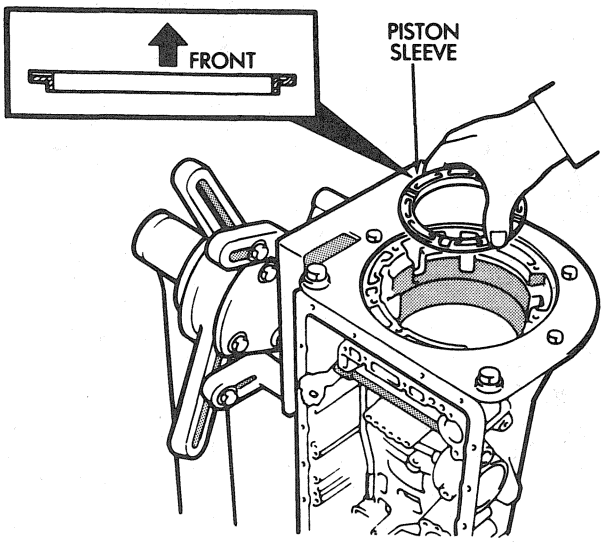
(10) Check first–reverse brake pack clearance with feeler gauge (Fig. 133). Clearance should be 0.70 – 1.20 mm (0.028 – 0.047 in.). If clearance is incorrect, planetary assembly, thrust bearing or snap ring is not properly seated in case. Remove and reinstall components if necessary.



J8921-674

Fig. 133 Checking First–Reverse Brake Pack Clearance

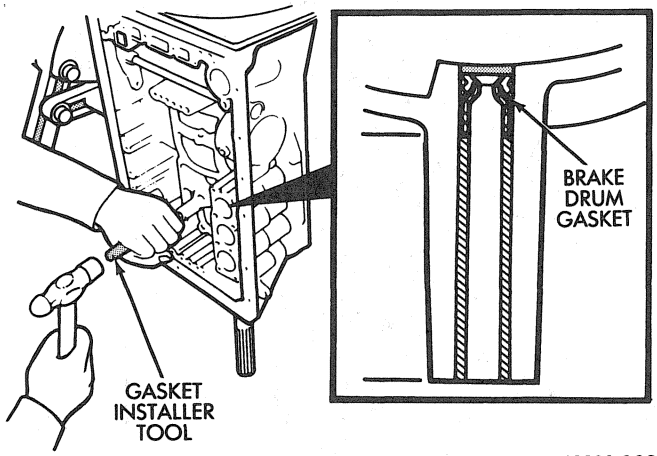
(11) Install second brake piston sleeve (Fig. 134). Sleeve lip faces up and toward case front as shown.



J8921-675

Fig. 134 Second Brake Piston Sleeve Installation

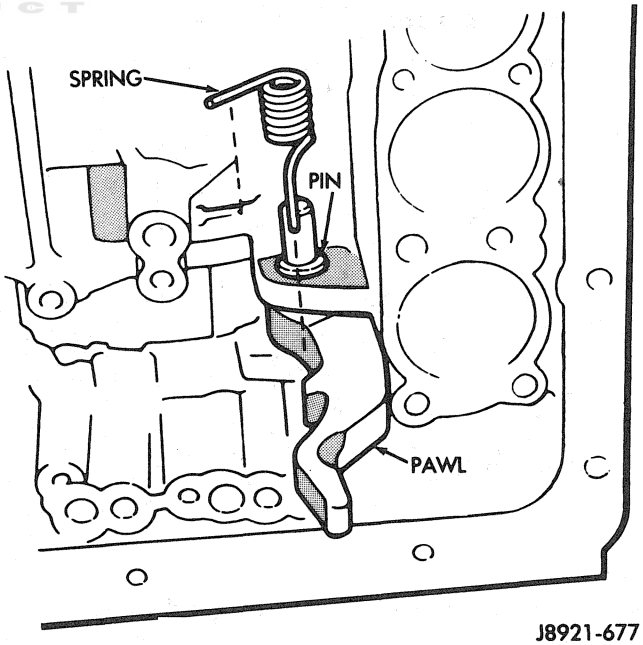
(12) Install second brake drum gasket with Installer Tool 7544 (Fig. 135). Gasket depth is 43.7 mm (1.720 in.).



J9121-382

Fig. 135 Second Brake Drum Gasket Installation

(13) Install park lock pawl, spring and pin (Fig. 136).



J8921-677

Fig. 136 Park Lock Pin, Spring And Pawl Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Connect park lock rod to manual valve shift sector (Fig. 137).

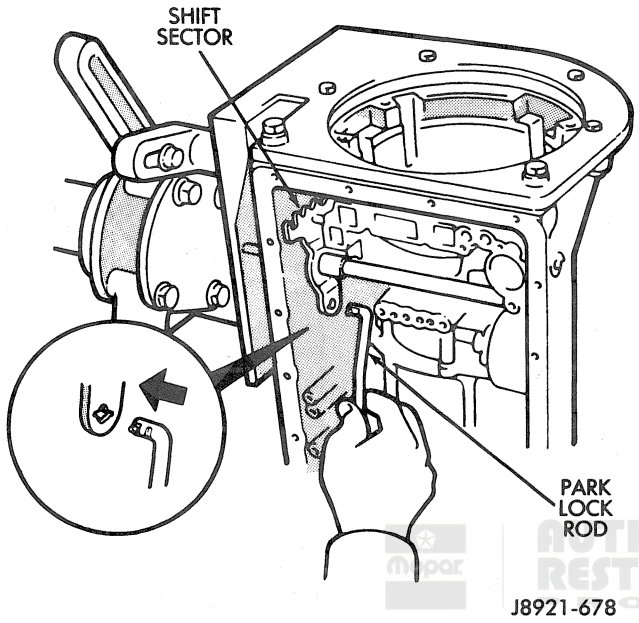


Fig. 137 Park Lock Rod Installation

(15) Position park lock rod bracket on case and tighten bracket attaching bolts to 10 N·m (7 ft. lbs.) torque (Fig. 138).

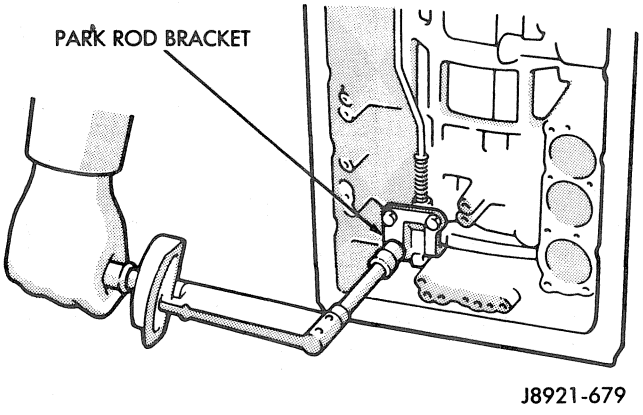


Fig. 138 Park Rod Bracket Installation

(16) Verify park lock operation. Move shift sector to Park position. Park pawl should be firmly engaged (locked) in planetary ring gear (Fig. 139).

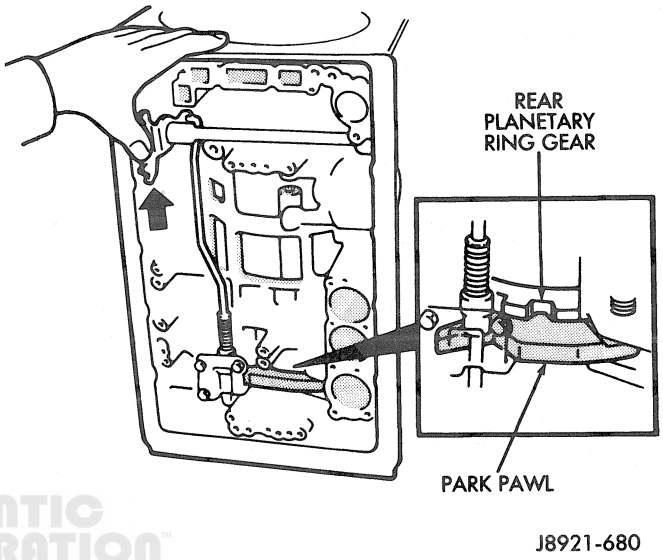


Fig. 139 Checking Park Pawl Engagement

(17) Install No. 1 one–way clutch (Fig. 140). Short flanged side of clutch faces up and toward case front.

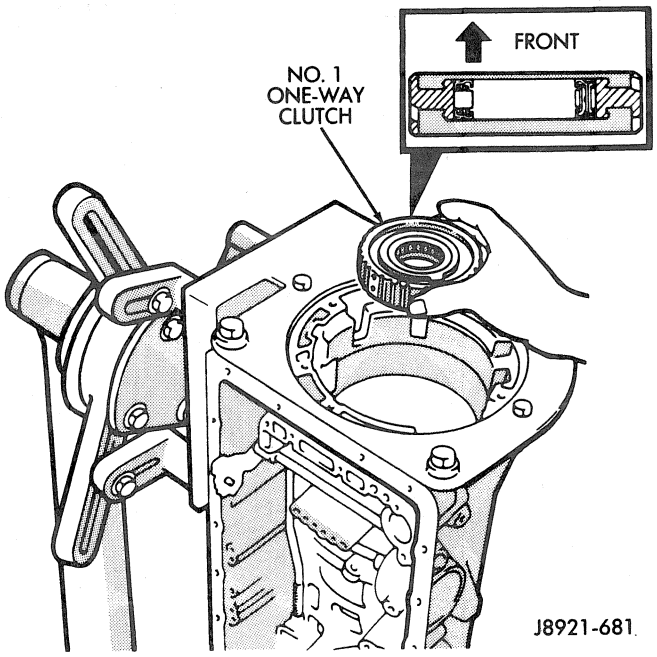


Fig. 140 Installing No. 1 One–Way Clutch

DISASSEMBLY AND ASSEMBLY (Continued)

(18) Install second brake pack (Fig. 141). Install disc then plate. Continue installation sequence until five discs and five plates are installed.

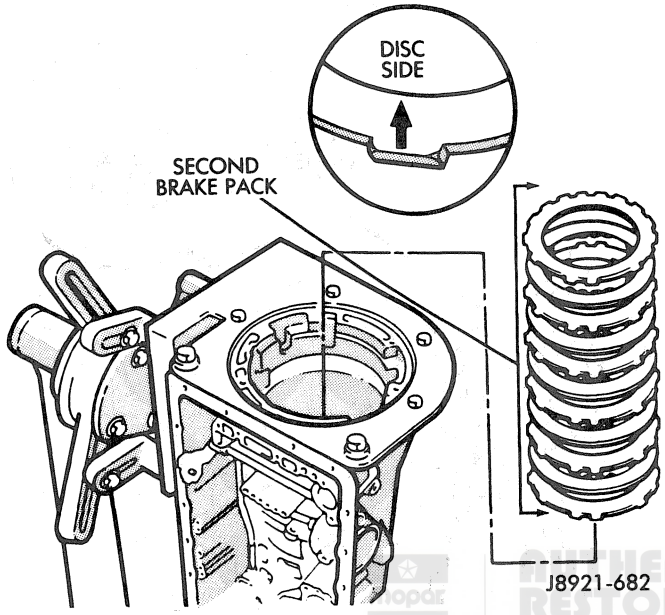


Fig. 141 Second Brake Pack Installation

(19) Install second brake pack retainer with rounded edge of retainer facing disc.

(20) Install second brake pack snap ring.

(21) Check brake pack clearance with feeler gauge (Fig. 142). Clearance should be 0.062 – 1.98 mm (0.024 – 0.078 in.). If brake pack clearance is not correct, brake pack components are not seated. Reassemble brake pack if necessary.

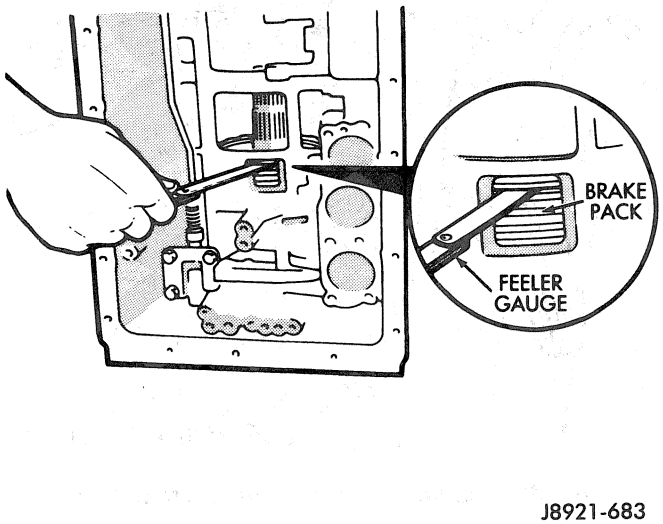


Fig. 142 Checking Second Brake Pack Clearance

(22) Install planetary sun gear and input drum (Fig. 143). Be sure drum thrust washer tabs are seated in drum. Use petroleum jelly to hold thrust washer in position if necessary.

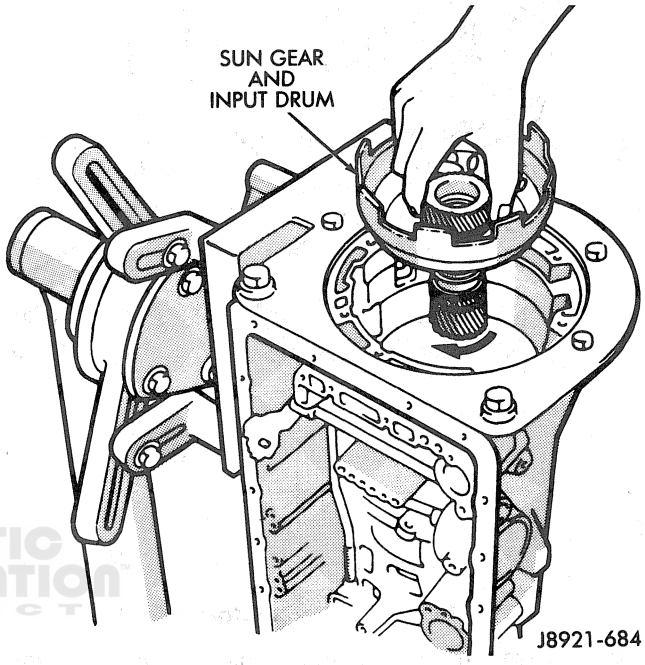


Fig. 143 Installing Sun Gear And Input Drum

(23) Install front planetary gear on sun gear (Fig. 144).

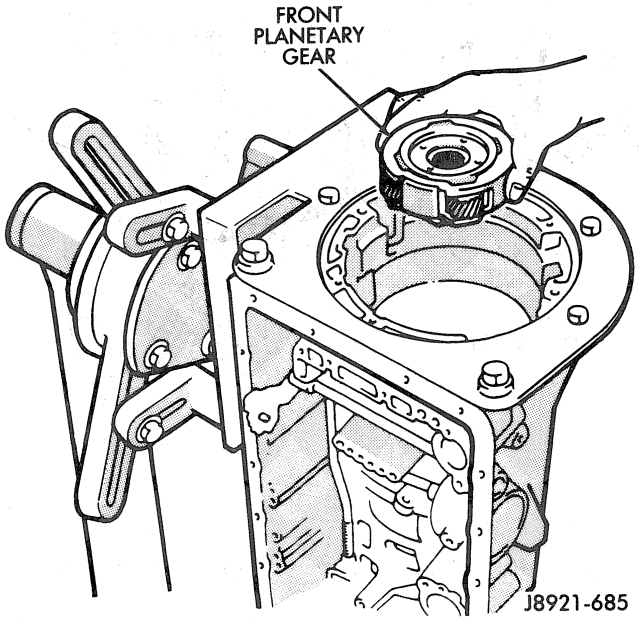


Fig. 144 Installing Front Planetary Gear

DISASSEMBLY AND ASSEMBLY (Continued)

(24) Support output shaft with wood blocks (Fig. 145).

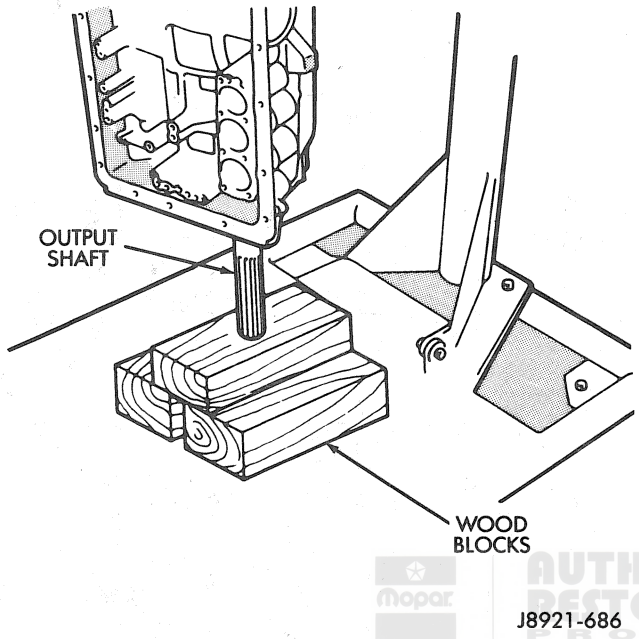


Fig. 145 Supporting Output Shaft

(25) Install planetary snap ring on sun gear with snap ring plier tool 7541 (Fig. 146).

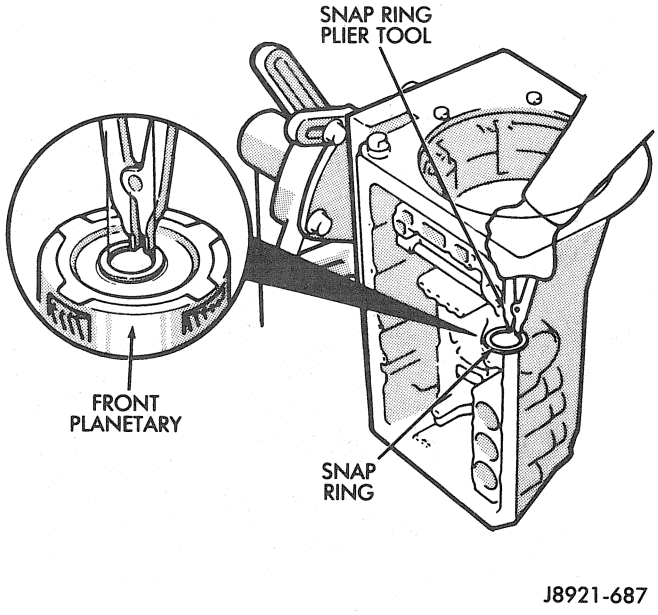


Fig. 146 Installing Front Planetary Snap Ring

(26) Install tabbed thrust race on front planetary gear (Fig. 147). Washer tabs face down and toward gear. Race outer diameter is 47.8 mm (1.882 in.). Inside diameter is 34.3 mm (1.350 in.).

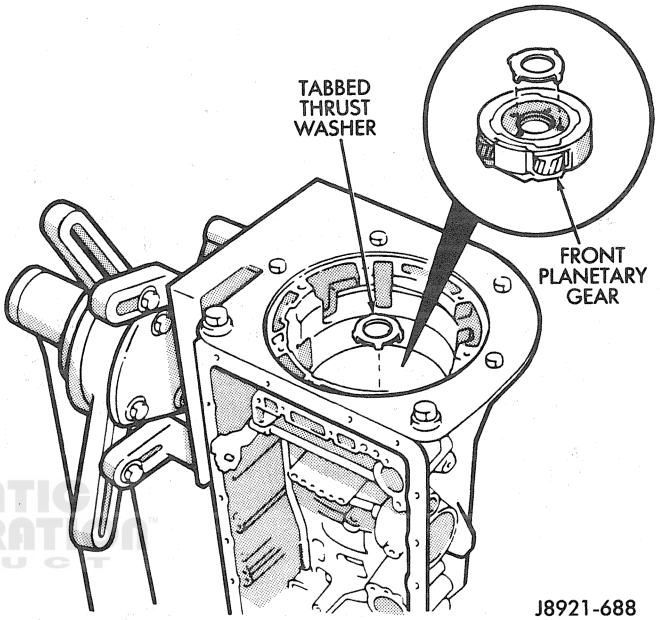


Fig. 147 Installing Planetary Thrust Race

(27) Install second coast brake band (Fig. 148).

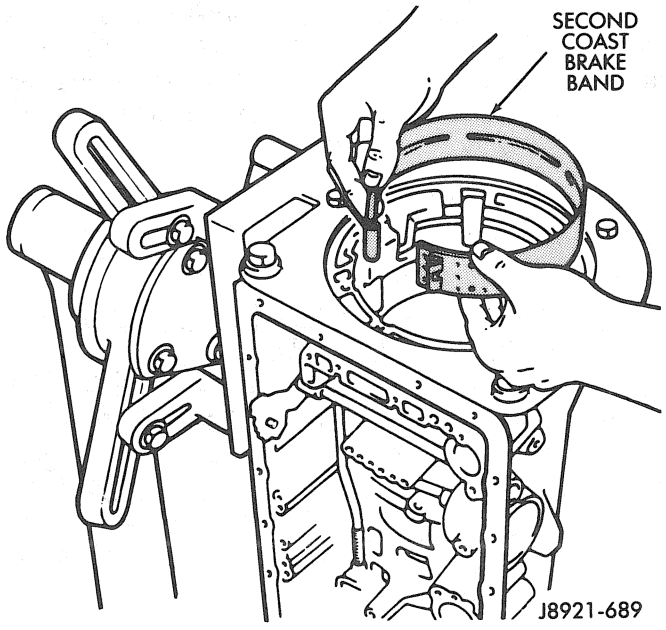
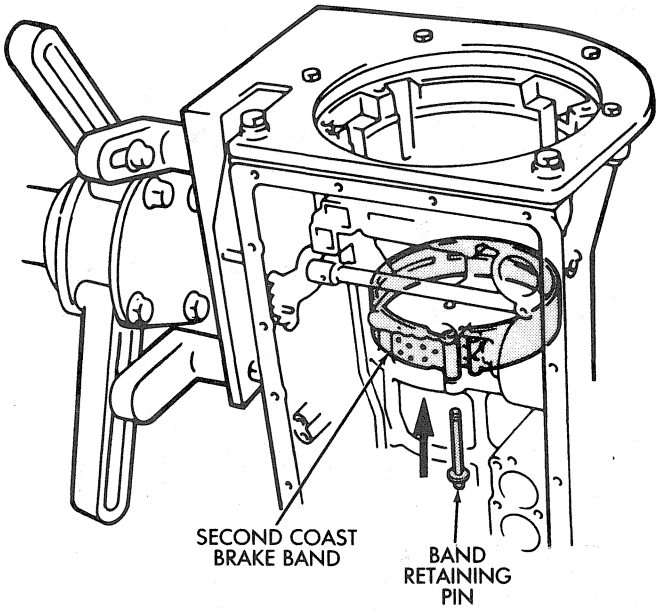


Fig. 148 Installing Second Coast Brake Band

DISASSEMBLY AND ASSEMBLY (Continued)

(28) Install pin in second coast brake band. Then install retaining ring on pin (Fig. 149).



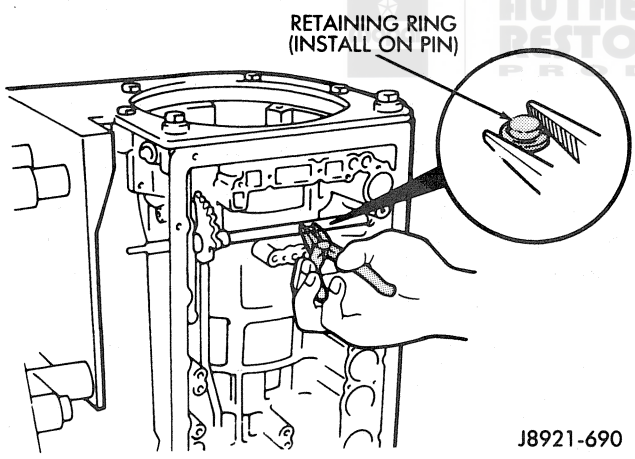


Fig. 149 Installing Second Coast Brake Band Retaining Pin

(29) Install thrust bearing and race in forward–direct clutch (Fig. 150). Coat bearing/race with petroleum jelly to hold them in place.

(30) Verify forward–direct clutch thrust bearing size.

- Race outer diameter is 48.9 mm (1.925 in.) and inside diameter is 26.0 mm (1.024 in.).
- Bearing outer diameter is 46.7 mm (1.839 in.) and inside diameter is 26.0 mm (1.024 in.).

(31) Coat front planetary ring gear race with petroleum jelly and install it in ring gear (Fig. 151).

(32) Verify ring gear race size. Outer diameter is 47.0 mm (1.850 in.) and inside diameter is 26.5 mm (1.045 in.).

(33) Align forward–direct clutch disc splines with screwdriver (Fig. 152).

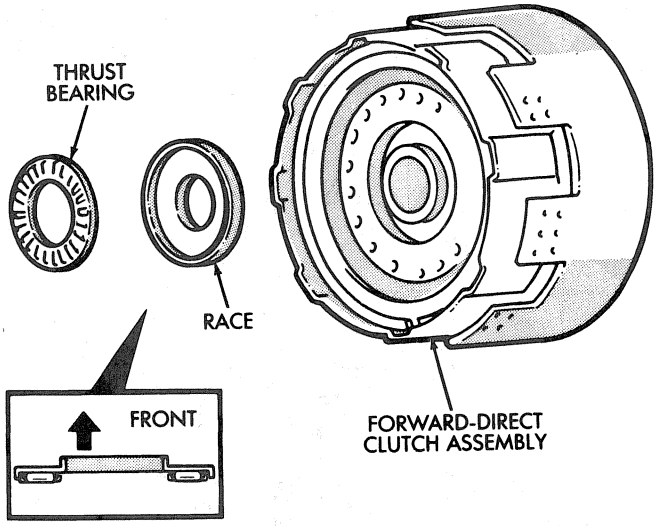


Fig. 150 Installing Forward–Direct Clutch Thrust Bearing And Race

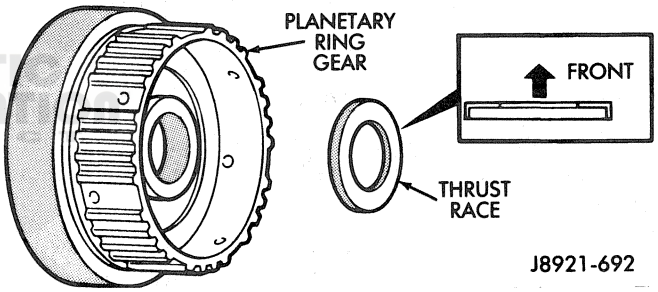


Fig. 151 Installing Planetary Ring Gear Race

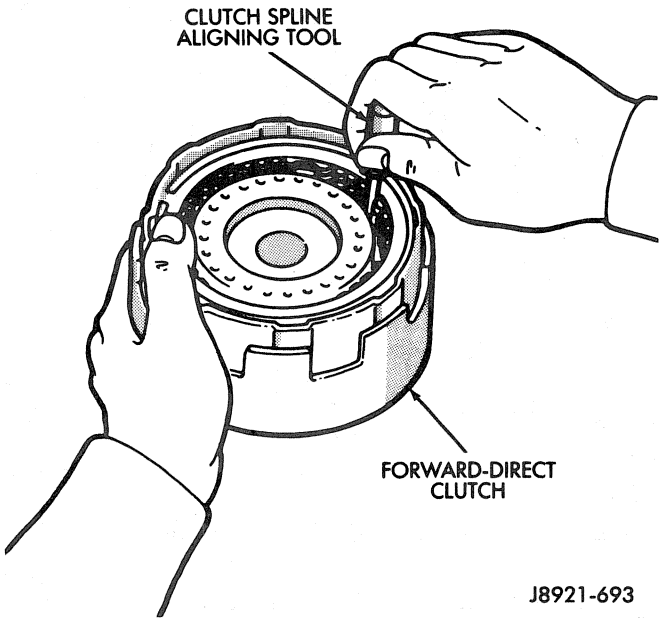


Fig. 152 Aligning Forward–Direct Clutch Splines

DISASSEMBLY AND ASSEMBLY (Continued)

(34) Align and install front planetary ring gear in forward–direct clutch (Fig. 153).

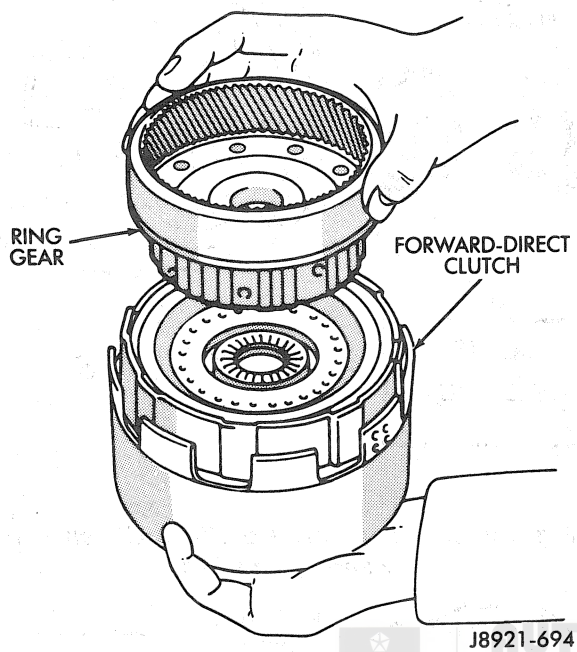


Fig. 153 Installing Front Planetary Ring Gear

(35) Coat bearing and race with petroleum jelly and install them in ring gear (Fig. 154). Verify bearing/race size.

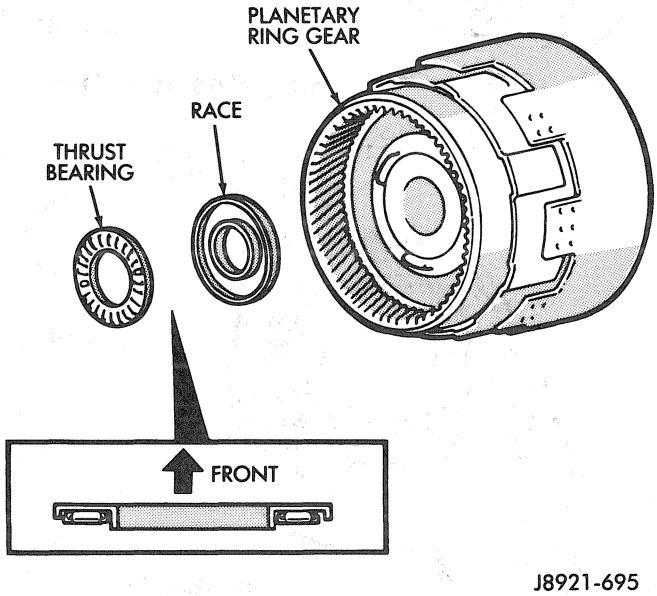


Fig. 154 Installing Ring Gear Bearing And Race

- Bearing outer diameter is 47.7 mm (1.878 in.) and inside diameter is 32.6 mm (1.283 in.).
- Race outer diameter is 53.6 mm (2.110 in.) and inside diameter is 30.6 mm (1.205 in.).

(36) Rotate front of transmission case downward and install assembled planetary gear/forward–direct clutch (Fig. 155).

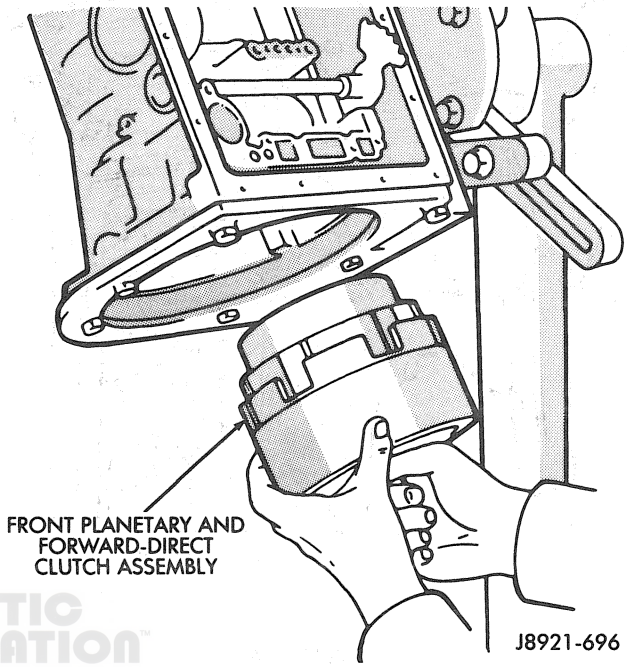


Fig. 155 Installing Front Planetary And Forward–Direct Clutch Assembly

(37) Check clearance between sun gear input drum and direct clutch drum (Fig. 156). Clearance should be 9.8 – 11.8 mm (0.386 – 0.465 in.). If clearance is incorrect, planetary gear/forward–direct clutch assembly is not seated or is improperly assembled. Remove, and correct if necessary.

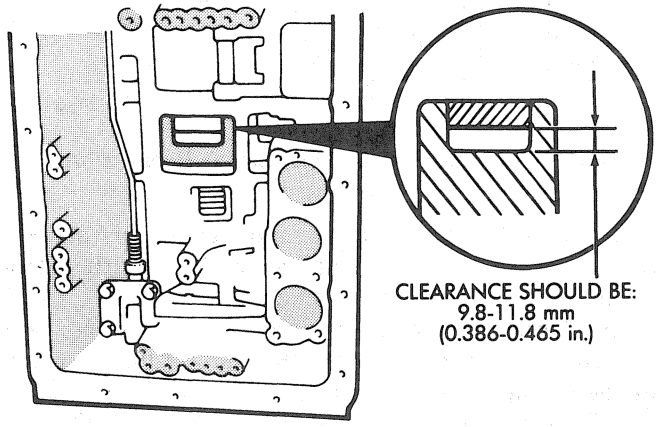


Fig. 156 Checking Input Drum–To–Direct Clutch Drum Clearance

DISASSEMBLY AND ASSEMBLY (Continued)

(38) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch shaft. Bearing faces up and toward case front as shown (Fig. 157). Verify bearing/race size. Bearing and race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 33.6 mm (1.301 in.).

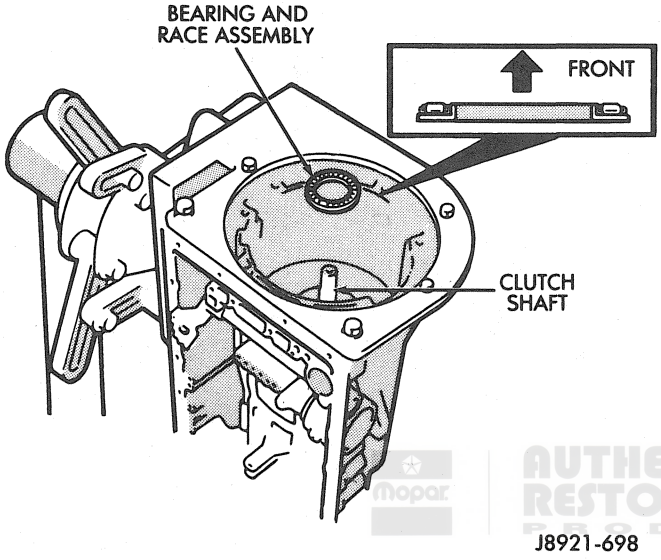


Fig. 157 Installing Clutch Shaft Thrust Bearing And Race Assembly

(39) Assemble second coast brake piston components (Fig. 158).

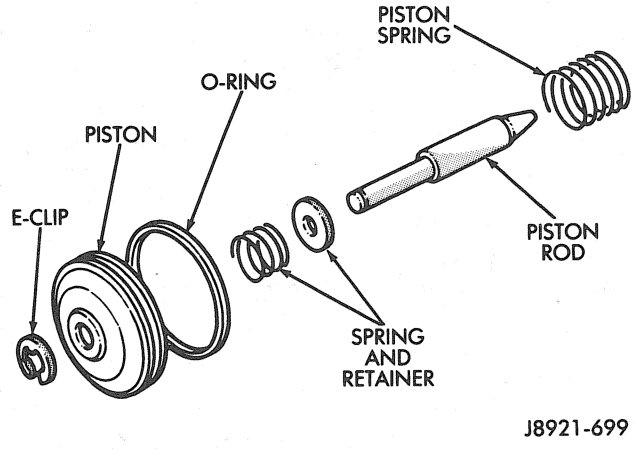


Fig. 158 Assembling Second Coast Brake Piston

(40) Install assembled second coast brake piston in case.

(41) Install replacement seals on second coast brake piston cover and install cover in case.

(42) Install second coast brake piston snap ring with snap ring plier tool (Fig. 159).

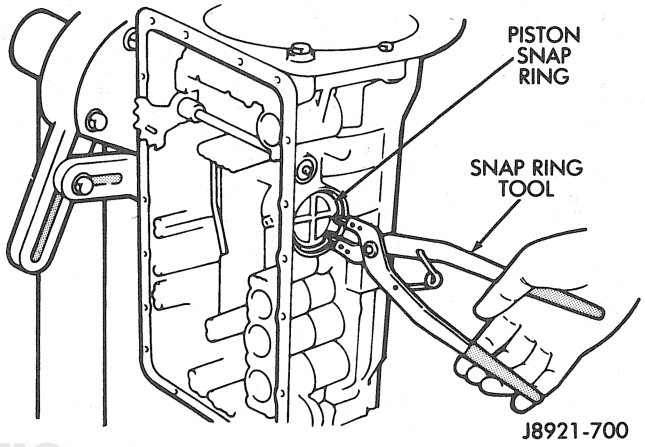


Fig. 159 Installing Second Coast Brake Piston Snap Ring

(43) Check second coast brake piston stroke as follows:

(a) Make reference mark on brake piston rod (Fig. 160).

(b) Apply 57–114 psi air pressure through feed hole (Fig. 160). Alternately apply and release air pressure to operate piston.

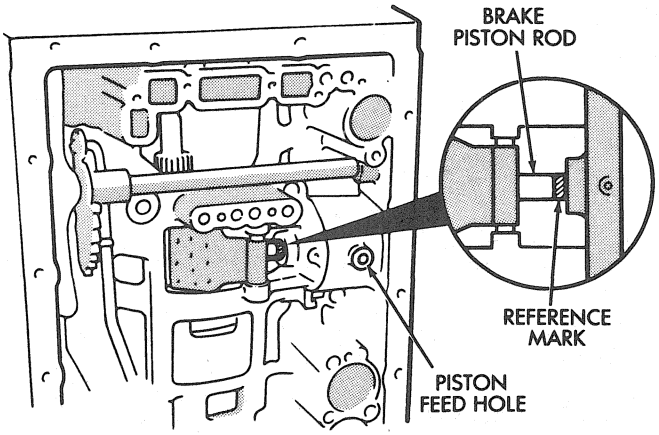


Fig. 160 Marking Brake Piston Rod

DISASSEMBLY AND ASSEMBLY (Continued)

(c) Check stroke with gauge 7552 (Fig. 161).

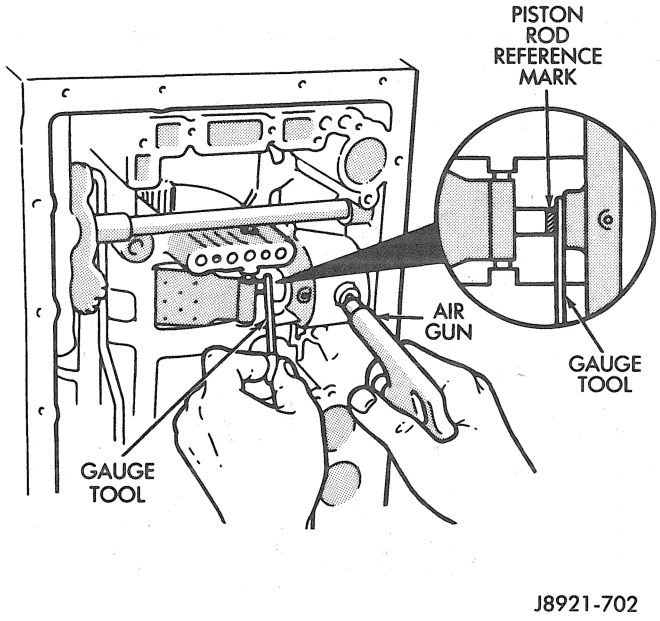


Fig. 161 Checking Second Coast Brake Piston Stroke

(d) If stroke length is incorrect, piston, cover or snap ring is not seated. Reassemble and check stroke again if necessary.

(44) Coat thrust race and tabbed washer with petroleum jelly and install them on overdrive support (Fig. 162). Verify race size. Race outer diameter is 50.9 mm (2.004 in.) and inside diameter is 36.2 mm (1.426 in.).

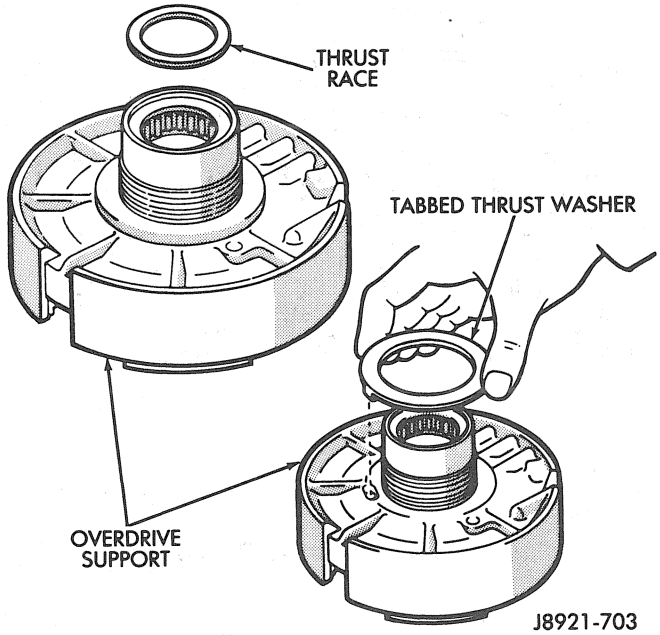


Fig. 162 Installing Overdrive Support Thrust Race And Washer

(45) Install overdrive support in case. Use two long bolts to help align and guide support into position (Fig. 163).

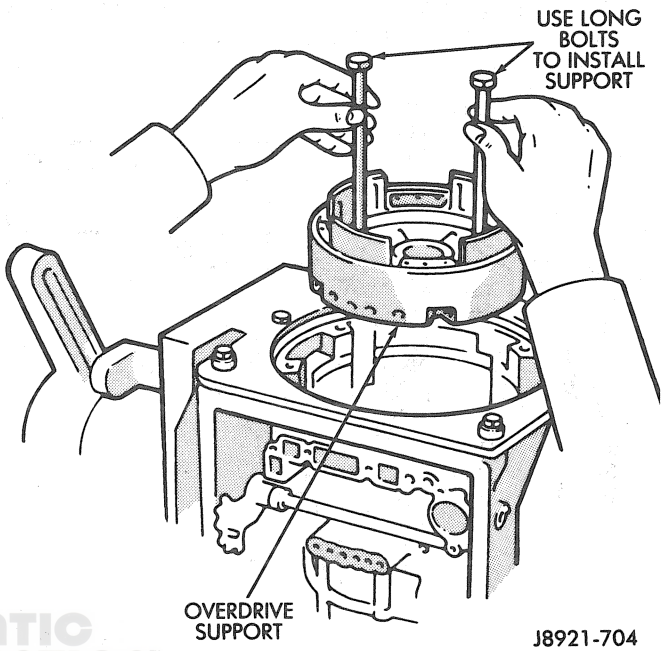


Fig. 163 Installing Overdrive Support

(46) Install overdrive support snap ring with Snap Ring Plier Tool 7540 (Fig. 164). Chamfered side of snap ring faces up and toward case front. **Snap ring ends must be aligned with case opening with ring ends approximately 24 mm (0.94 in.) from center line of case opening.**

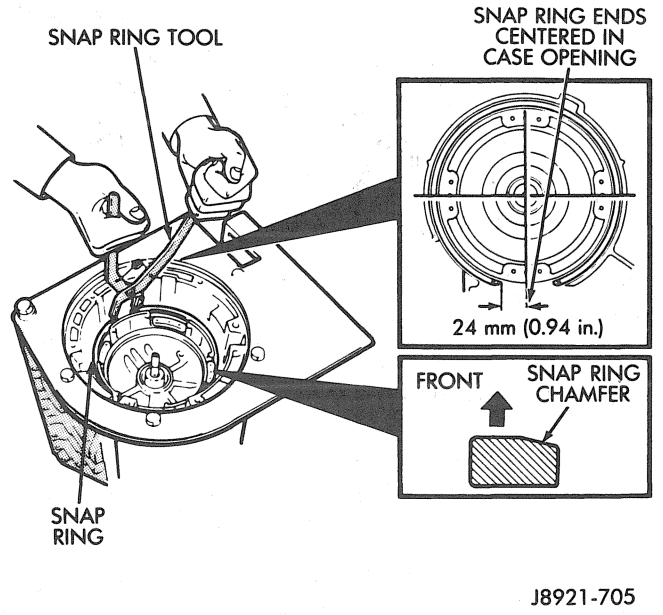


Fig. 164 Installing Overdrive Support Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(47) Install and tighten overdrive support bolts to 25 N·m (19 ft. lbs.) torque (Fig. 165).

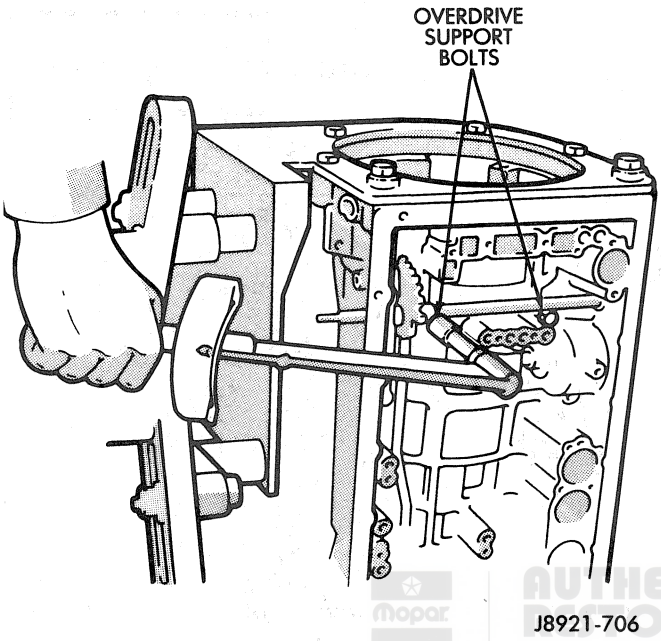


Fig. 165 Installing Overdrive Support Bolts

(48) Check output shaft end play with dial indicator (Fig. 166). End play should be 0.27 – 0.86 mm (0.0106 – 0.0339 in.).

(49) If output shaft end play is incorrect, one or more of installed components is not seated. Reassemble as necessary and check end play again.

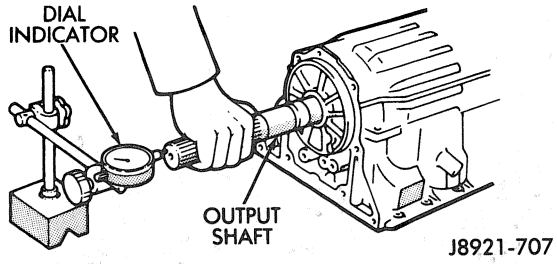


Fig. 166 Checking Output Shaft End Play

(50) Install overdrive brake clutch pack (Fig. 167). Install thickest clutch plate first. Rounded edge of plate faces up. Install first disc followed by another plate until four discs and three plates are installed.

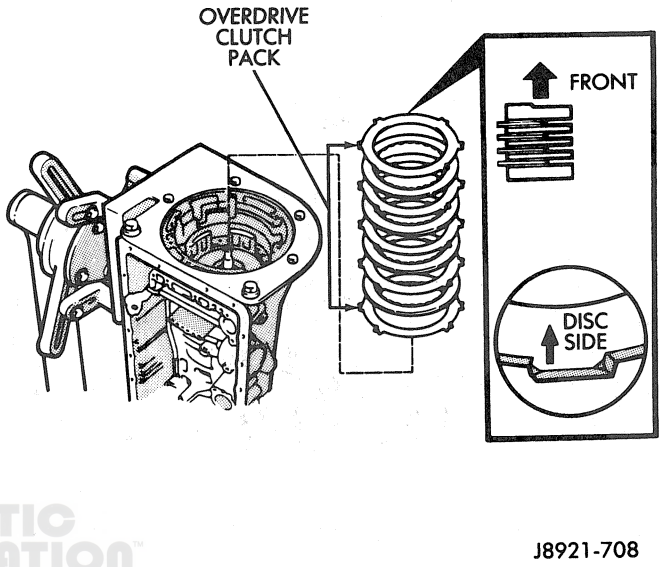


Fig. 167 Installing Overdrive Brake Clutch Pack

(51) Install stepped ring retainer plate with flat side facing disc. Then install brake pack snap ring (Fig. 168).

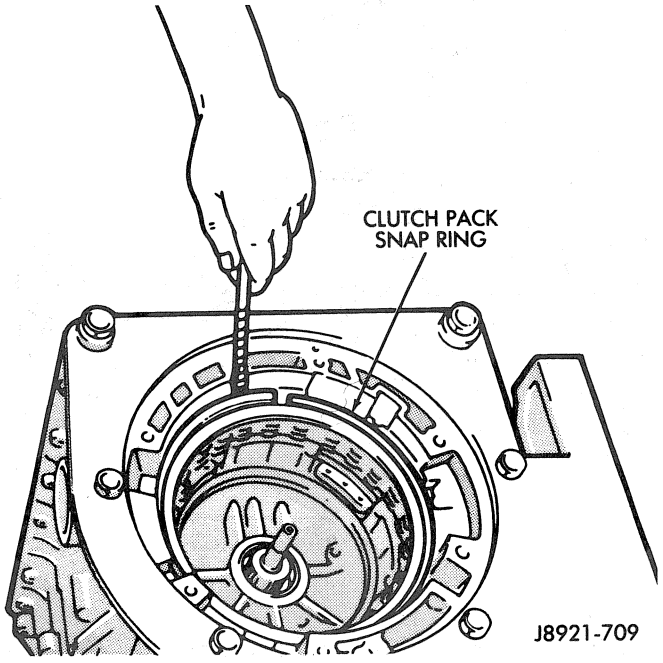


Fig. 168 Installing Overdrive Brake Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(52) Check overdrive brake piston stroke as follows:

(a) Mount Gauge 7546 in dial indicator and position gauge tool against overdrive brake piston (Fig. 169).

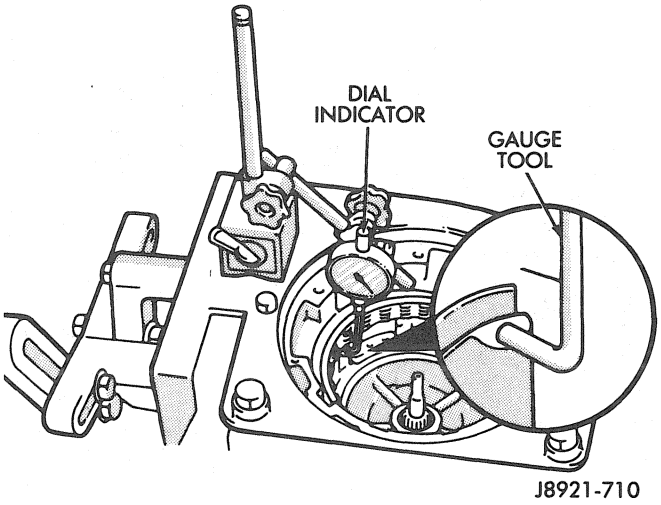


Fig. 169 Positioning Gauge Tool And Dial Indicator

(b) Apply and release overdrive brake piston with compressed air and note piston stroke length on dial indicator. Apply air pressure through feed hole in case (Fig. 170).

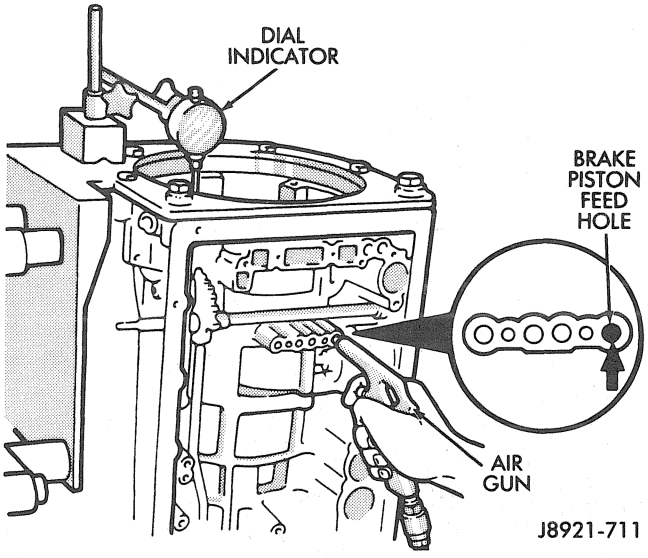


Fig. 170 Checking Overdrive Brake Piston Stroke

(c) Piston stroke length should be 1.40 – 1.70 mm (0.55 – 0.66 in.).

(d) If stroke is incorrect, brake pack or piston is installed incorrectly. Check and correct as necessary and measure piston stroke again.

(53) Remove dial indicator and gauge tool.

(54) Remove overdrive brake piston snap ring and remove overdrive clutch pack components.

(55) Coat overdrive lower race, thrust bearing and upper race with petroleum jelly and install them in overdrive support (Fig. 171). Be sure races and bearing are assembled and installed as shown.

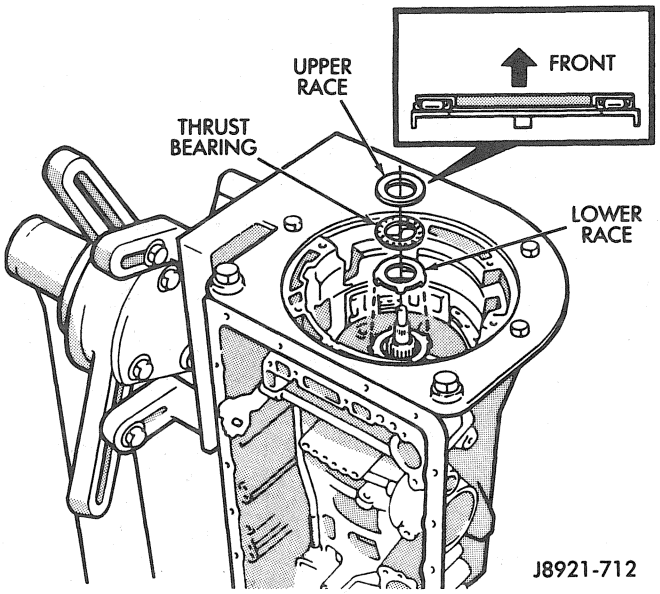


Fig. 171 Installing Overdrive Support Thrust Bearing And Races

(56) Verify bearing/race sizes before proceeding. Bearing– race sizes are:

- Outer diameter of lower race is 47.8 mm (1.882 in.) and inside diameter is 34.3 mm (1.350 in.).
- Outer diameter of bearing is 47.7 mm (1.878 in.) and inside diameter is 32.7 mm (1.287 in.).
- Outer diameter of upper race is 47.8 mm (1.882 in.) and inside diameter is 30.7 mm (1.209 in.).

(57) Install overdrive planetary ring gear in support (Fig. 172).

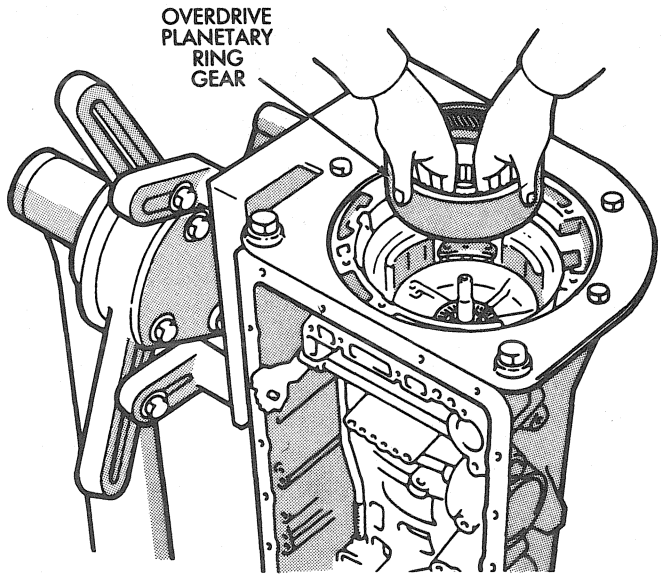


Fig. 172 Installing Overdrive Planetary Ring Gear

DISASSEMBLY AND ASSEMBLY (Continued)

(58) Coat ring gear thrust race and thrust bearing assembly with petroleum jelly and install them in gear (Fig. 173).

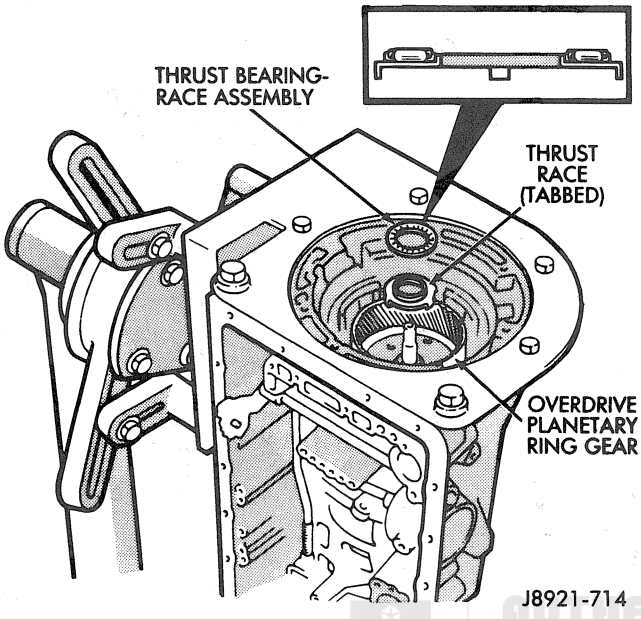


Fig. 173 Installing Ring Gear Thrust Bearing And Race

(59) Verify bearing/race size before proceeding.

- Outer diameter of ring gear race–bearing is 47.8 mm (1.882 in.) and inside diameter is 24.2 mm (0.953 in.).
- Outer diameter of bearing is 46.8 mm (1.844 in.) and inside diameter is 26.0 mm (1.024 in.).

(60) Coat tabbed thrust race with petroleum jelly and install it on planetary gear (Fig. 174). Race outer diameter is 41.8 mm (1.646 in.) and inside diameter is 27.1 mm (1.067 in.).

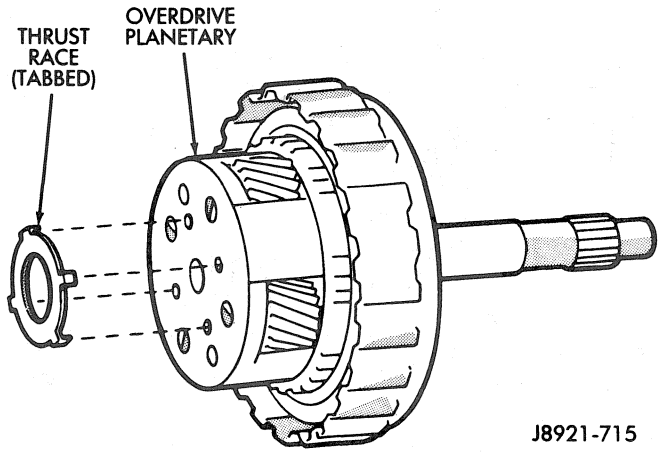


Fig. 174 Installing Planetary thrust Race

(61) Install assembled overdrive planetary gear and clutch (Fig. 175).

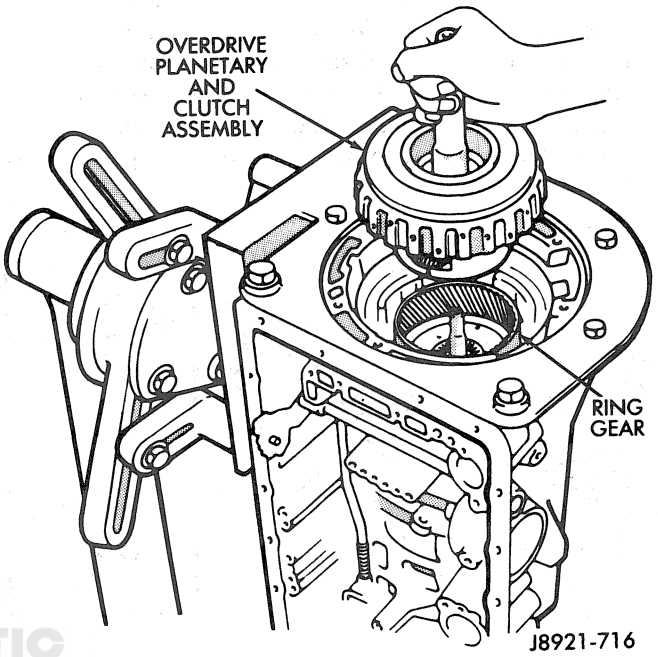


Fig. 175 Installing Overdrive Planetary And Clutch Assembly

(62) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch input shaft (Fig. 176). Bearing and race outer diameter is 50.2 mm (1.976 in.) and inside diameter is 28.9 mm (1.138 in.).

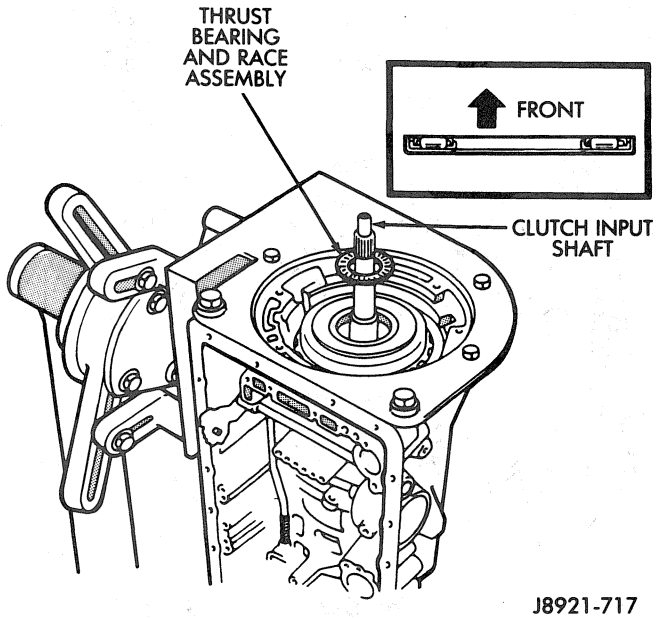


Fig. 176 Installing Input Shaft Thrust Bearing And Race Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

(63) Install overdrive brake pack as follows:

(a) Install 4.0 mm (0.157 in.) thick plate first. Rounded edge of plate must face upward.

(b) Install a disc followed by a plate until the required number of discs and plates are installed. Be sure to install the stepped plate last with the flat side of the plate facing the disc (Fig. 177).

(c) Confirm that four discs and three plates have been installed.

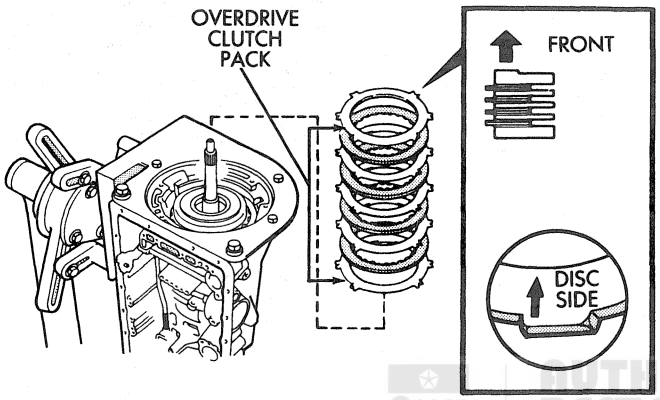


Fig. 177 Installing Overdrive Clutch Pack

(64) Install clutch pack snap ring (Fig. 178).

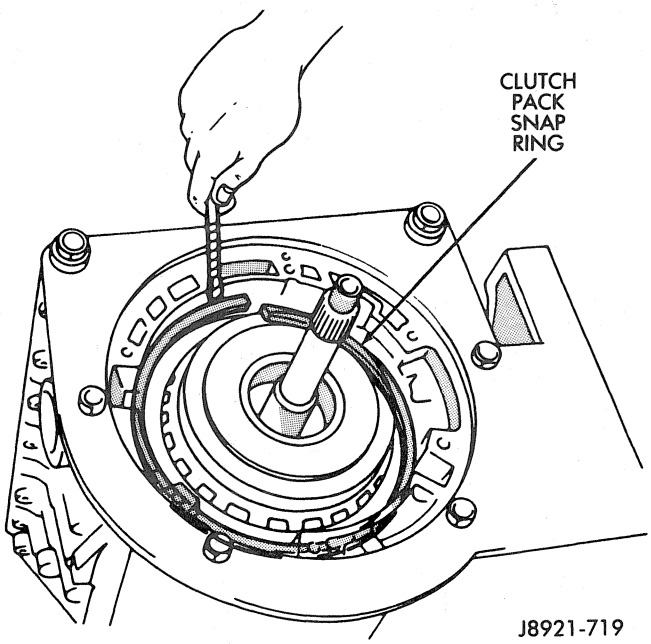


Fig. 178 Installing Clutch Pack Snap Ring

(65) Coat thrust bearing race with petroleum jelly and install it in oil pump (Fig. 179). Bearing race outer diameter is 47.2 mm (1.858 in.) and inside diameter is 28.1 mm (1.106 in.).

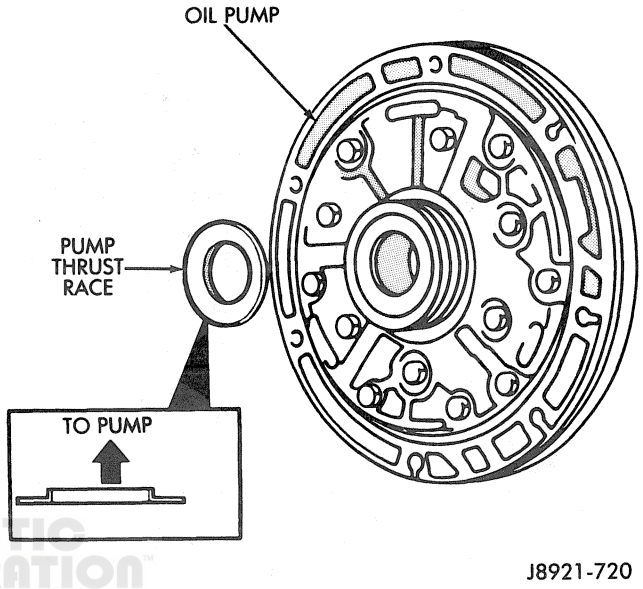


Fig. 179 Installing Oil Pump Thrust Race

(66) Lubricate and install replacement O–ring on oil pump body.

(67) Install oil pump in case. Align pump and case bolt holes and carefully ease pump into place (Fig. 180).

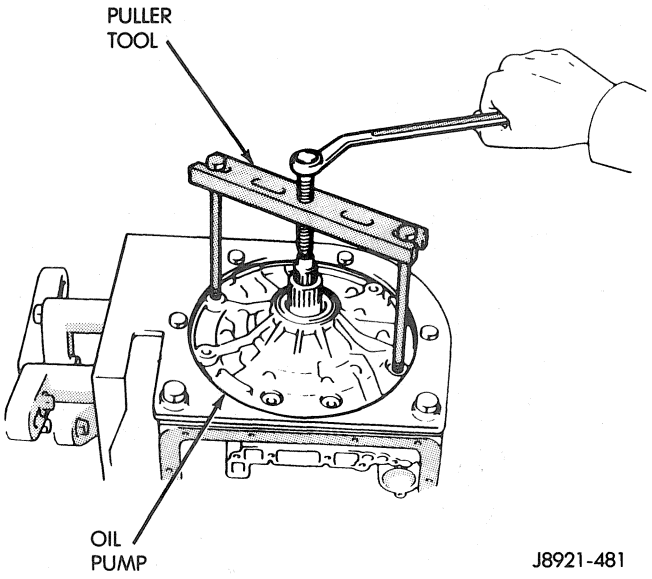


Fig. 180 Installing Oil Pump

DISASSEMBLY AND ASSEMBLY (Continued)

CAUTION: Do not use force to seat the pump. The seal rings on the stator shaft could be damaged if they bind or stick to the direct clutch drum.

(68) Tighten oil pump bolts to 22 N·m (16 ft. lbs.) torque.

(69) Verify input shaft rotation. Shaft should rotate smoothly and not bind.

(70) Lubricate and install new O–ring on transmission throttle cable adapter and install cable in case (Fig. 181).

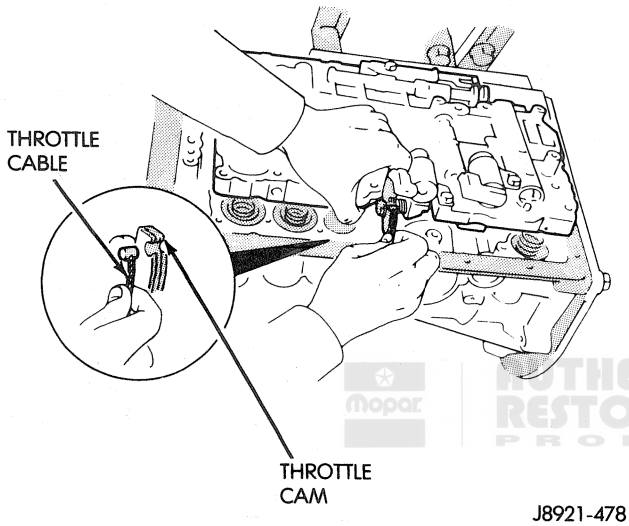
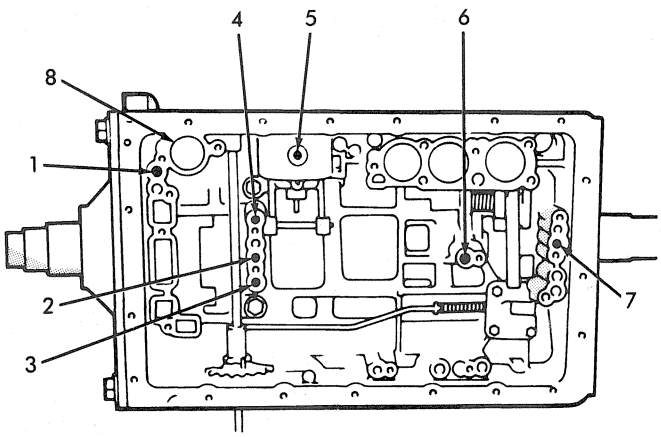


Fig. 181 Installing Transmission Throttle Cable

(71) Check clutch and brake operation. Operate clutches and brakes with compressed air applied through feed holes in case (Fig. 182). Listen for clutch and brake application. If you do not hear a clutch or brake apply, disassemble transmission and repair fault before proceeding. **It is necessary to block the overdrive clutch accumulator feed hole No. 8 (Fig. 182) in order to check direct clutch operation.**

(72) Lubricate and install new O–rings on accumulator pistons (Fig. 183).

(73) Assemble and install accumulator pistons and springs (Fig. 183).



1. OVERDRIVE DIRECT CLUTCH FEED
2. DIRECT CLUTCH FEED
3. FORWARD CLUTCH FEED
4. OVERDRIVE BRAKE FEED
5. SECOND COAST BRAKE FEED
6. SECOND BRAKE FEED
7. FIRST-REVERSE BRAKE FEED
8. OVERDRIVE CLUTCH ACCUMULATOR PISTON HOLE (BLOCK THIS HOLE WHEN CHECKING DIRECT CLUTCH OPERATION)

Fig. 182 Clutch And Brake Feed Hole Locations

Ⓐ SECOND BRAKE ACCUMULATOR PISTON
Ⓑ DIRECT CLUTCH ACCUMULATOR PISTON
Ⓒ OVERDRIVE BRAKE ACCUMULATOR PISTON
Ⓓ OVERDRIVE CLUTCH ACCUMULATOR PISTON

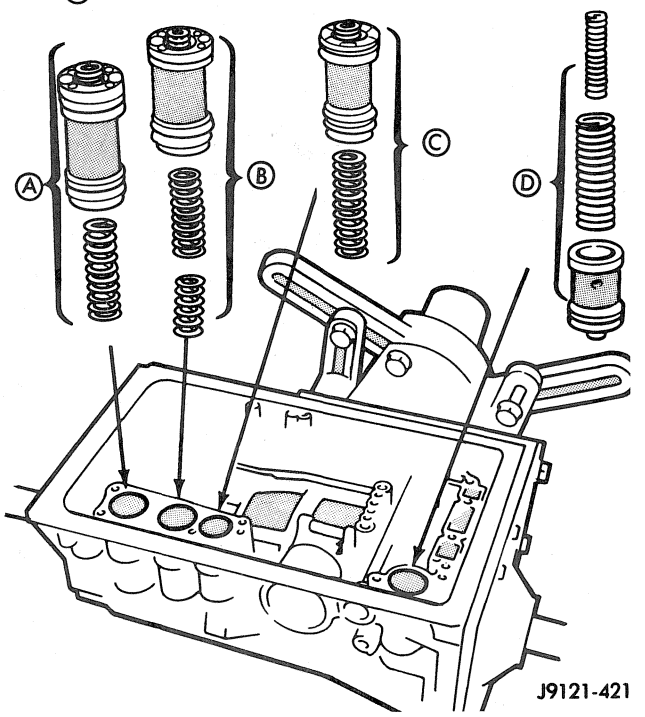


Fig. 183 Accumulator Piston And Spring Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(74) Install new check ball body and spring (Fig. 184).

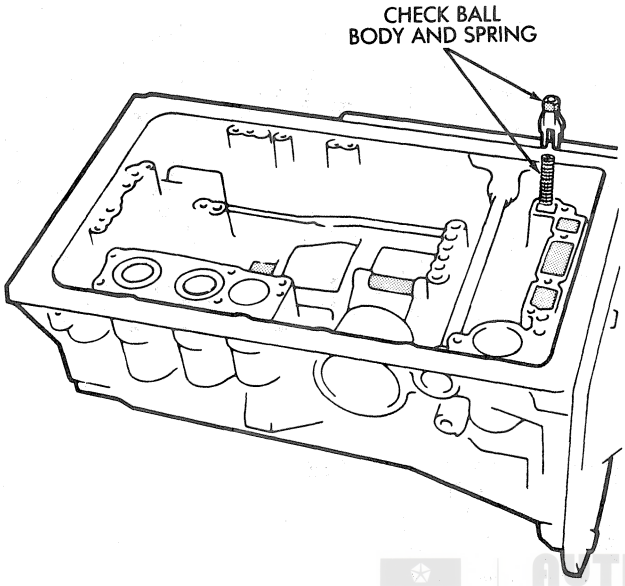


Fig. 184 Installing Check Ball Body And Spring

(75) Position valve body on case (Fig. 185).

(76) Install detent spring (Fig. 185).

(77) Align manual valve, detent spring and shift sector (Fig. 185).

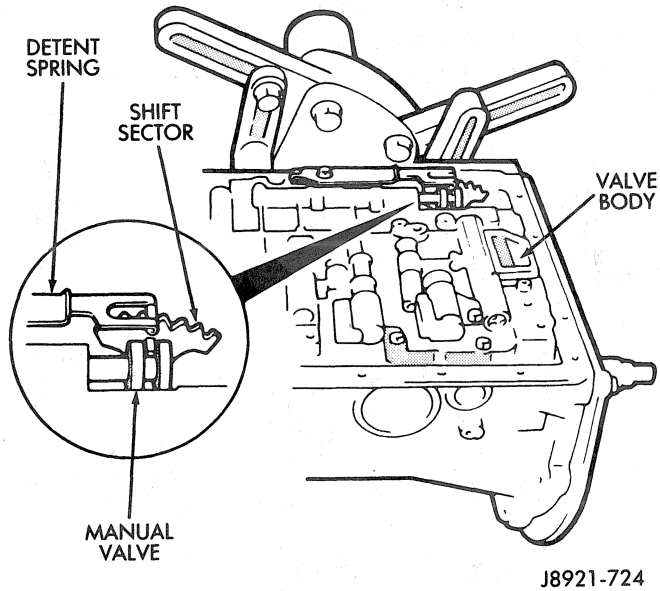


Fig. 185 Aligning Manual Valve, Shift Sector And Detent Spring

(78) Connect transmission throttle cable to throttle valve cam (Fig. 186).

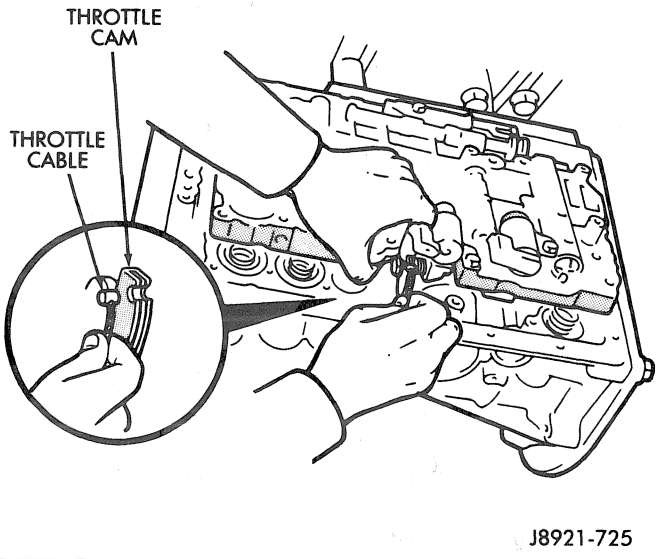


Fig. 186 Connecting Transmission Throttle Cable

(79) Install and tighten valve body–to–case bolts to 10 N·m (7 ft. lbs.) torque.

(80) Connect valve body solenoid wires to solenoids (Fig. 187).

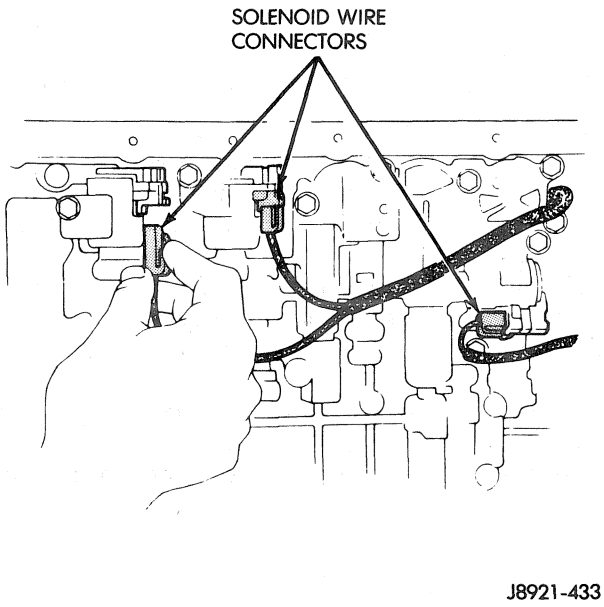


Fig. 187 Connecting Valve Body Solenoid Wires

(81) Install new O–ring on solenoid harness adapter and secure adapter to case.

DISASSEMBLY AND ASSEMBLY (Continued)

(82) Install valve body oil tubes (Fig. 188). Tap tubes into place with a plastic mallet. Be sure the flanged tube ends and straight tube ends are installed as shown.

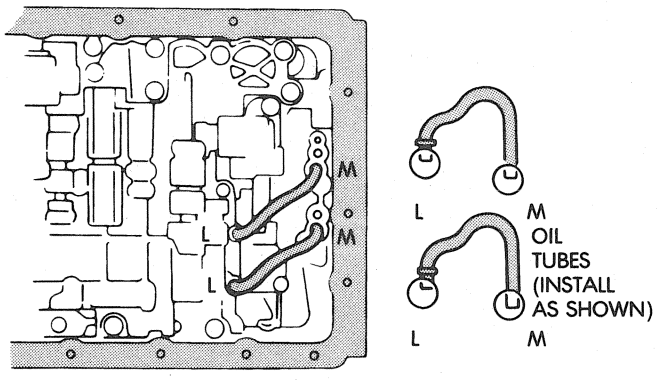


Fig. 188 Installing Valve Body Oil Tubes

(83) Install new gaskets on oil screen and install screen on valve body. Tighten screen bolts to 10 N·m (7 ft. lbs.) torque.

(84) Install magnet in oil pan. Be sure magnet does not interfere with valve body oil tubes.

(85) Apply Mopar or Loctite 599 to sealing surface of oil pan. Sealer bead should be at least 3 mm (1/8 in.) wide. Install pan on case and tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(86) Install transmission speed sensor rotor and key on output shaft (Fig. 189).

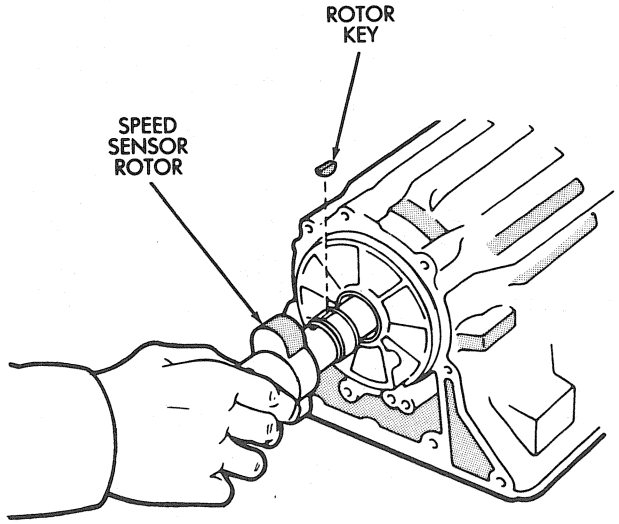


Fig. 189 Installing Transmission Speed Sensor Rotor And Key

(87) Install spacer and speedometer drive gear on output shaft. Then install retaining snap ring (Fig. 190).

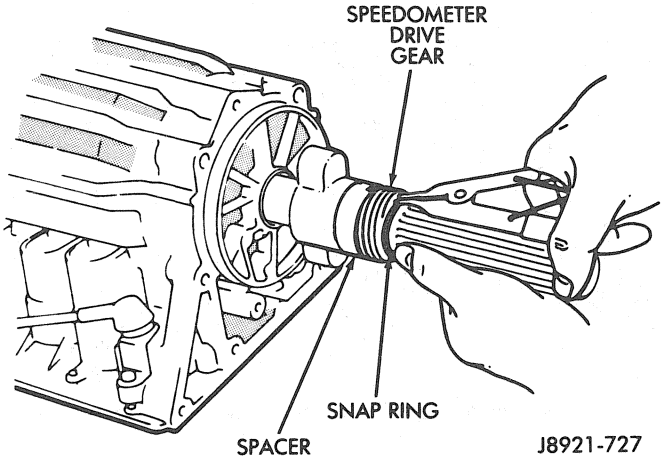


Fig. 190 Installing Spacer And Speedometer Drive Gear

(88) Apply bead of Mopar or Loctite 599 sealer to sealing surface at rear of case (Fig. 191).

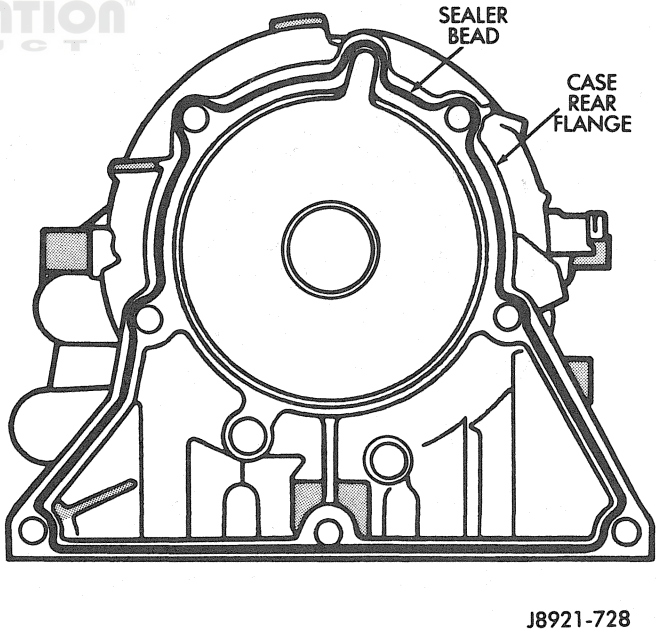


Fig. 191 Applying Sealer To Case Rear Flange

(89) Install adapter housing on transmission. Tighten adapter bolts to 34 N·m (25 ft. lbs.) torque.

(90) Install transmission speed sensor (Fig. 192). Tighten sensor bolt to 7.4 N·m (65 in. lbs.) torque and connect sensor wire harness connector.

(91) Install converter housing (Fig. 193). Tighten 12 mm diameter housing bolts to 57 N·m (42 ft. lbs.) torque. Tighten 10 mm diameter housing bolts to 34 N·m (25 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

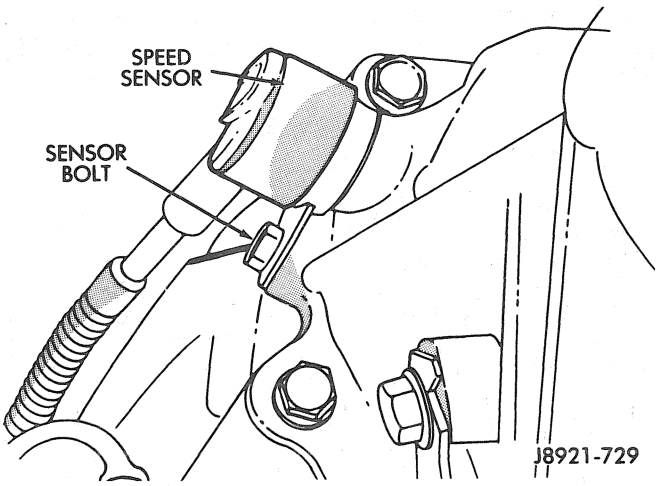


Fig. 192 Installing Transmission Speed Sensor

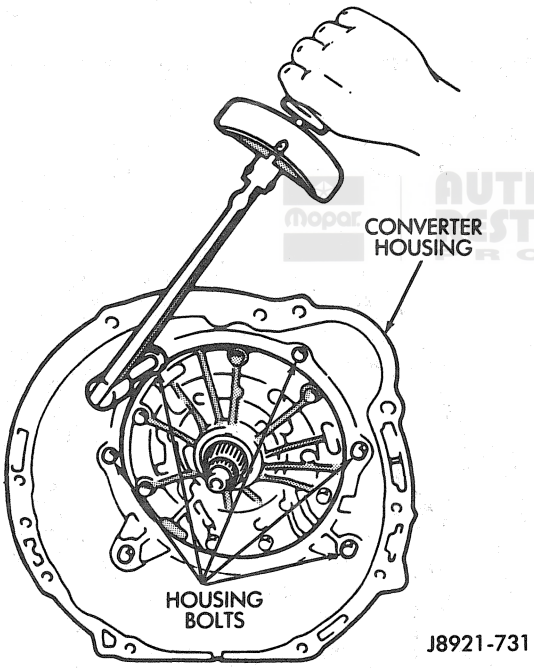


Fig. 193 Installing Converter Housing

(92) Install transmission shift lever on manual valve shaft. Do not install lever attaching nut at this time.

(93) Move transmission shift lever fully rearward. Then move lever two detent positions forward.

(94) Mount park/neutral position switch on manual valve shaft and tighten switch adjusting bolt just enough to keep switch from moving (Fig. 194).

(95) Install park/neutral position switch tabbed washer and retaining nut (Fig. 194). Tighten nut to 6.9 N·m (61 in. lbs.) torque, but do not bend any of the washer tabs against the nut at this time.

(96) Align park/neutral position switch standard line with groove or flat on manual shaft (Fig. 194).

(97) Tighten park/neutral position switch adjusting bolt to 13 N·m (9 ft. lbs.) torque.

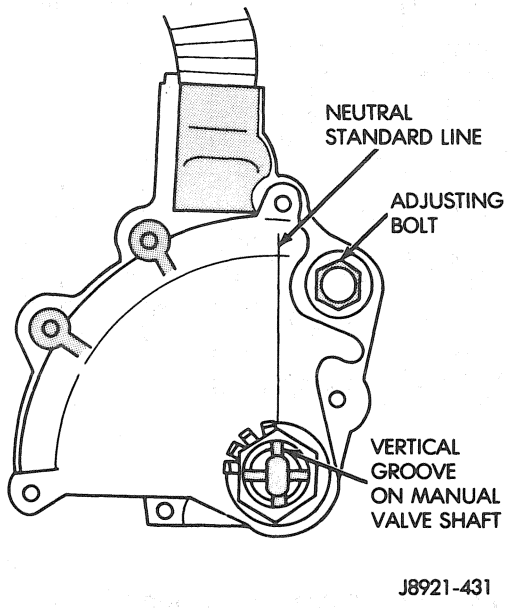


Fig. 194 Park/Neutral Position Switch Installation/ Adjustment

(98) Install transmission shift lever on manual valve shaft. Tighten lever attaching nut to 16 N·m (12 ft. lbs.) torque.

(99) Install retaining clamp for wire harness and throttle cable (Fig. 195).

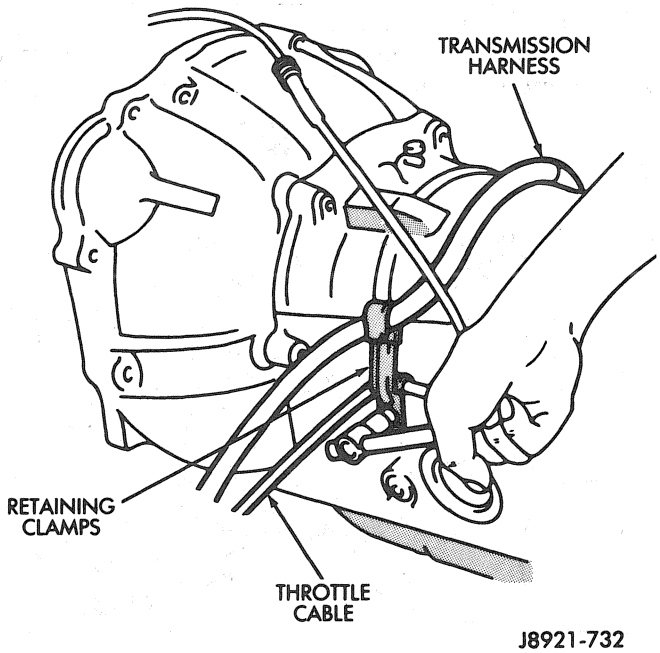


Fig. 195 Installing Cable/Harness Clamps

(100) Install torque converter.

(101) Verify that converter is seated by measuring distance between converter housing flange and one of

DISASSEMBLY AND ASSEMBLY (Continued)

the converter mounting pads (Fig. 196). Use straightedge and vernier calipers to measure distance. On 6–cyl. transmissions, distance should be 16.5 mm (0.650 in.).

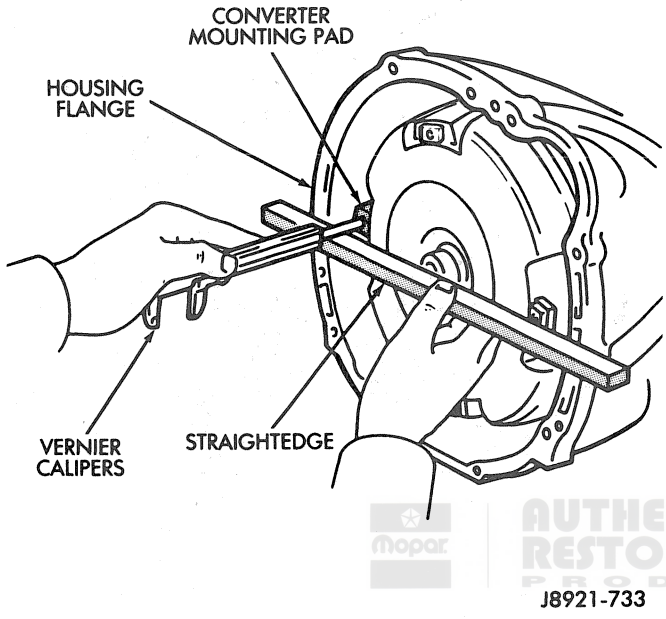


Fig. 196 Checking Converter Installation

(102) Secure converter in transmission with C–clamp or metal strapping. Do this before mounting transmission on jack or moving transmission under vehicle.

(103) Install lower half of transmission fill tube (install upper half after transmission is in vehicle).

CAUTION: The transmission cooler and lines must be reverse flushed if overhaul corrected a malfunction that generated sludge, metal particles, or clutch friction material. The torque converter should also be replaced if contaminated by the same malfunction. Debris and residue not flushed from the cooler and lines will flow back into the transmission and converter. The result will be a repeat failure and shop comeback.

OIL PUMP OVERHAUL

(1) Remove pump body O–ring (Fig. 197).

(2) Remove pump seal rings (Fig. 197).

(3) Remove bolts attaching stator shaft to pump body and separate components.

(4) Remove drive gear and driven gear from pump body (Fig. 197).

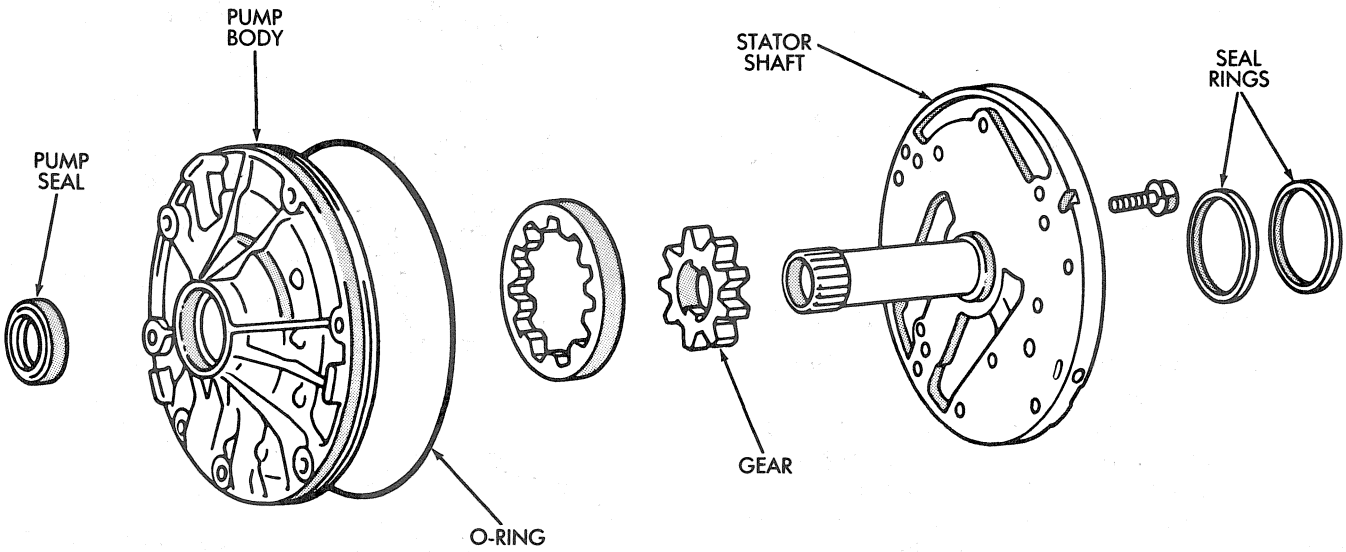


Fig. 197 Oil Pump Components

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Measure inside diameter of pump body bushing with bore gauge or inside micrometer (Fig. 198). Diameter should be maximum of 38.19 mm (1.5035 in.). Replace pump body if bushing I.D. is greater than specified.

(6) Measure inside diameter of stator shaft bushing (Fig. 198). Take measurements at front and rear of bushing. Diameter should be maximum of 21.58 mm (0.08496 in.) at front and 27.08 mm (1.0661 in.) at rear. Replace stator shaft if bushing diameter is greater than specified.

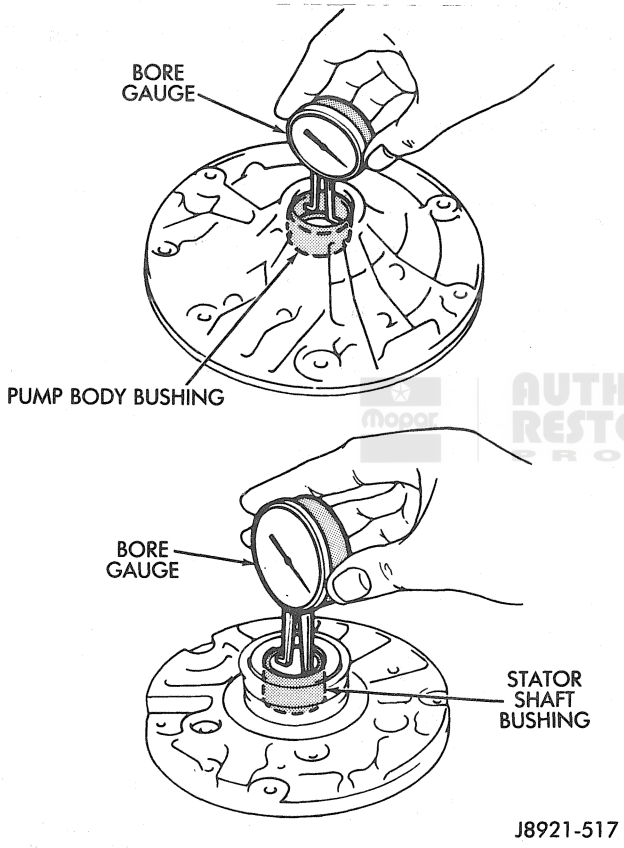


Fig. 198 Checking Pump/Stator Shaft Bushings

(7) Measure oil pump clearances (Fig. 199).

- Clearance between pump driven gear and pump body should be maximum of 0.3 mm (0.012 in).
- Clearance between tips of pump gear teeth should be maximum of 0.3 mm (0.012 in).
- Clearance between rear surface of pump housing and pump gears should be maximum of 0.1 mm (0.004 in.).

(8) Replace pump body and gears if any clearance is greater than specified.

(9) Remove old pump seal. Install new seal with Seal Installer 7549 (Fig. 200).

(10) Lubricate and install gears in pump body.

(11) Assemble stator shaft and pump body. Tighten shaft–to–body bolts to 10 N·m (7 ft. lbs.) torque.

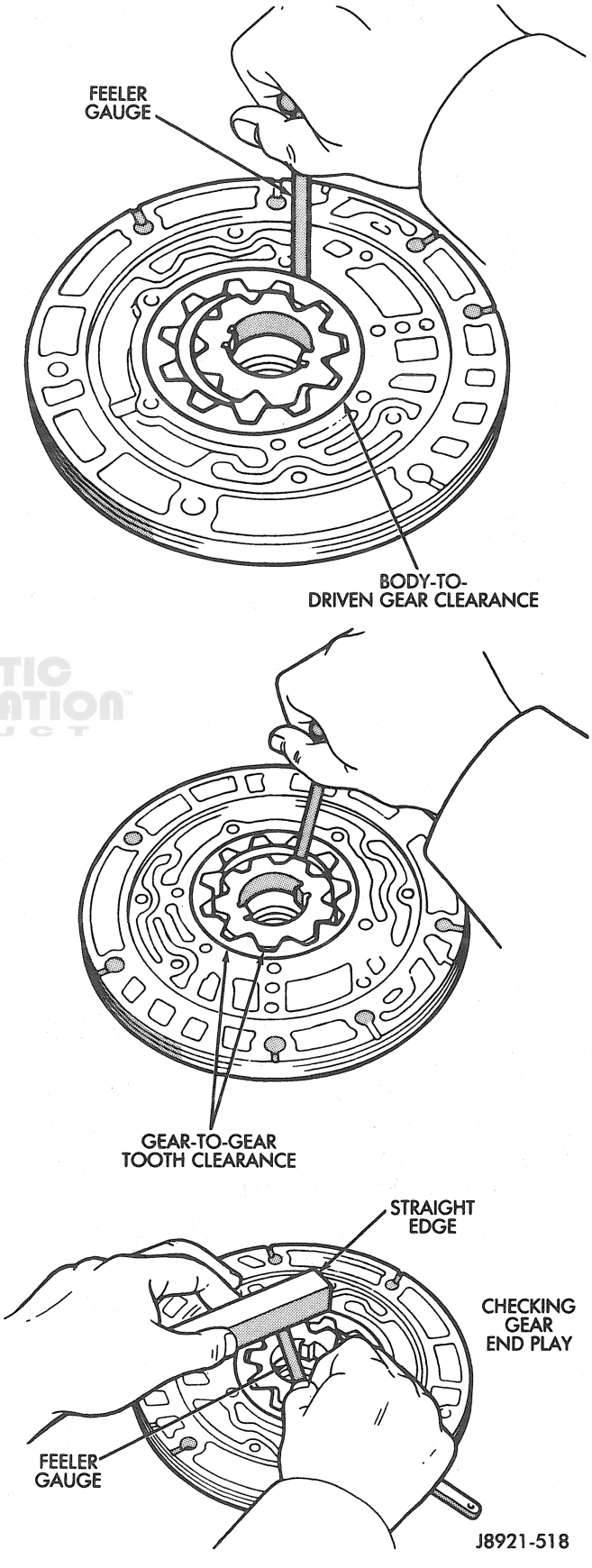


Fig. 199 Checking Pump Gear Clearances

DISASSEMBLY AND ASSEMBLY (Continued)

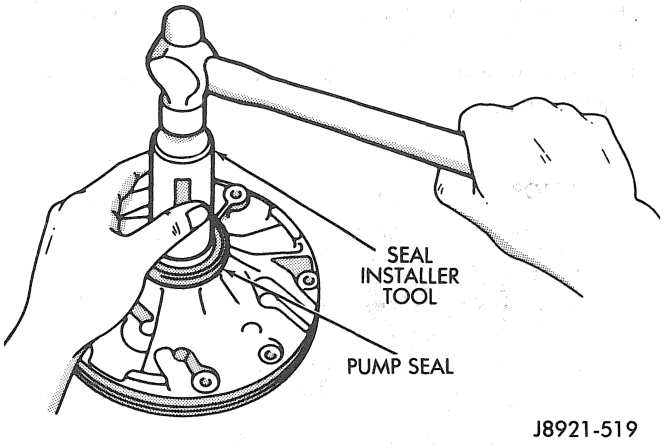


Fig. 200 Installing Pump Seal

(12) Install new O–ring on pump body and new seal rings on stator shaft.

(13) Install pump in torque converter and check pump gear rotation (Fig. 201). Gears must rotate smoothly when turned clockwise and counterclockwise.

(14) Lubricate pump O–ring and seal rings with petroleum jelly.

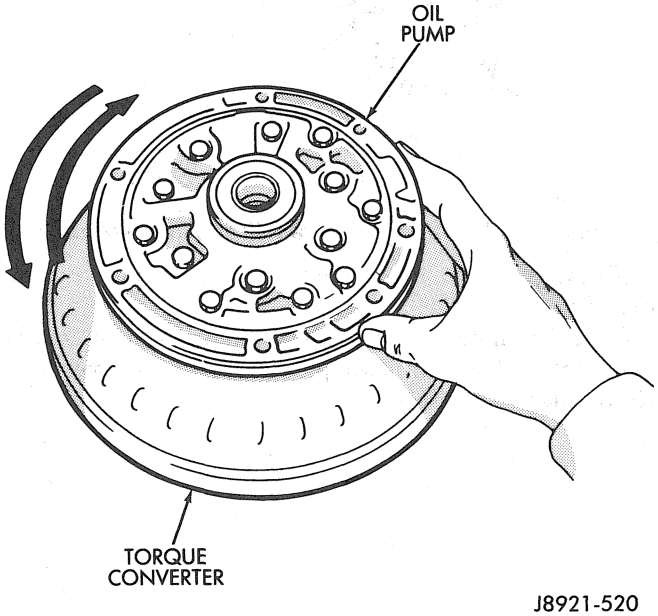
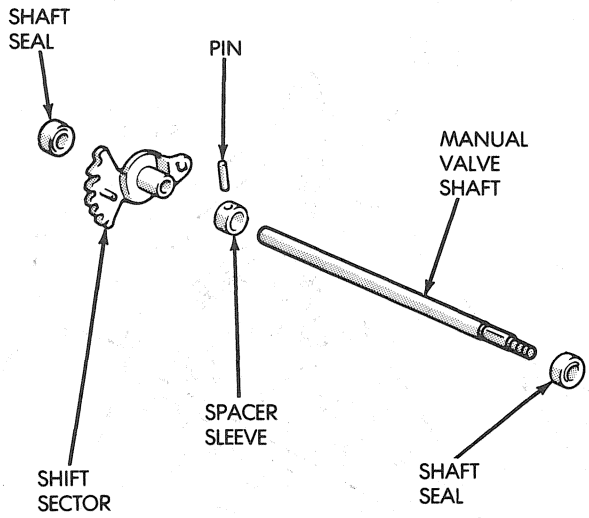


Fig. 201 Checking Pump Gear Rotation

MANUAL VALVE SHAFT OVERHAUL



Manual Valve Shaft Components

(1) Cut shaft spacer sleeve in half with chisel and remove it from lever and shaft (Fig. 202).

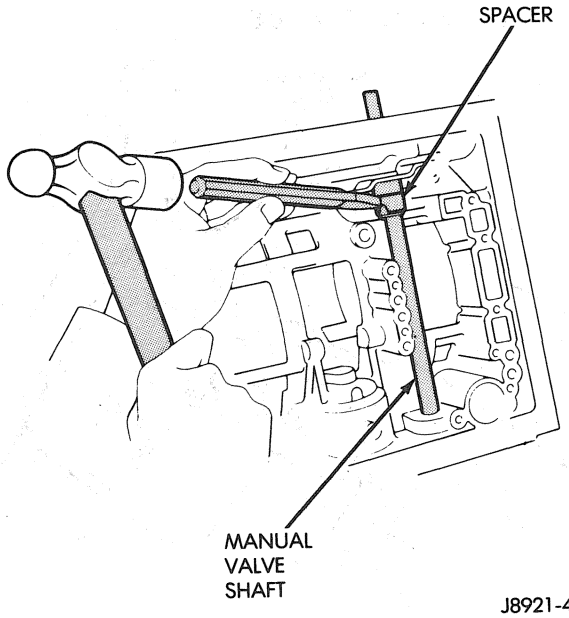


Fig. 202 Cutting Shaft Spacer Sleeve

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Remove shift sector retaining pin with pin punch (Fig. 203).

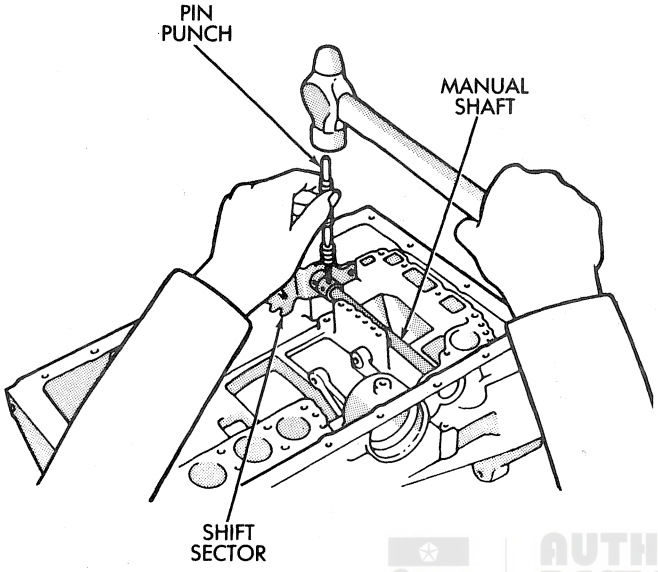


Fig. 203 Removing/Installing Sector Retaining Pin

(3) Pull shaft out of case and remove manual lever.
(4) Carefully pry shaft seals from case.
(5) Lubricate new seals with petroleum jelly and install them in case (Fig. 204).

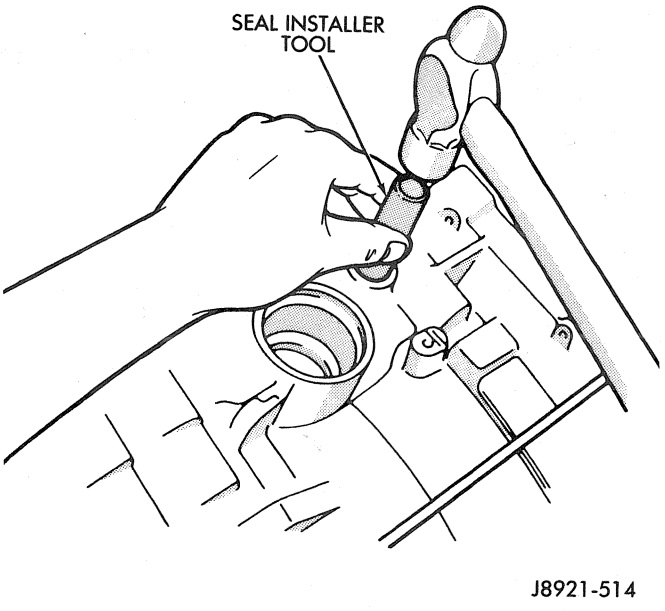


Fig. 204 Installing Manual Shaft Seals

(6) Install new spacer sleeve on shift sector (Fig. 205).
(7) Install sector and sleeve on shaft and install shaft in case.

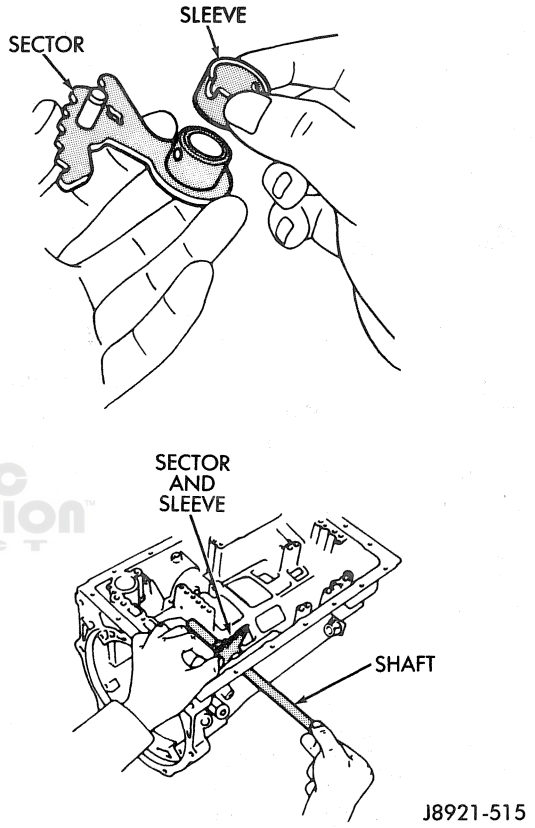


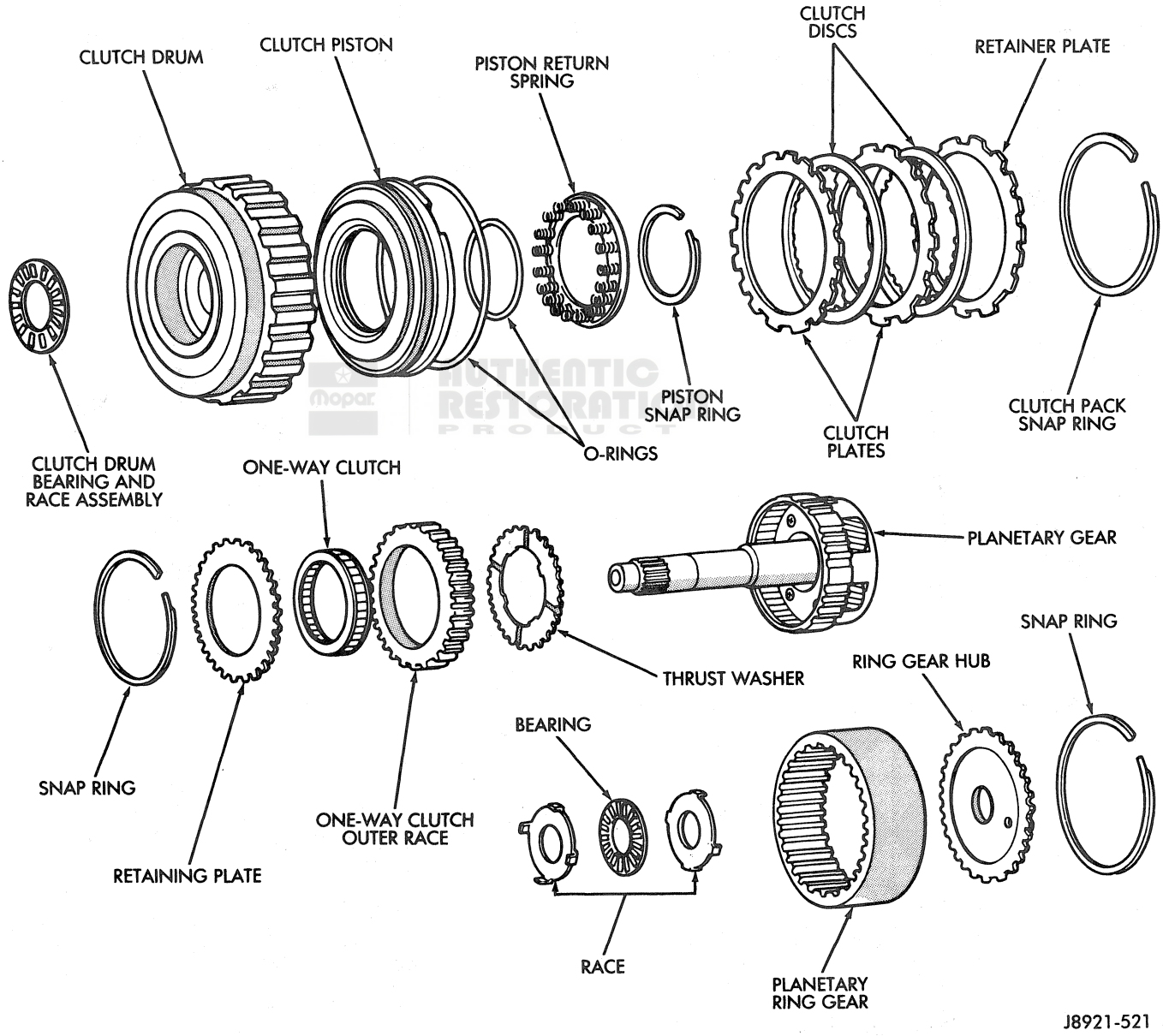
Fig. 205 Installing Manual Shaft And Sector

(8) Align sector and sleeve and install new retaining pin.
(9) Align notch in sleeve with depression in sector and stake sleeve in two places. Be sure lever and shaft rotate smoothly.

DISASSEMBLY AND ASSEMBLY (Continued)

OVERDRIVE PLANETARY GEAR AND CLUTCH OVERHAUL

GEAR AND CLUTCH DISASSEMBLY



Overdrive Planetary Gear And Clutch Components

DISASSEMBLY AND ASSEMBLY (Continued)

(1) Check operation of one–way clutch in clutch drum (Fig. 206). Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn clockwise freely but lock when turned counterclockwise. Replace one–way clutch if necessary.

(2) Replace overdrive brake clutch pack if any discs are worn below 1.84 mm (0.0724 in.) thickness. This is clutch pack that fits in case and over clutch drum.

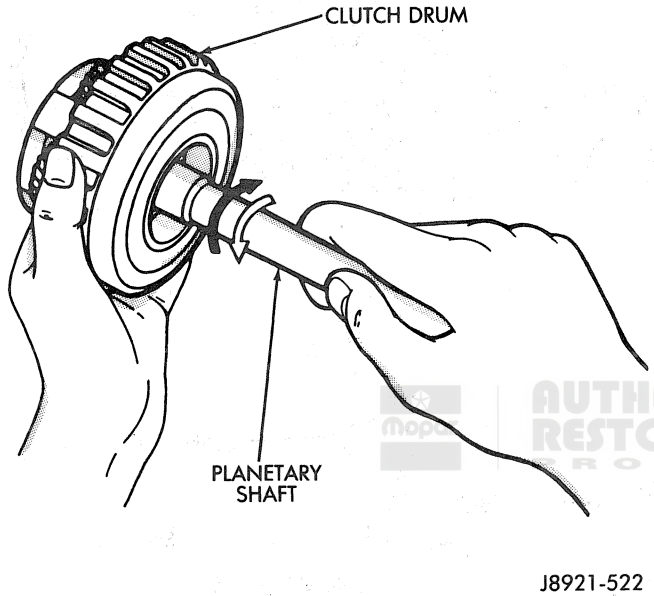


Fig. 206 Checking One–Way Clutch

(3) Remove overdrive clutch from planetary gear (Fig. 207).

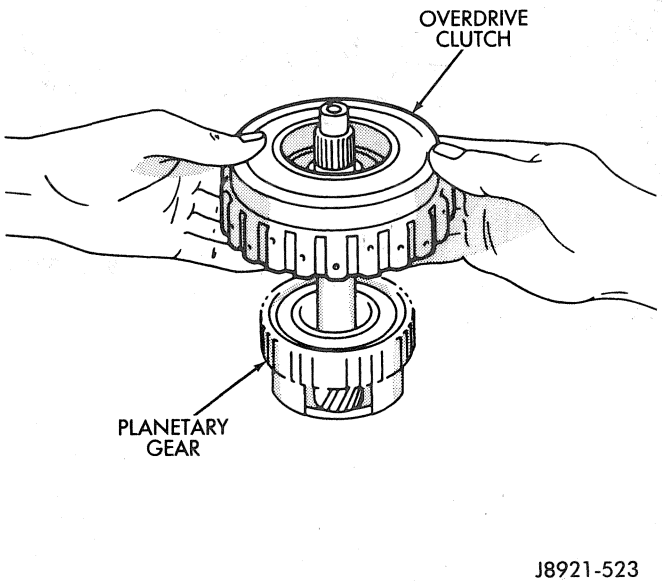


Fig. 207 Removing Overdrive Clutch From Gear

(4) Remove thrust bearing and race assembly from clutch drum (Fig. 208).

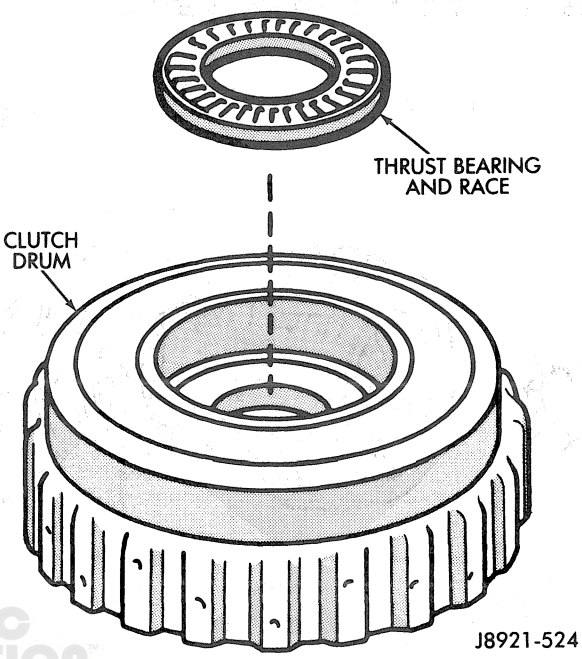


Fig. 208 Removing Clutch Drum Bearing And Race

(5) Measure stroke length of overdrive clutch piston as follows:

(a) Mount oil pump on torque converter. Then mount clutch on oil pump (Fig. 209).

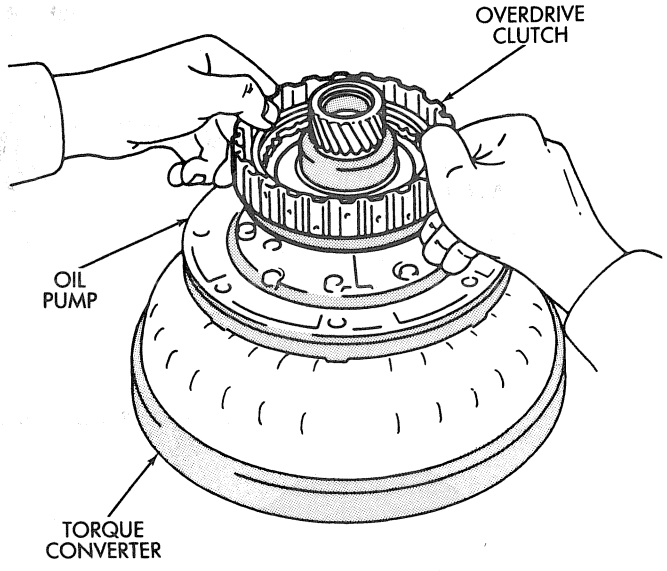


Fig. 209 Assembling Converter, Pump And Clutch For Test

DISASSEMBLY AND ASSEMBLY (Continued)

(b) Mount dial indicator on clutch and position indicator stylus on clutch piston (Fig. 210).

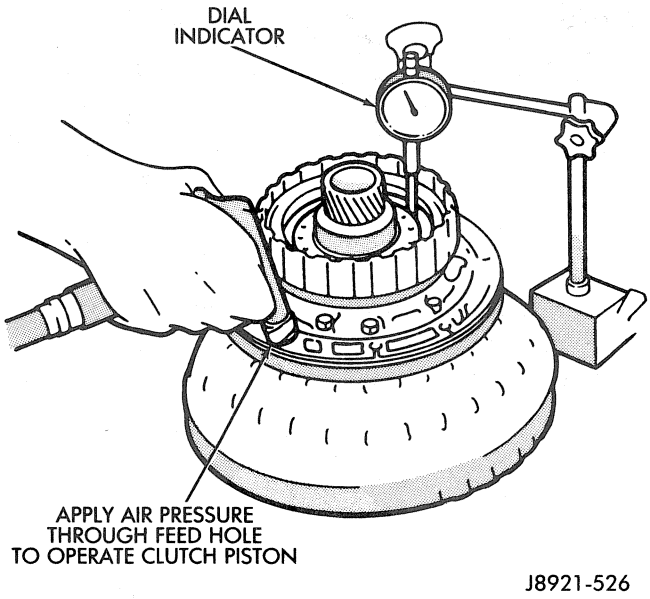


Fig. 210 Checking Overdrive Clutch Piston Stroke

(c) Apply compressed air through clutch feed hole in oil pump and note piston stroke length. Stroke length should be 1.85 – 2.15 mm (0.0728 – 0.0846 in.).

(6) Replace clutch pack if stroke length is incorrect.

(7) Remove clutch pack snap ring and remove the clutch pack (Fig. 211).

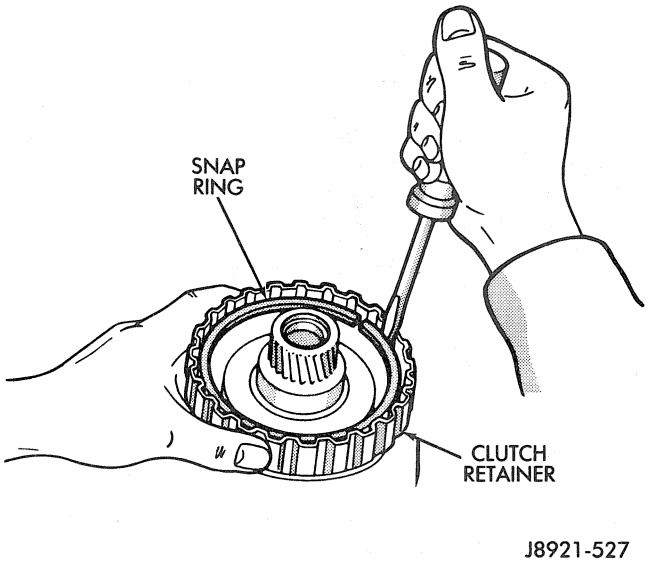


Fig. 211 Removing Clutch Pack Snap Ring

(8) Compress piston return spring with Tool 7538 (Fig. 212). Remove snap ring and remove compressor tool.

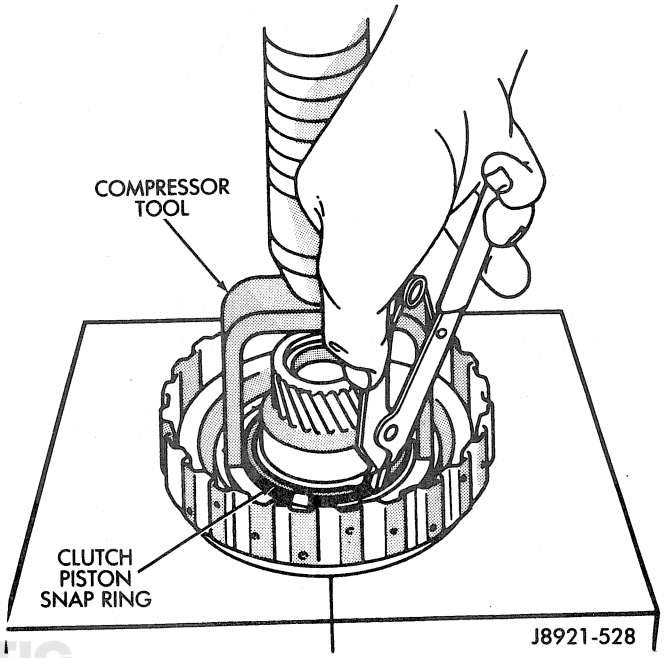


Fig. 212 Removing Clutch Piston Snap Ring

(9) Remove compressor tool and piston return springs.

(10) Mount oil pump on converter. Then mount clutch on oil pump (Fig. 213).

(11) Hold clutch piston by hand and apply compressed air through oil pump feed hole to ease piston out (Fig. 213). Apply only enough air pressure to remove piston.

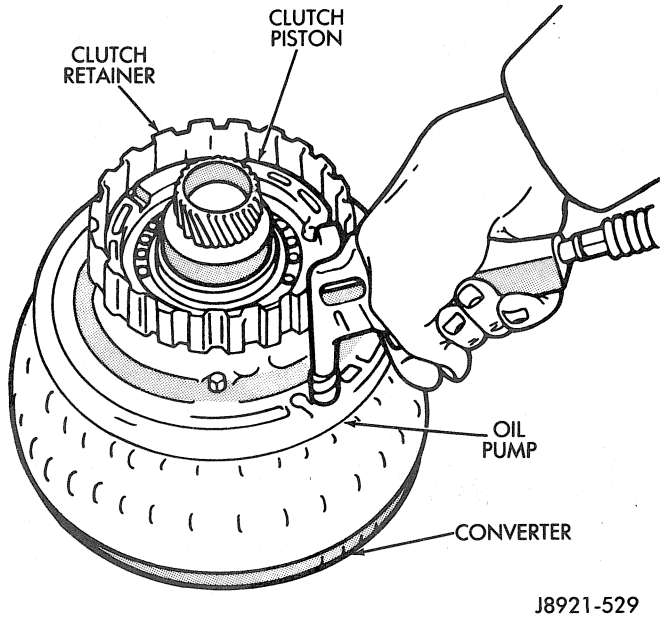


Fig. 213 Removing Overdrive Clutch Piston

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Remove bearing and race from ring gear (Fig. 214).

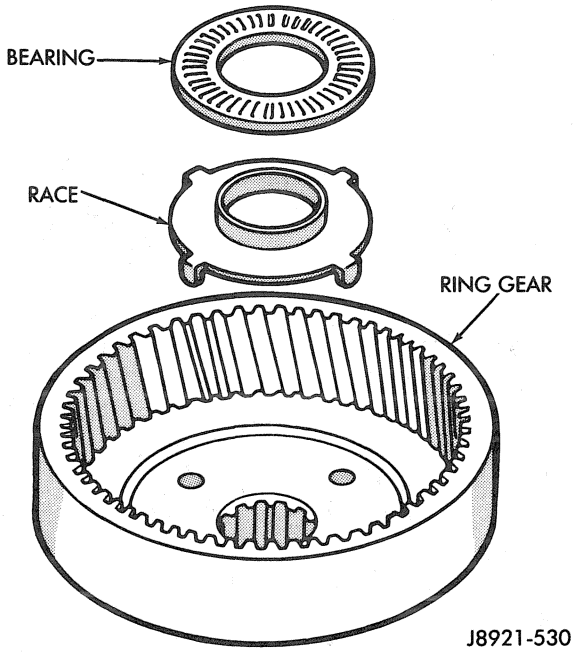


Fig. 214 Removing Ring Gear Bearing And Race

(13) Remove snap ring from ring gear and remove ring gear hub (Fig. 215).

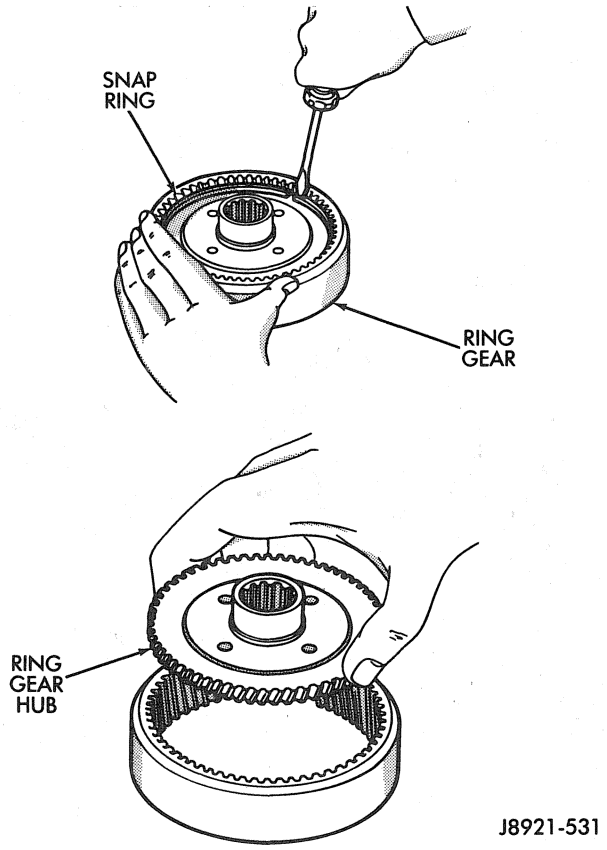


Fig. 215 Removing Ring Gear Hub

(14) Remove race from planetary gear (Fig. 216).

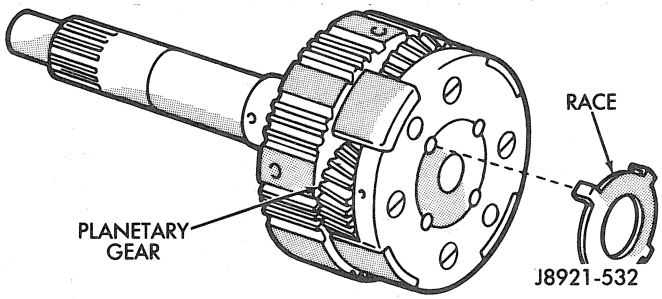


Fig. 216 Remove Planetary Gear Race

(15) Remove snap ring and remove retaining plate (Fig. 217).

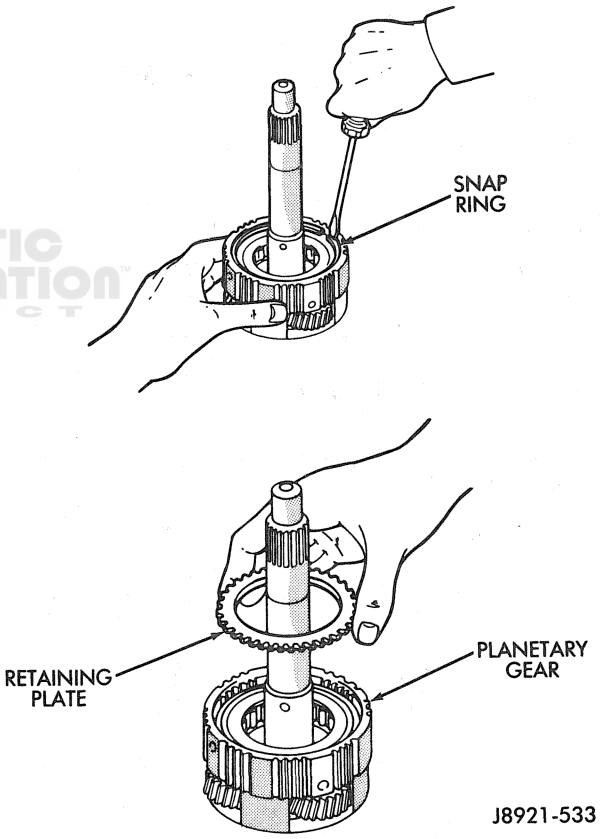


Fig. 217 Removing Snap Ring And Retaining Plate

DISASSEMBLY AND ASSEMBLY (Continued)

(16) Remove one–way clutch and outer race as assembly. Then separate race from clutch (Fig. 218).

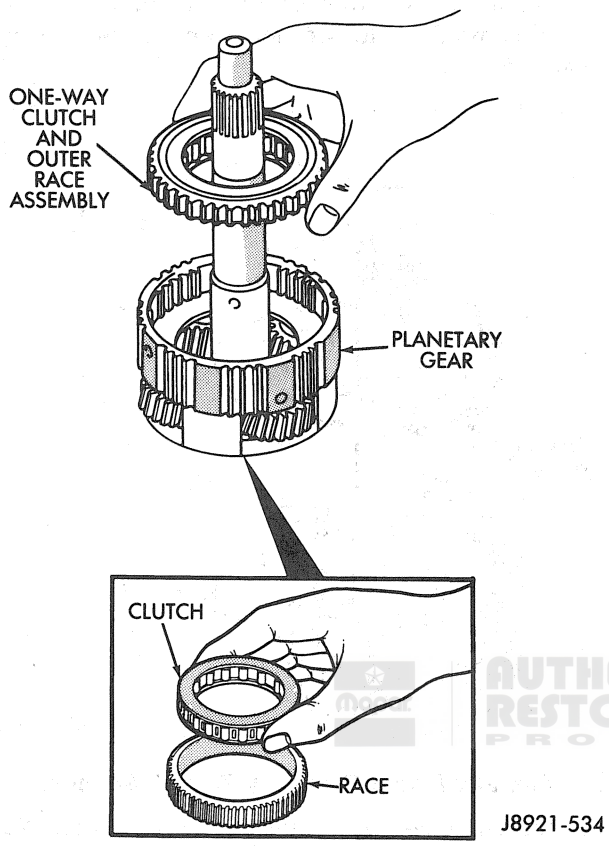


Fig. 218 Removing One–Way Clutch

(17) Remove thrust washer (Fig. 219).

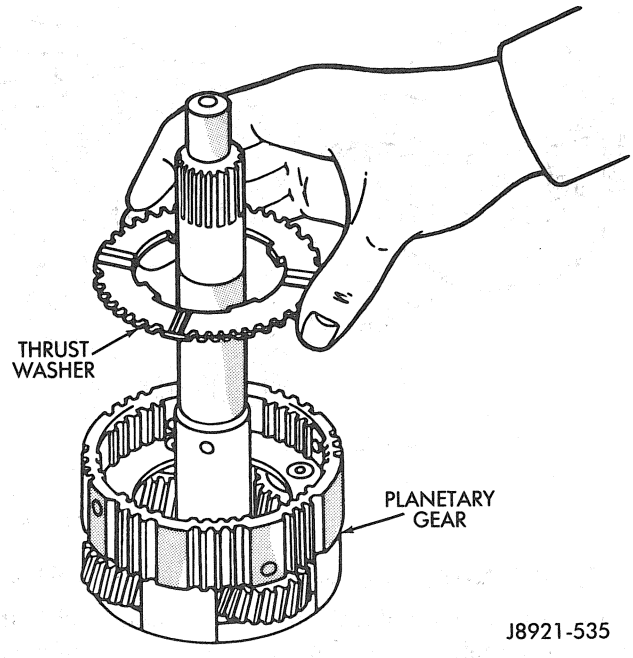


Fig. 219 Removing Planetary Thrust Washer

(18) Measure overdrive clutch disc thickness. Minimum allowable thickness is 1.84 mm (0.0724 in.). Replace clutch pack if any disc is below specified thickness.

(19) Measure free length of piston return springs with springs in retainer (Fig. 220). Length should be 16.8 mm (0.661 in.). Replace spring and retainer assembly if necessary.

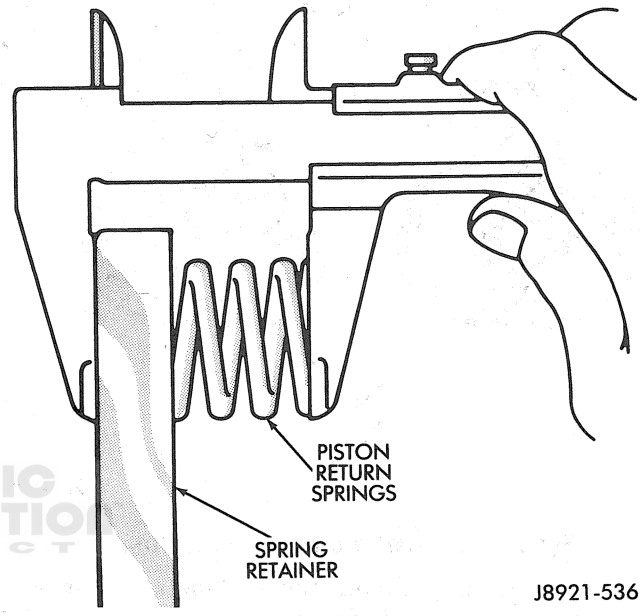


Fig. 220 Checking Piston Return Spring Length

(20) Check clutch piston check ball (Fig. 221). Shake piston to see if ball moves freely. Then check ball sealing by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.

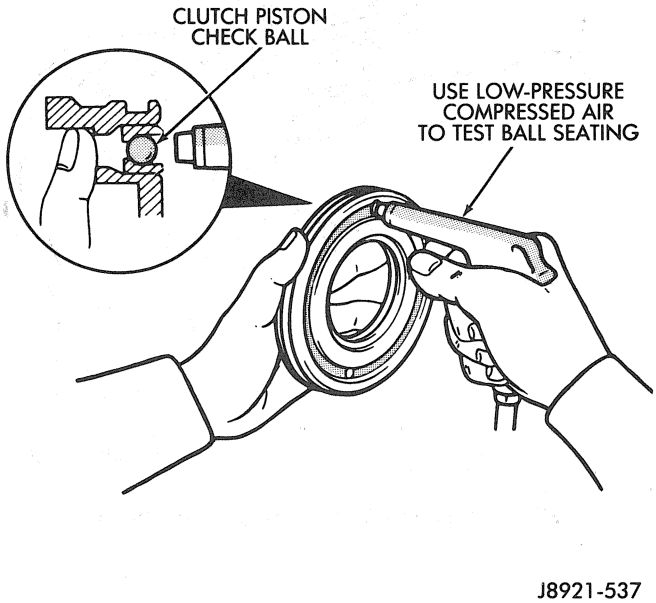


Fig. 221 Testing Clutch Piston Check Ball

DISASSEMBLY AND ASSEMBLY (Continued)

(21) Check inside diameter of clutch drum bushings with bore gauge or inside micrometer (Fig. 222). Maximum inside diameter is 27.11 mm (1.0673 in.). Replace drum if bushing inside diameter is greater than specified.

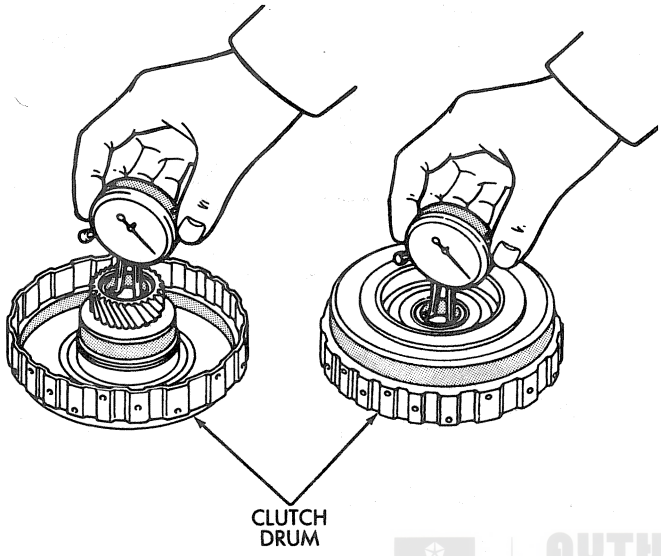


Fig. 222 Checking Clutch Drum Bushings

(22) Check inside diameter of planetary gear bushing (Fig. 223). Maximum inside diameter is 11.27 mm (0.4437 in.). Replace planetary gear if bushing inside diameter is greater then specified.

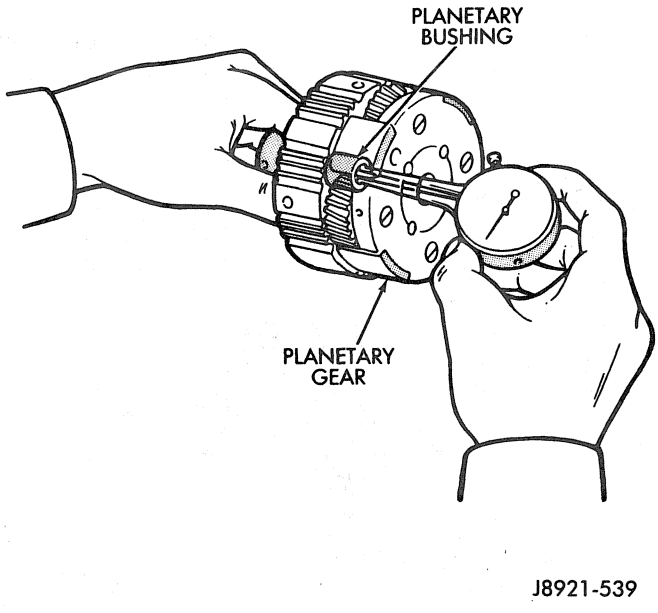


Fig. 223 Checking Planetary Bushing

ASSEMBLING OVERDRIVE GEAR AND CLUTCH

(1) Install thrust washer in planetary gear (Fig. 224). **Grooved side of washer faces up and toward front.**

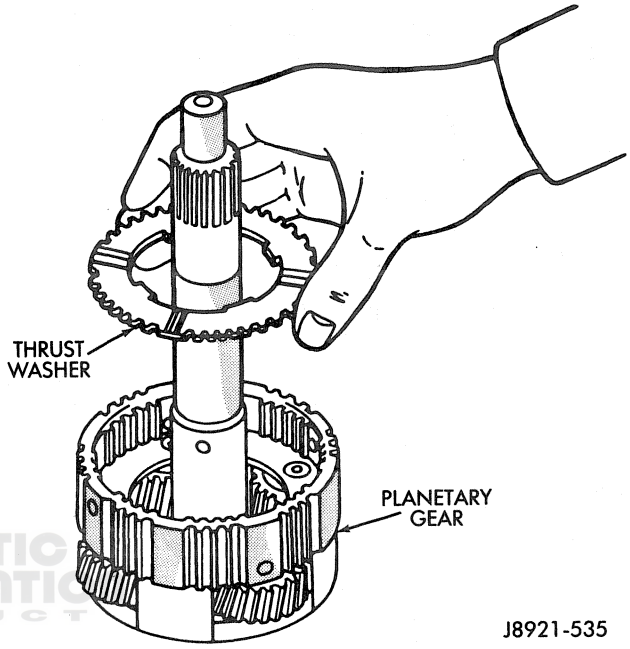


Fig. 224 Install Planetary Thrust Washer

(2) Install one–way clutch in race (Fig. 225). Flanged side of clutch must face upward as shown.

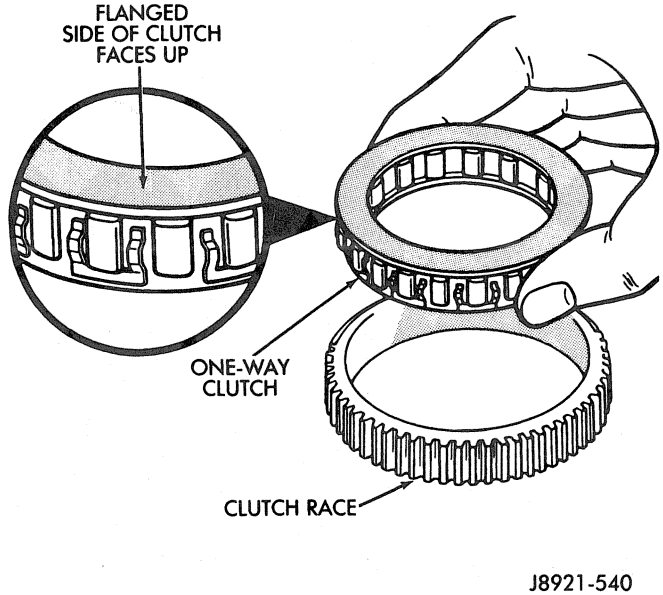


Fig. 225 Assembling One–Way Clutch And Race

(3) Install assembled one–way clutch and outer race in planetary gear. Be sure flanged side of clutch is facing upward.

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Install clutch pack retaining plate and snap ring in planetary gear.

(5) Coat planetary race with petroleum jelly and install it on planetary gear. Outside diameter of race is 41.8 mm (1.646 in.); inside diameter is 27.1 mm (1.067 in.).

(6) Install hub in planetary ring gear and install snap ring.

(7) Coat race and bearing with petroleum jelly and install in planetary ring gear (Fig. 226).

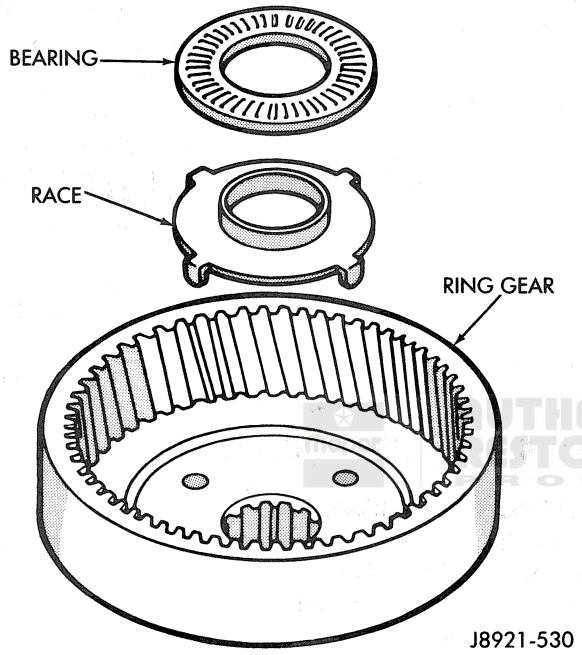


Fig. 226 Install Ring Gear Bearing And Race

(8) Verify bearing/race size. Outside diameter of race is 47.8 mm (1.882 in.) and inside diameter is 24.2 mm (0.953 in.). Outside diameter of bearing is 46.8 mm (1.843 in.) and inside diameter is 26 mm (1.024 in.).

(9) Lubricate new clutch piston O–rings with Mopar Door Ease, or Ru–Glyde. Then install rings on clutch piston and install piston in clutch drum.

(10) Install piston return springs in clutch piston (Fig. 227).

(11) Install piston snap ring. Compress piston return springs with Tool 7538 and shop press (Fig. 228).

(12) Install overdrive clutch pack in drum. Install steel plate first, then a disc (Fig. 229). Continue installation sequence until required number of discs and plates have been installed.

(13) Install clutch pack retainer with flat side facing downward. Then install retainer snap ring (Fig. 230). Compress springs with suitable tool.

(14) Install clutch drum bearing and race assembly (Fig. 231). Be sure bearing rollers face upward as shown. Outside diameter of assembled bearing and race is 50.2 mm (1.976 in.). Inside diameter is 28.9 mm (1.138 in.).

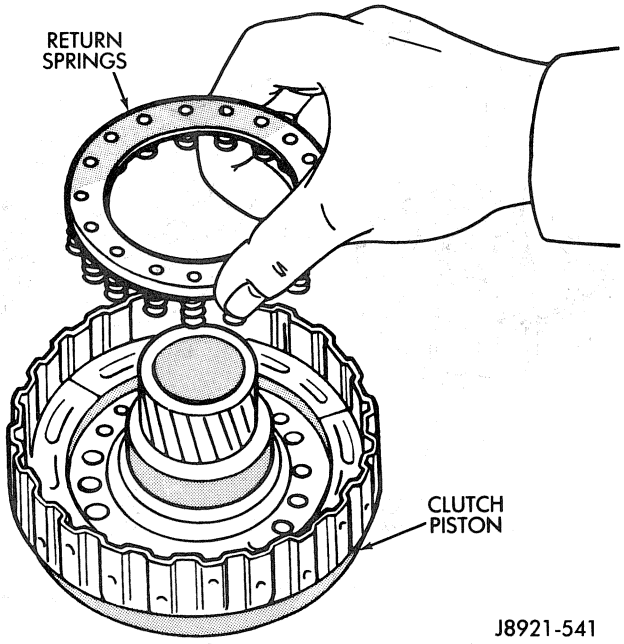


Fig. 227 Installing Piston Return Springs

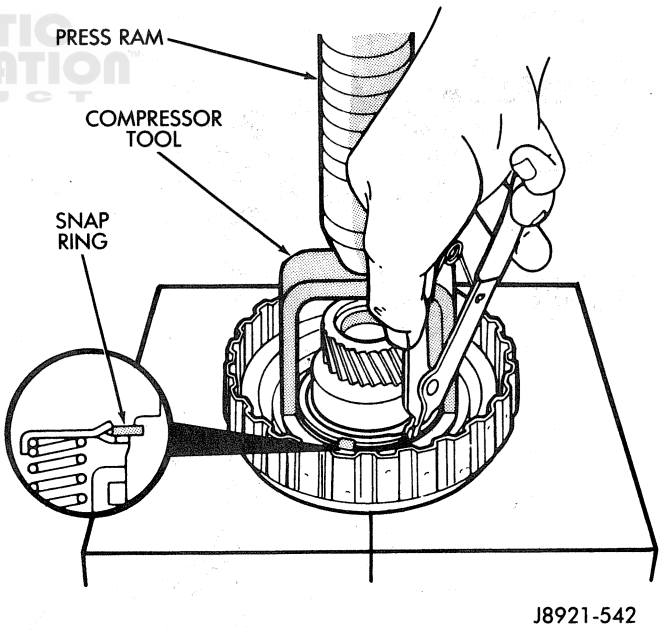


Fig. 228 Installing Clutch Piston Snap Ring

(15) Install clutch on planetary gear.

(16) Verify one–way clutch operation. Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn clockwise freely but lock when turned counterclockwise.

DISASSEMBLY AND ASSEMBLY (Continued)

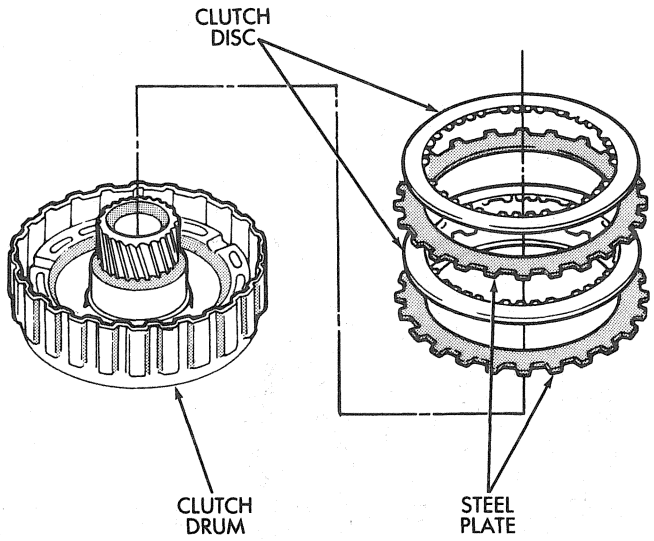


Fig. 229 Installing Overdrive Clutch Discs And Plates

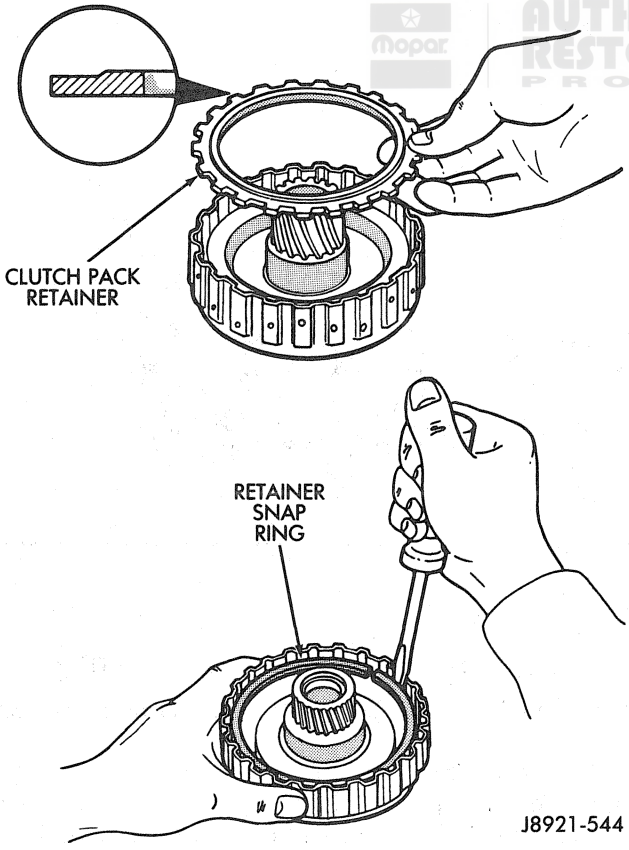


Fig. 230 Installing Retainer And Snap Ring

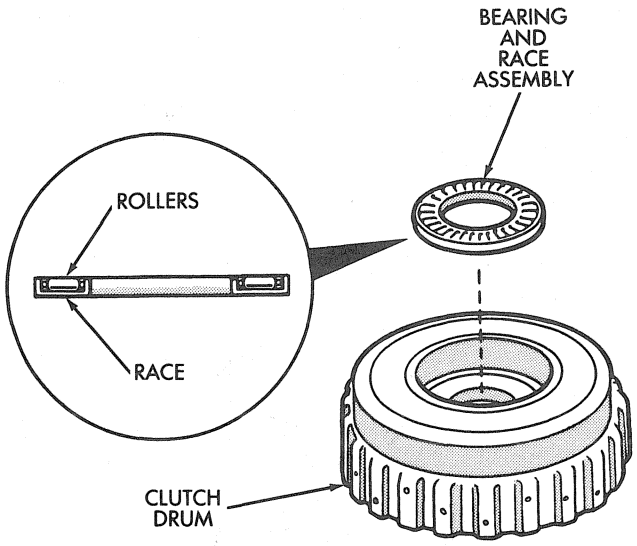


Fig. 231 Installing Clutch Drum Bearing And Race Assembly

OVERDRIVE SUPPORT OVERHAUL

SUPPORT DISASSEMBLY

(1) Check brake piston operation. Mount support on clutch (Fig. 232).

(2) Apply compressed air through support feed hole and observe brake piston movement (Fig. 232). Piston should move smoothly and not bind or stick. If operation is incorrect, replace piston and support.

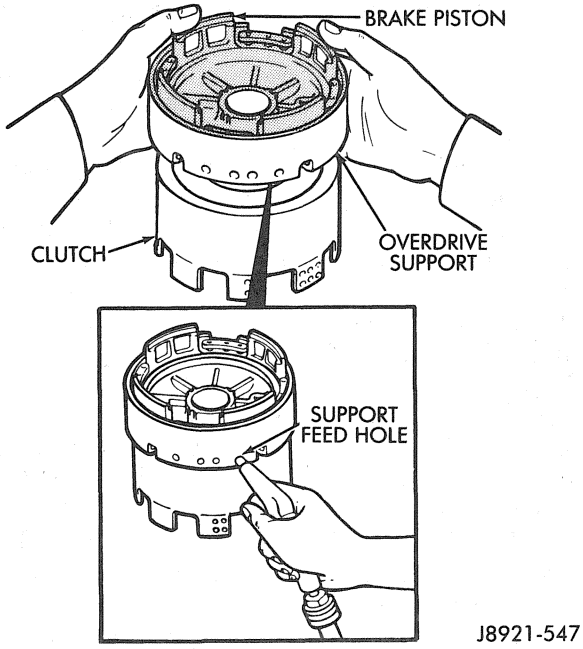


Fig. 232 Checking Brake Piston Movement

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove thrust bearing front race, thrust bearing and rear race (Fig. 233).

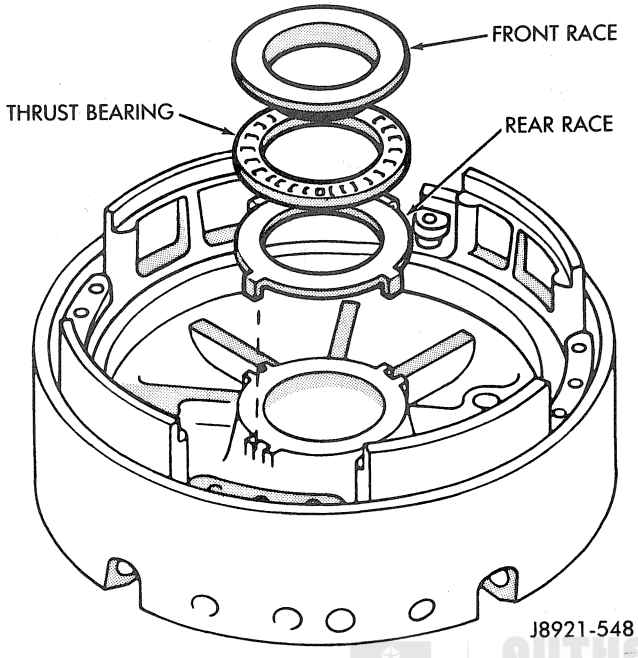


Fig. 233 Removing Support Thrust Bearing And Races

(4) Turn overdrive support over and remove bearing race and clutch drum thrust washer (Fig. 234).

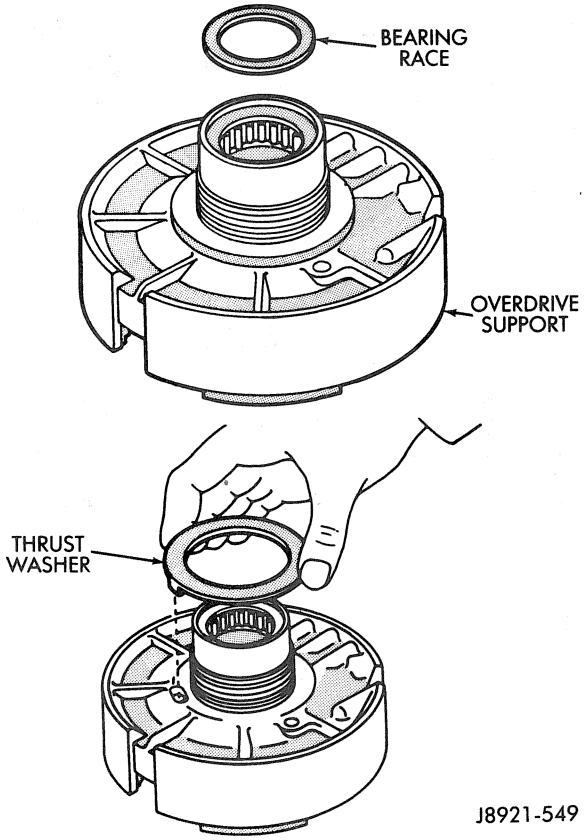


Fig. 234 Removing Clutch Drum Thrust Washer And Race

(5) Compress piston return spring with Spring Compressor 7537 and remove piston snap ring (Fig. 235).

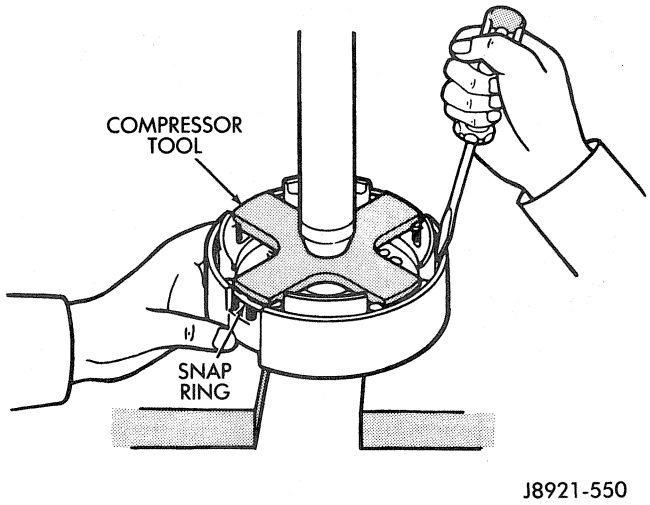


Fig. 235 Removing/Installing Piston Snap Ring

(6) Mount support in direct clutch and remove brake piston with compressed air. Apply air to same feed hole used when checking piston operation.

(7) Remove and discard support O–rings (Fig. 236).

(8) Remove support seal rings (Fig. 237).

(9) Measure free length of piston return springs with springs mounted in retainer (Fig. 238). Length should be 17.23 mm (0.678 in.).

(10) Clean support components and dry them with compressed air.

(11) Inspect overdrive support and brake piston. Replace support and piston if either part is worn or damaged.

DISASSEMBLY AND ASSEMBLY (Continued)

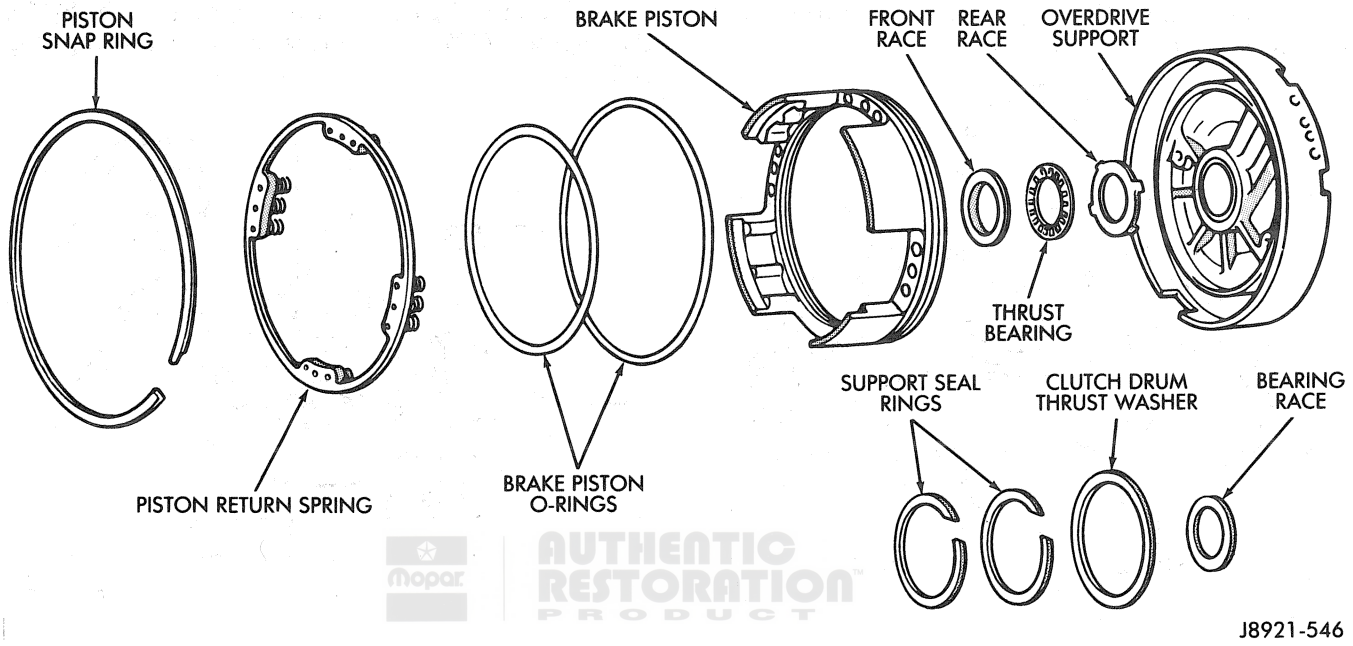


Fig. 236 Overdrive Support Components

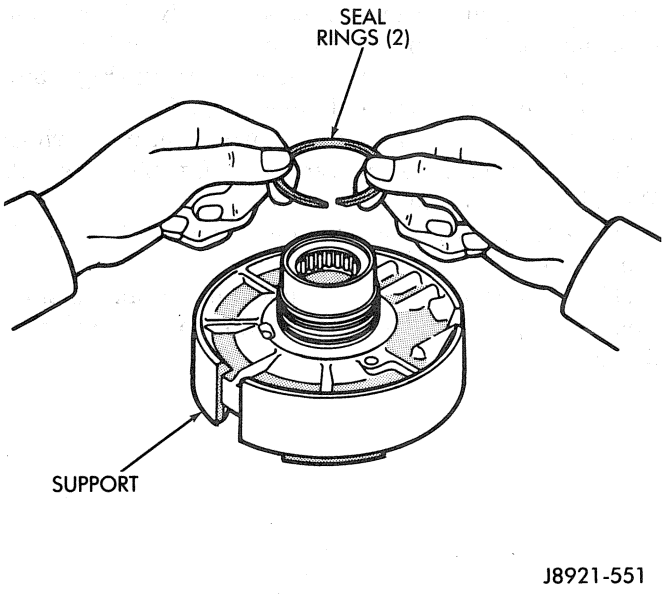


Fig. 237 Removing Support Seal Rings

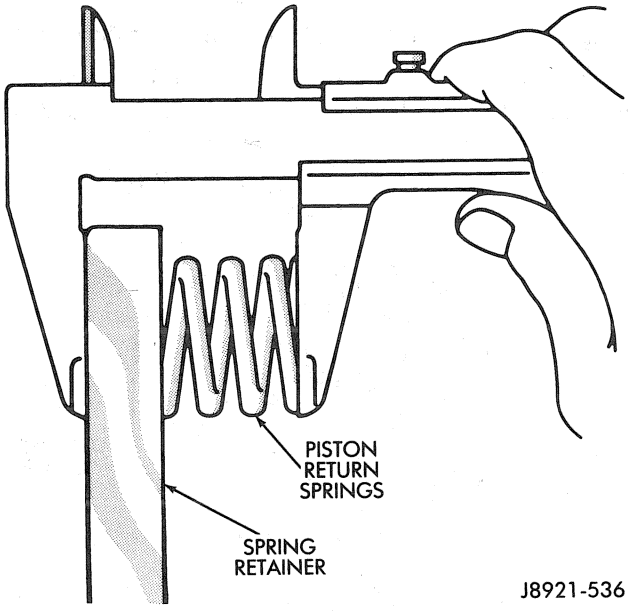


Fig. 238 Checking Piston Return Spring Length

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLING OVERDRIVE SUPPORT

(1) Lubricate new support seal rings. Then compress rings and install them on support (Fig. 239).

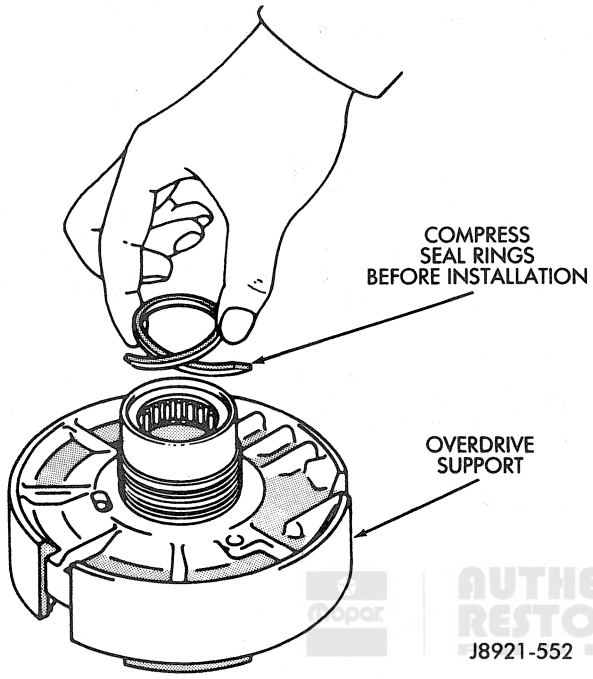


Fig. 239 Installing Support Seal Rings

(2) Lubricate and install new O–rings on brake piston. Then carefully seat piston in support.

(3) Install return springs on brake piston.

(4) Compress return springs with Spring Compressor 7537 (Fig. 235) and install piston snap ring.

(5) Install support bearing race and clutch drum thrust washer (Fig. 234).

(6) Install thrust bearing and front and rear bearing races. Thrust bearing rollers should face upward as shown (Fig. 239).

(7) Verify thrust bearing/race sizes (Fig. 240).

- Front race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 30.7 mm (1.209 in.).
- Rear race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 34.3 mm (1.350 in.).
- Bearing outer diameter is 47.7 mm (1.878 in.) and inside diameter is 32.7 mm (1.287 in.).

(8) Verify brake piston operation. Use same procedure described at beginning of disassembly. Piston should operate smoothly and not bind or stick.

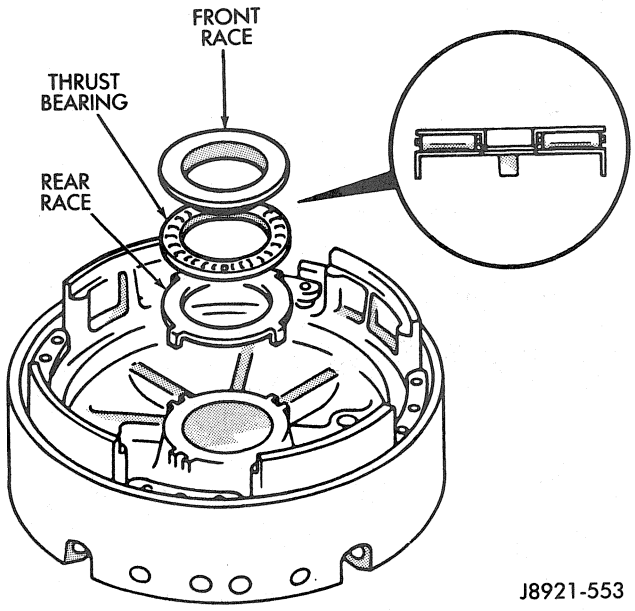


Fig. 240 Installing Support Thrust Bearing And Races

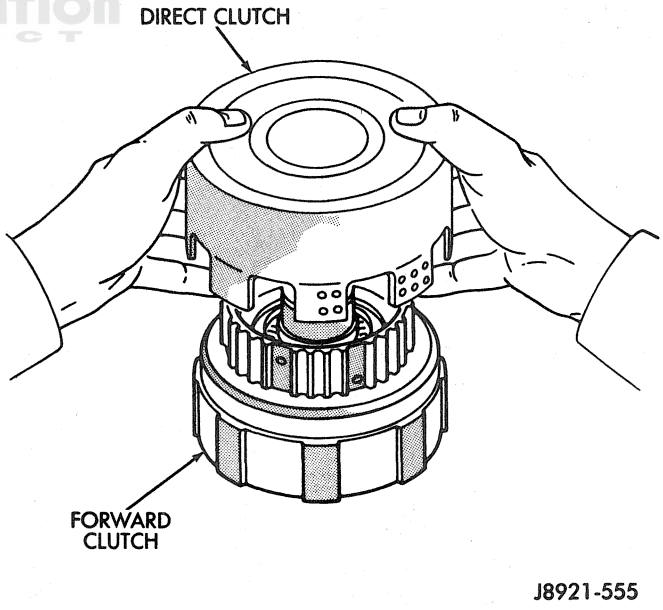


Fig. 241 Separate Direct Clutch From Forward Clutch

DIRECT CLUTCH OVERHAUL

CLUTCH DISASSEMBLE

(1) Remove direct clutch from forward clutch (Fig. 241).

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Remove clutch drum thrust washer (Fig. 242).

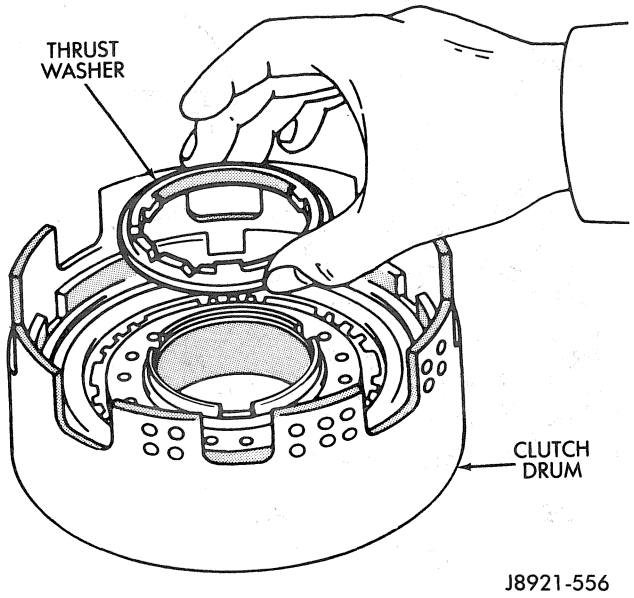


Fig. 242 Removing Clutch Drum Thrust Washer

(3) Check clutch piston stroke length as outlined in following steps.

(4) Mount direct clutch on overdrive support assembly (Fig. 243).

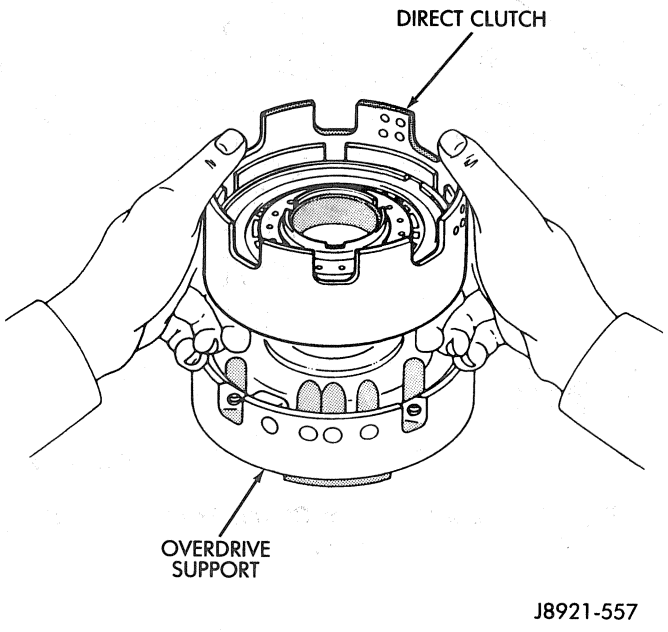


Fig. 243 Mount Direct Clutch On Overdrive Support

(5) Mount dial indicator on clutch and position indicator plunger on clutch piston (Fig. 244).

(6) Apply 57–114 psi air pressure through feed hole in overdrive support and note piston stroke length (Fig. 244). Check stroke at least twice.

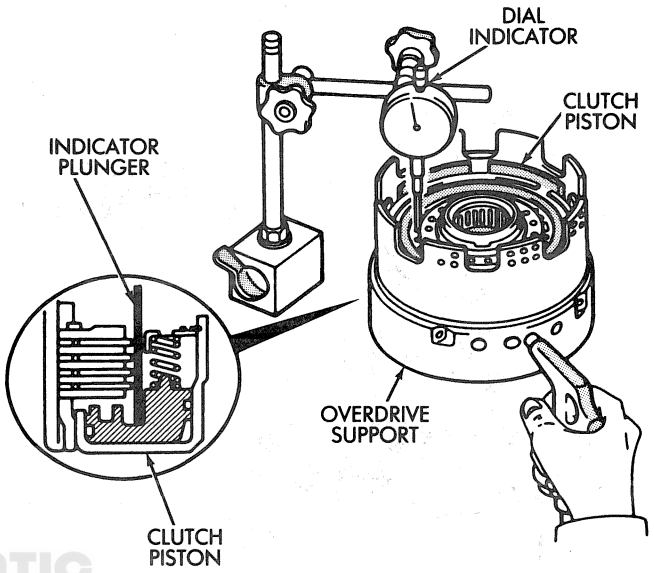


Fig. 244 Checking Direct Clutch Piston Stroke Length

(7) Piston stroke length should be 1.37 mm – 1.67 mm (0.054 – 0.065 in.). If stroke length is incorrect, either the clutch pack retainer or clutch discs will have to be replaced.

(8) Remove clutch pack snap ring and remove retainer and clutch pack from drum (Fig. 245).

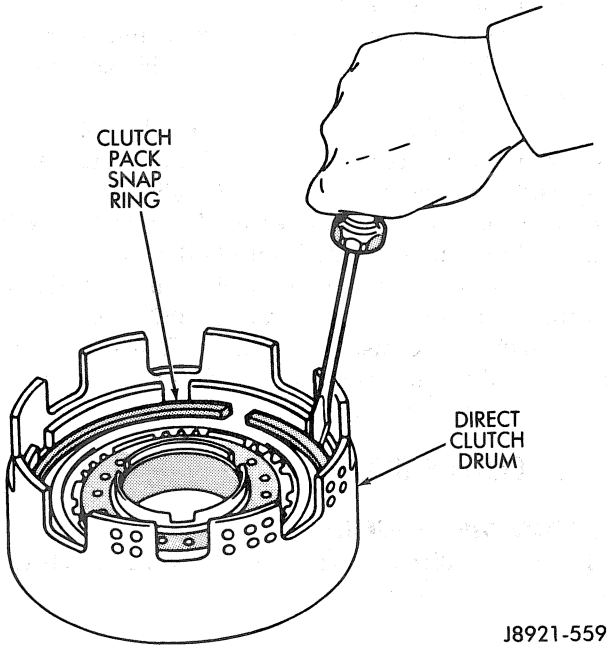


Fig. 245 Removing Clutch Pack Snap Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Compress clutch piston return springs with tool 7538 and remove clutch piston snap ring (Fig. 246).

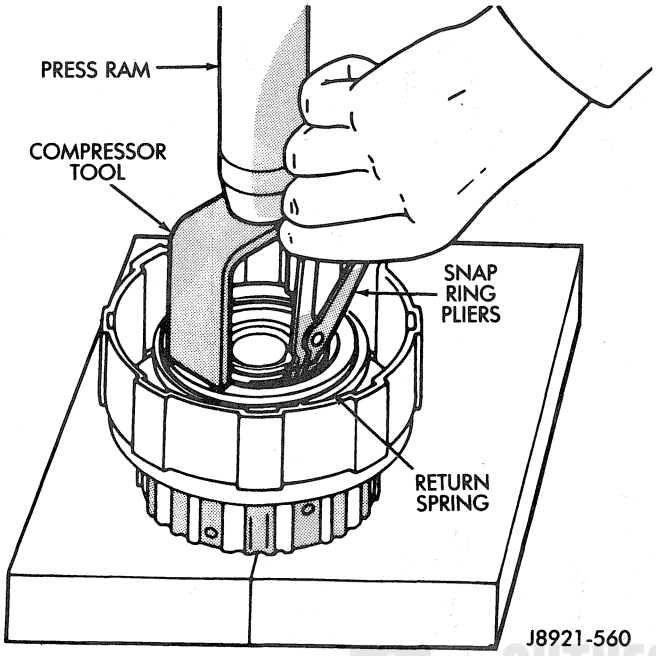


Fig. 246 Removing Piston Return Spring

(10) Remove compressor tool and return spring.

(11) Remove clutch piston. Remount clutch on overdrive support (Fig. 247). Apply compressed air through piston feed hole in support to remove piston. Use only enough air to ease piston out.

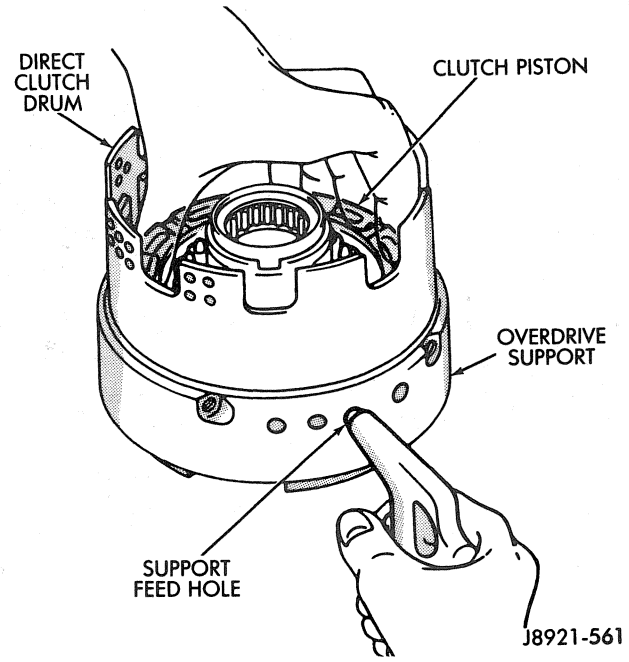


Fig. 247 Removing Direct Clutch Piston

(12) Remove and discard clutch piston O–rings.

(13) Measure clutch disc thickness. Minimum allowable thickness is 1.84 mm (0.0724 in). Replace clutch pack if any disc is below minimum thickness.

(14) Measure free length of piston return springs with springs in retainer (Fig. 248). Length should be 21.32 mm (0.839 in.). Replace return springs if not within specification.

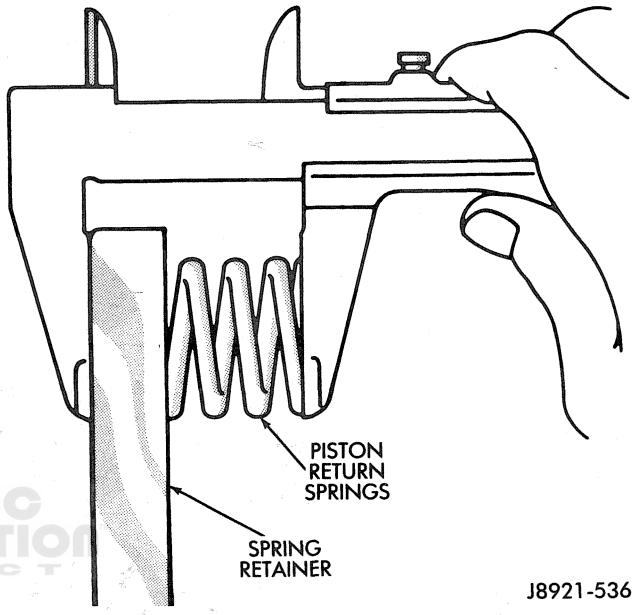


Fig. 248 Checking Piston Return Spring Length

(15) Check clutch piston check ball (Fig. 249). Shake piston to see if ball moves freely. Then check ball seating by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.

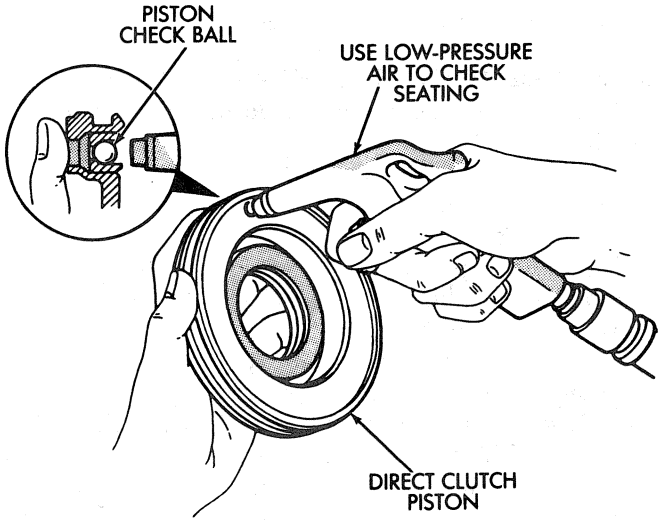


Fig. 249 Testing Piston Check Ball Seating

DISASSEMBLY AND ASSEMBLY (Continued)

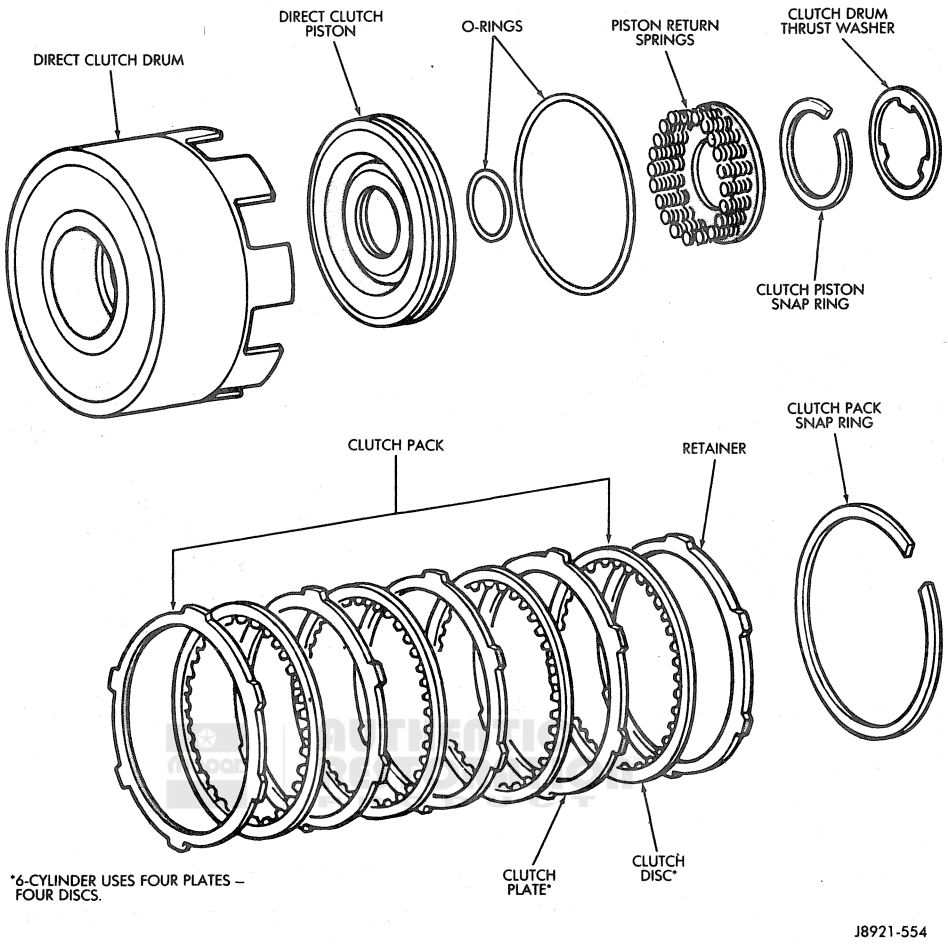


Fig. 250 Direct Clutch Components

(16) Measure inside diameter of clutch drum bushing. Inside diameter should be no more than 53.97 mm (2.1248 in.). Replace drum if bushing inside diameter is greater than specified.

DIRECT CLUTCH ASSEMBLY

(1) Lubricate and install replacement O–rings on clutch piston (Fig. 250).

(2) Install clutch piston in drum and install return springs on piston.

(3) Compress piston return springs with Tool 7538 and install snap ring (Fig. 246). Be sure snap ring end gap is not aligned with spring retainer tab.

(4) Install clutch discs and plates (Fig. 251). Install plate then disc until all plates and discs are installed. Four plates and discs are required.

(5) Install clutch pack retainer in drum (Fig. 252).

(6) Install clutch pack snap ring (Fig. 252).

(7) Check snap ring position. If necessary, shift snap ring until end gap is **not** aligned with any notches in clutch drum (Fig. 253).

(8) Lubricate clutch drum thrust washer with petroleum jelly and install it in drum (Fig. 243).

(9) Mount direct clutch assembly on forward clutch assembly and check assembled height (Fig. 254).

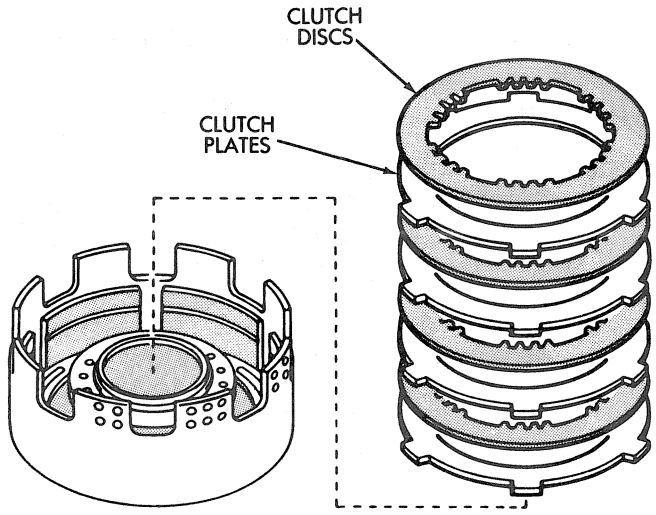


Fig. 251 Installing Direct Clutch Discs And Plates

Height should be 70.3 to 71.5 mm (2.767 to 2.815 in.).

DISASSEMBLY AND ASSEMBLY (Continued)

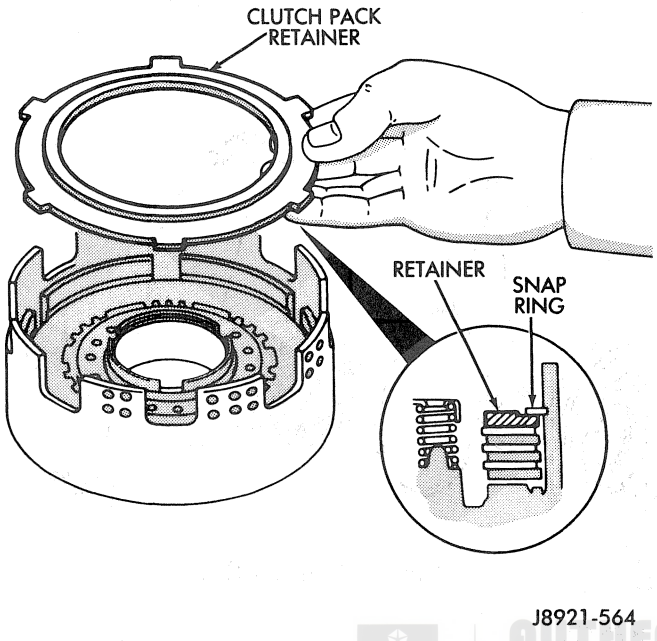


Fig. 252 Install Clutch Pack Retainer

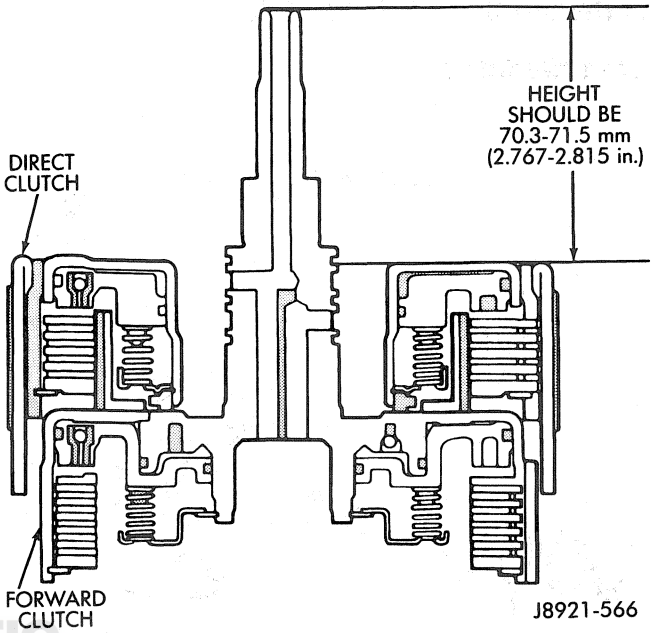


Fig. 254 Checking Direct Clutch Assembled Height

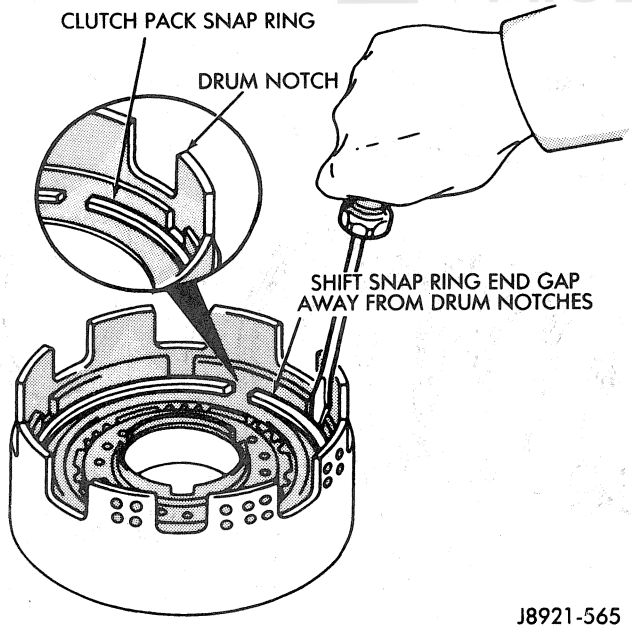


Fig. 253 Adjusting Clutch Pack Snap Ring Position

(10) If assembled height is incorrect, clutches are not seated.

(11) If clutch height is OK, remove direct clutch from forward clutch and proceed to forward clutch overhaul.

DISASSEMBLY AND ASSEMBLY (Continued)

FORWARD CLUTCH OVERHAUL

DISASSEMBLE

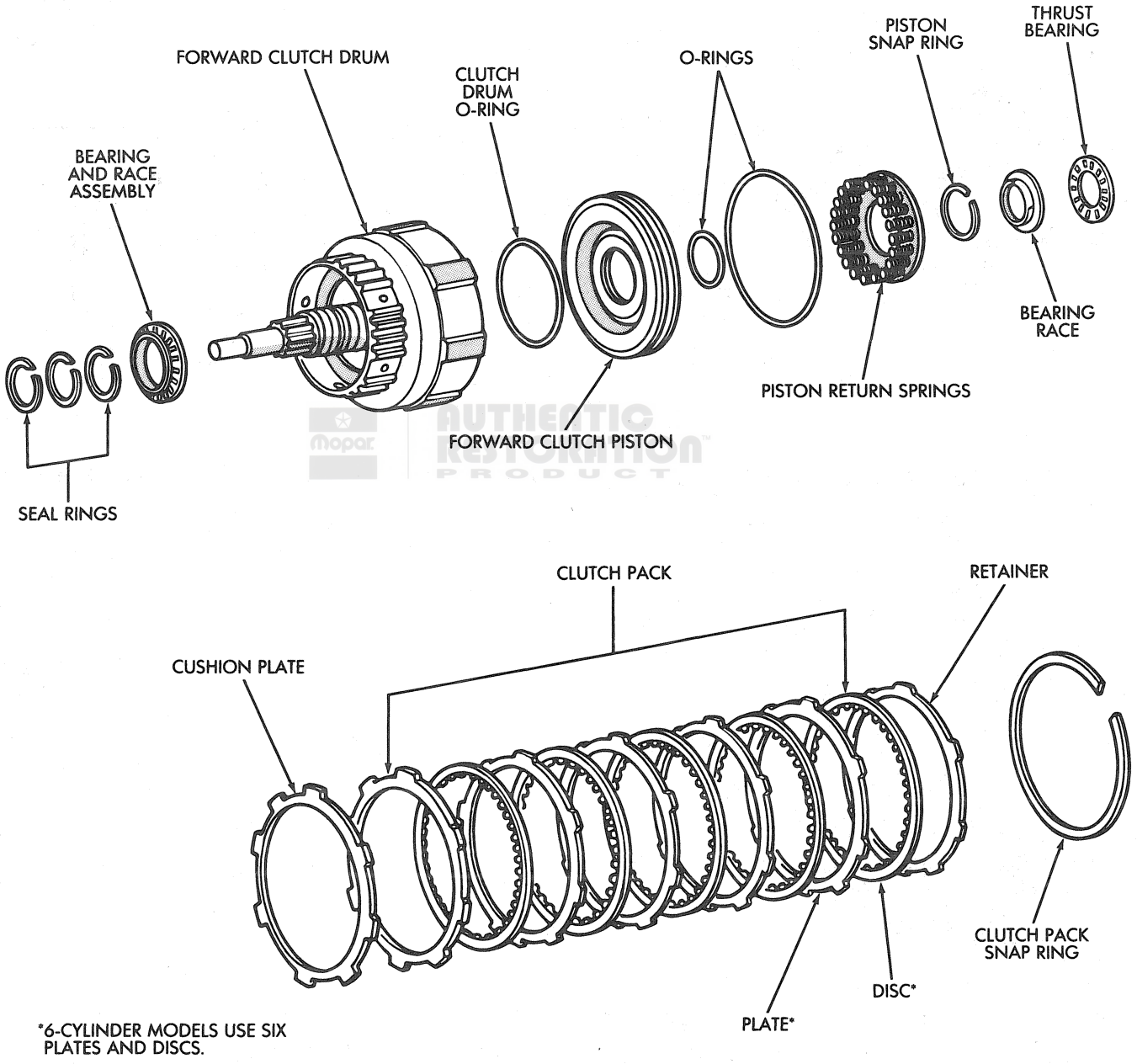


Fig. 255 Forward Clutch Components

DISASSEMBLY AND ASSEMBLY (Continued)

(1) Check clutch piston stroke as outlined in following steps.

(2) Position overdrive support on wood blocks and mount forward clutch drum on support (Fig. 256).

(3) Remove bearing and race from forward clutch drum (Fig. 256).

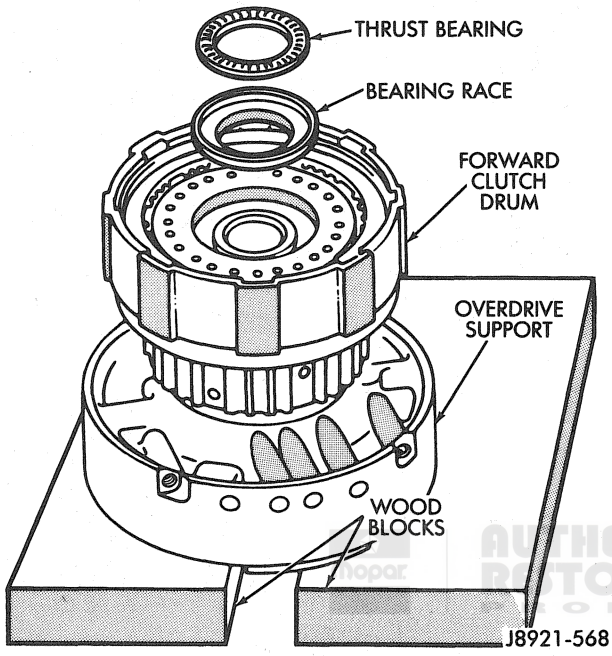


Fig. 256 Positioning Drum And Support On Wood Blocks

(4) Mount dial indicator on clutch drum. Position dial indicator plunger against clutch piston (Fig. 257).

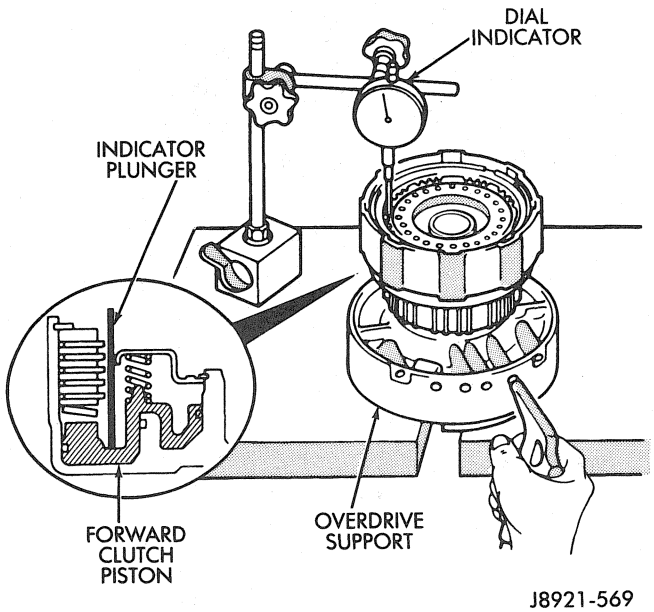


Fig. 257 Checking Forward Clutch Piston Stroke Length

(5) Apply compressed air through right side feed hole in support and note piston stroke length on dial indicator.

(6) Stroke length should be 3.55 – 3.73 mm (0.1348 – 0.1469 in.).

(7) Replace clutch discs if stroke length is incorrect.

(8) Remove clutch pack snap ring and remove retainer and clutch pack (Fig. 258).

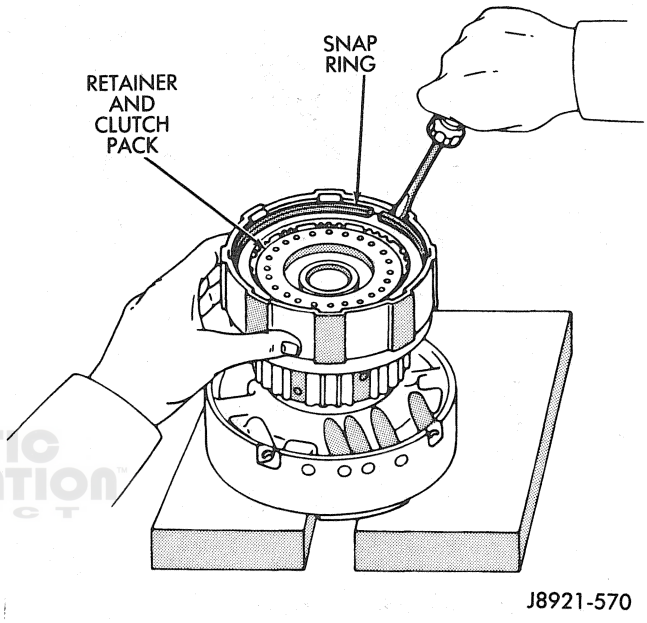


Fig. 258 Removing Retainer And Clutch Pack

(9) Remove clutch pack cushion plate (Fig. 259).

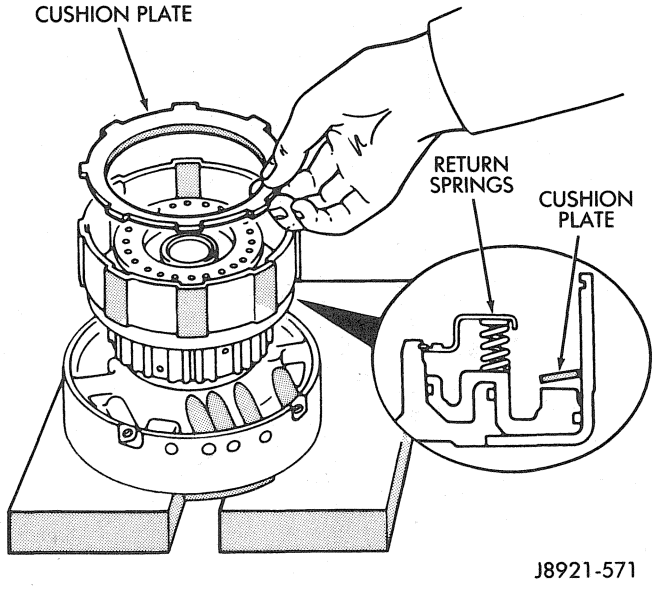


Fig. 259 Removing Cushion Plate

(10) Compress clutch springs with Tool 7538 and remove piston snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)

(11) Remove spring compressor tool and piston return springs.

(12) Remount forward clutch drum on overdrive support (Fig. 260).

(13) Apply compressed air through feed hole in support to remove piston (Fig. 260). Use only enough air pressure to ease piston out of drum.

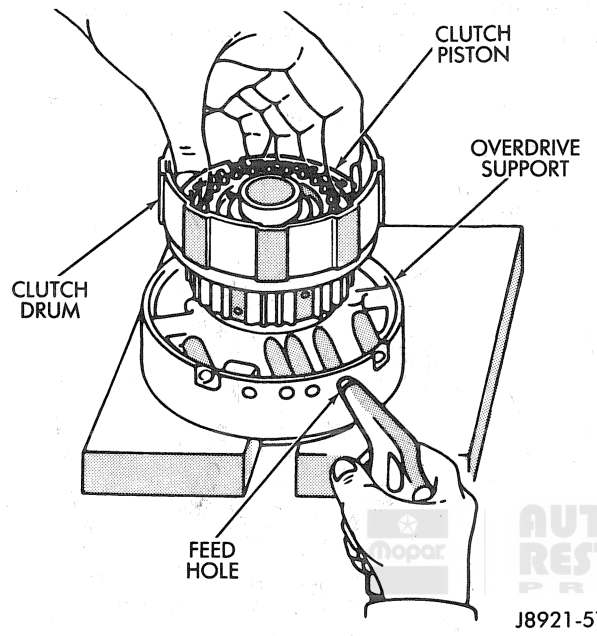


Fig. 260 Removing Forward Clutch Piston

(14) Remove and discard clutch piston O–rings (Fig. 261).

(15) Remove clutch drum O–ring from rear hub of drum.

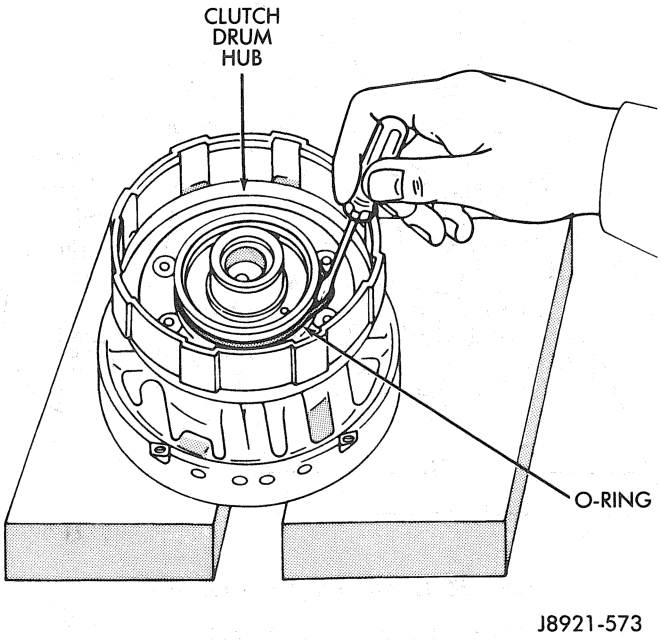


Fig. 261 Removing/Installing Clutch Drum O–Ring

(16) Remove three seal rings from clutch drum shaft (Fig. 262).

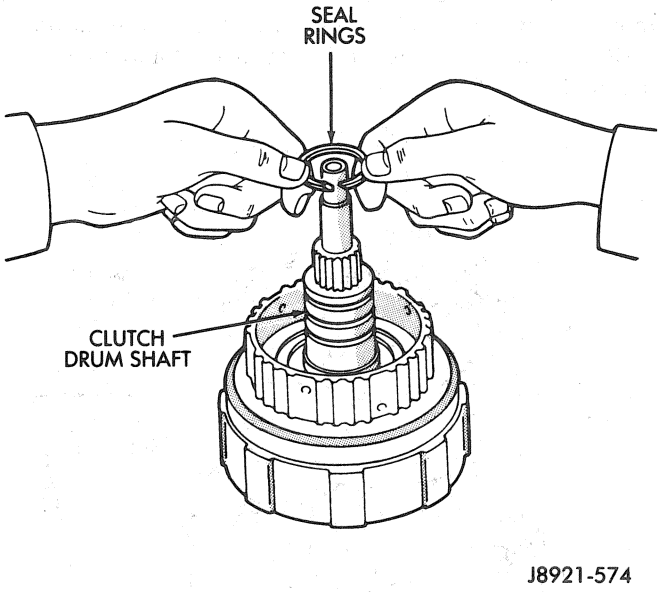


Fig. 262 Removing Clutch Drum Seal Rings

(17) Remove thrust bearing and race assembly from clutch drum (Fig. 263).

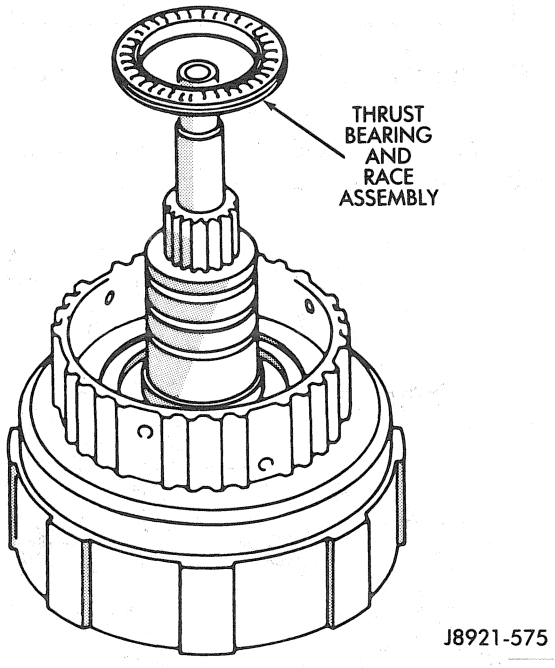


Fig. 263 Removing Clutch Drum Thrust Bearing Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

(18) Measure clutch disc thickness (Fig. 264). Minimum allowable thickness is 1.51 mm (0.0595 in.). Replace clutch pack if any disc falls below specified minimum thickness.

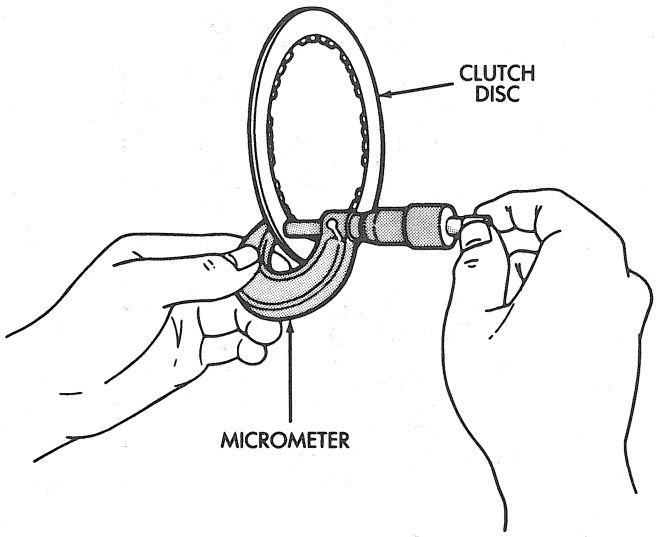


Fig. 264 Measuring Clutch Disc Thickness

(19) Measure free length of piston return springs with springs mounted in retainer (Fig. 265). Length should be 19.47 mm (0.767 in.). Replace springs and retainer if length is incorrect.

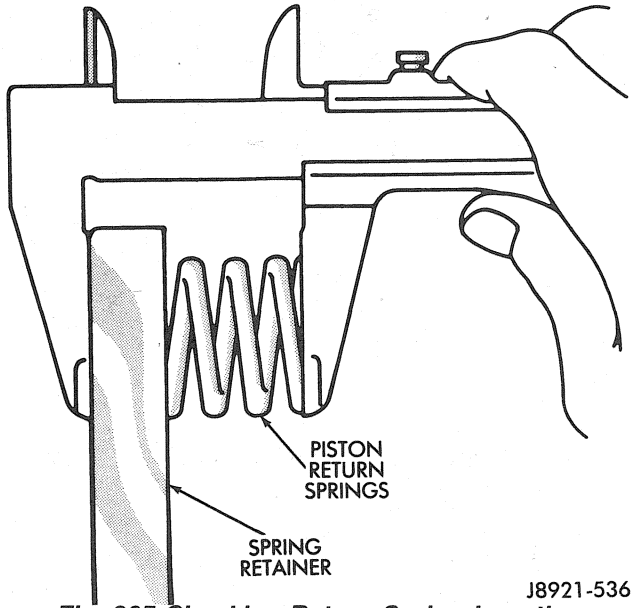


Fig. 265 Checking Return Spring Length

(20) Inspect clutch piston check ball (Fig. 266). Ball should move freely within piston. Check ball seating by applying low pressure compressed air to ball feed hole. Ball should seat firmly and not leak air.

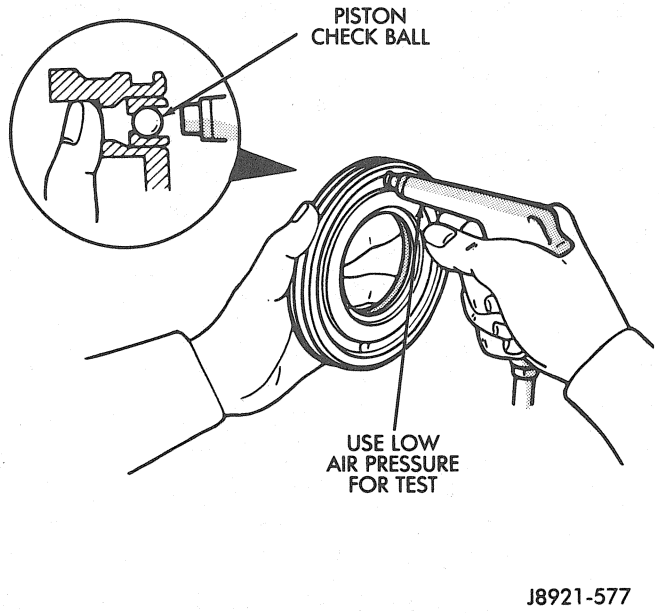


Fig. 266 Testing Piston Check Ball

(21) Measure inside diameter of bushing in clutch drum hub. Maximum allowable diameter is 24.08 mm (0.9480 in.). Replace clutch drum if bushing inside diameter is greater than specified.

FORWARD CLUTCH ASSEMBLY

(1) Lubricate bearing and race assembly with petroleum jelly and install it in clutch drum (Fig. 267). Race side of assembly faces downward and toward drum. Bearing rollers face up (Fig. 267)

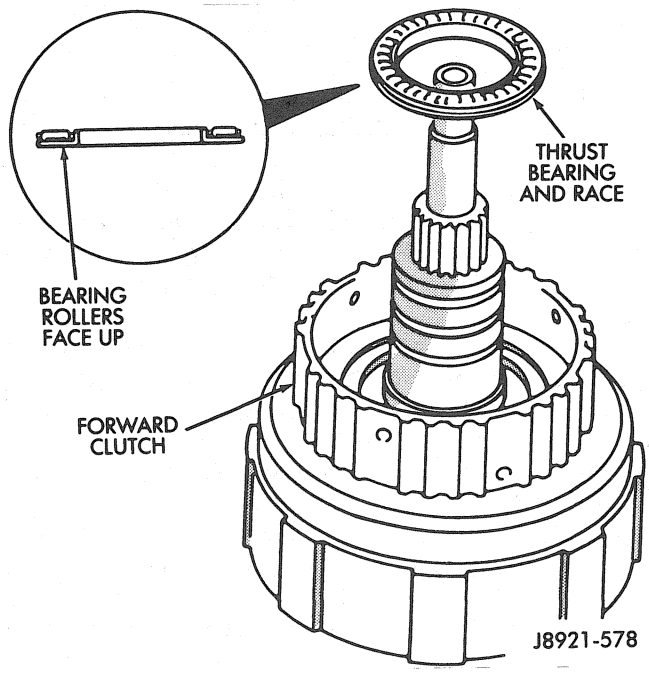


Fig. 267 Installing Thrust Bearing And Race

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Coat new clutch drum shaft seal rings with petroleum jelly. Before installing drum shaft seal rings, squeeze each ring so ring ends overlap (Fig. 268). This tightens ring making clutch installation easier.

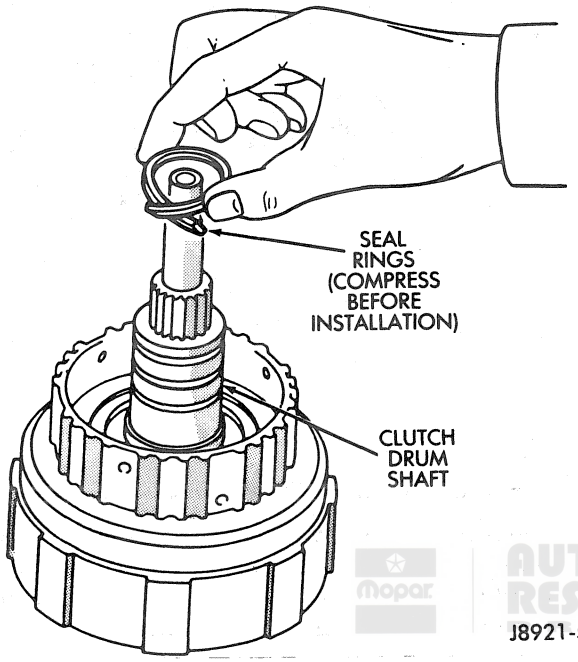


Fig. 268 Installing Clutch Drum Shaft Seal Rings

(3) Install seal rings on shaft. Keep rings closed as tightly as possible during installation. Avoid overspreading them.

(4) Mount clutch drum on overdrive support.

(5) Lubricate and install new O–ring on clutch drum hub (Fig. 261).

(6) Lubricate new clutch piston O–rings with Mopar Door Ease, or Ru–Glyde. Install rings on clutch piston and install piston in drum.

(7) Install piston return springs.

(8) Compress piston return springs with Tool 7538 and shop press and install piston snap ring. Be sure snap ring end gap is not aligned with any notches in drum.

(9) Install cushion plate in drum. Concave side of plate faces downward (Fig. 259).

(10) Install clutch discs, plates and retainer (Fig. 269). Install tabbed plate followed by disc until required number of plates and discs are installed. Use six plates and discs.

(11) Install clutch pack snap ring.

(12) Recheck clutch piston stroke length using same method outlined at beginning of disassembly procedure. If stroke length is not within specified limits, replace clutch discs.

(13) Lubricate race and bearing with petroleum jelly and install them in clutch drum (Fig. 270). Be sure bearing rollers face up and race lip seats in drum as shown.

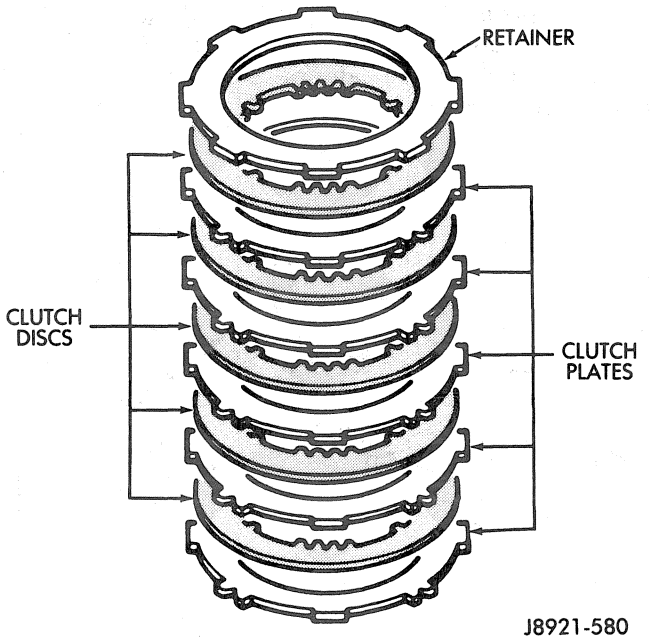


Fig. 269 Installing Forward Clutch Discs And Plates

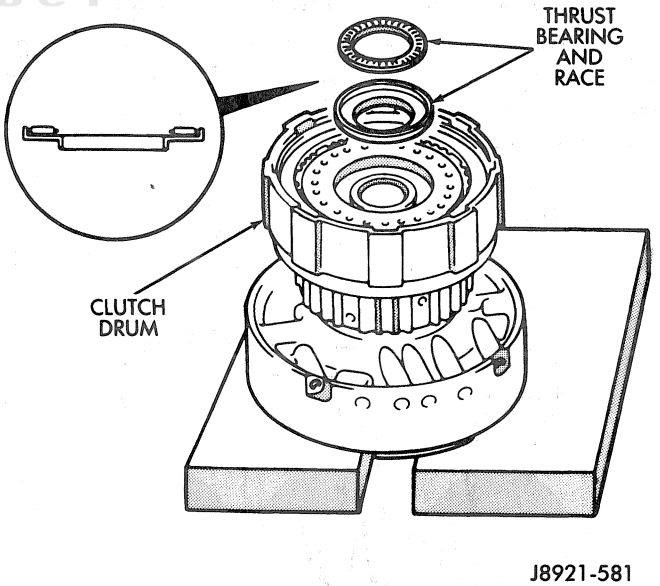


Fig. 270 Installing Thrust Bearing And Race

(14) Verify bearing and race size.

- Outer diameter of bearing is 46.7 mm (1.839 in).
- Outer diameter of race is 48.9 mm (1.925 in.).
- Inner diameter of bearing and race is 26.0 mm (1.024 in.).

(15) Mount forward clutch on direct clutch and check assembled height (Fig. 271). Height should be 70.3 – 71.5 mm (2.767 – 2.815 in.).

DISASSEMBLY AND ASSEMBLY (Continued)

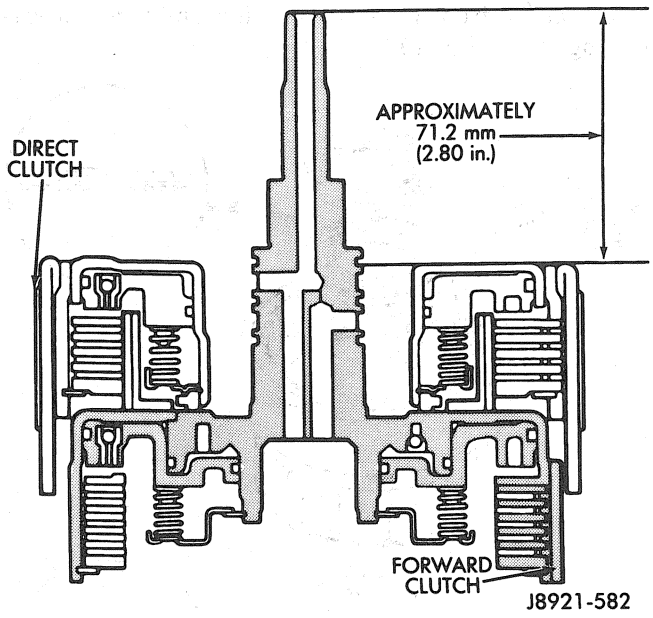


Fig. 271 Checking Forward Clutch Assembled Height

FRONT PLANETARY GEAR OVERHAUL

Front Planetary Disassembly

(1) Remove ring gear from planetary gear (Fig. 272).

(2) Remove front bearing and the two races from ring gear (Fig. 272).

(3) Remove tabbed thrust race from planetary gear (Fig. 272).

(4) Remove snap ring attaching planetary gear to shaft and remove gear.

(5) Remove rear bearing and race from planetary gear.

(6) Measure inside diameter of ring gear bushing. Maximum allowable diameter is 24.08 mm (0.9480 in.). Replace ring gear if bushing inside diameter is greater than specified.

(7) Check condition of planetary gear. Replace gear if teeth are worn, pins are loose, or carrier is cracked, distorted, or worn.

Front Planetary Assembly

(1) Lubricate planetary and ring gear bearings and races with petroleum jelly.

(2) Identify planetary bearings and races before installation. (Fig. 272). Bearings and races can be identified by following dimensions:

- Outer diameter of rear bearing is 47.7 mm (1.878 in.). Inner diameter is 35.5 mm (1.398 in.).
- Outer diameter of rear race 47.6 mm (1.874 in.). Inner diameter is 33.7 mm (1.327 in.).
- Outer diameter of front race is 53.6 mm (2.110 in.). Inner diameter is 30.5 mm (1.201 in.).
- Outer diameter of front bearing is 47.7 mm (1.878 in.). Inner diameter is 32.6 (1.283 in.).
- Outer diameter of forward race is 47.0 mm (1.850 in.). Inner diameter is 26.5 mm 1.043 in.).

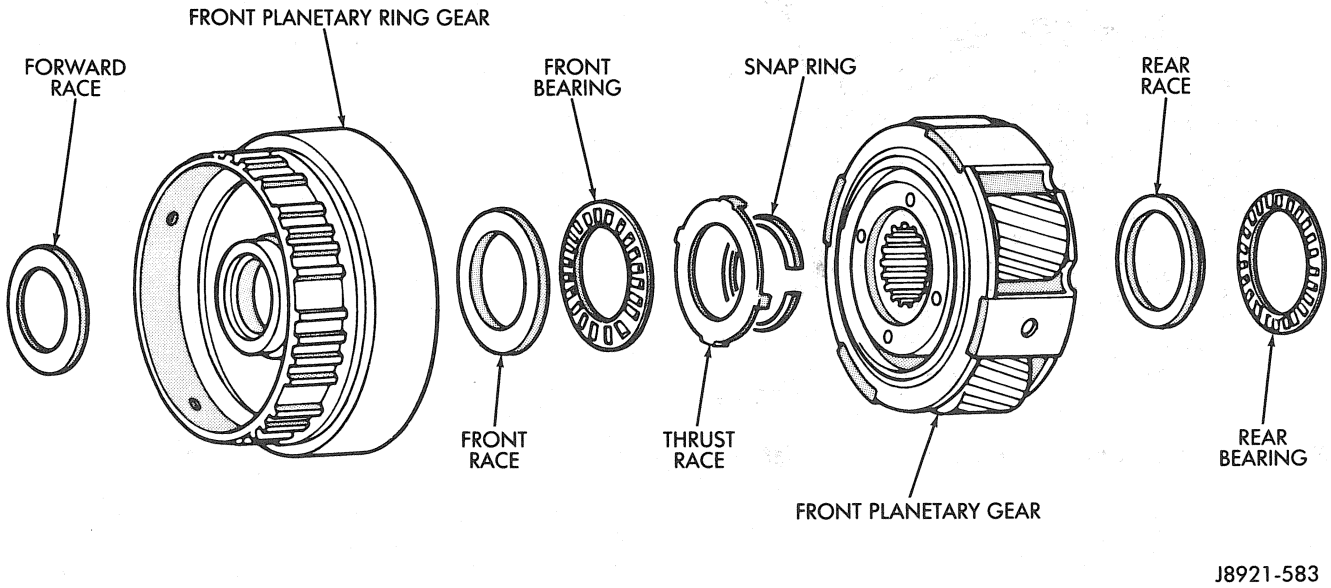


Fig. 272 Front Planetary Gear Components

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Install rear race and bearing in gear (Fig. 273).

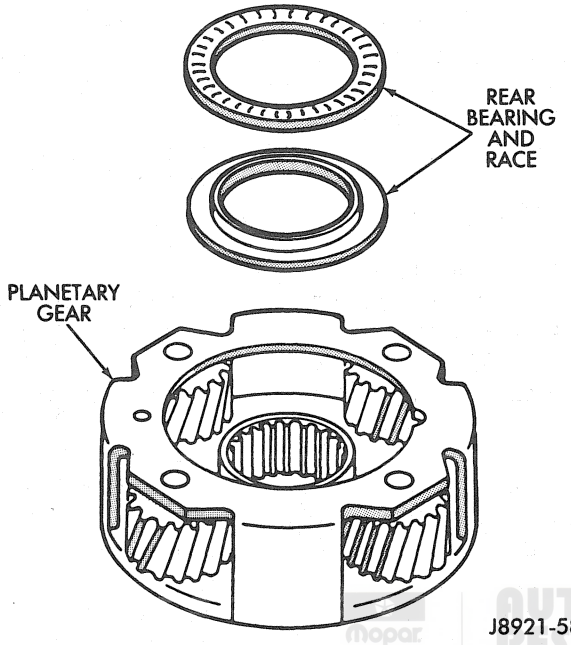


Fig. 273 Front Planetary Rear Bearing and Race Installation

(4) Turn planetary over and install thrust race (Fig. 274).

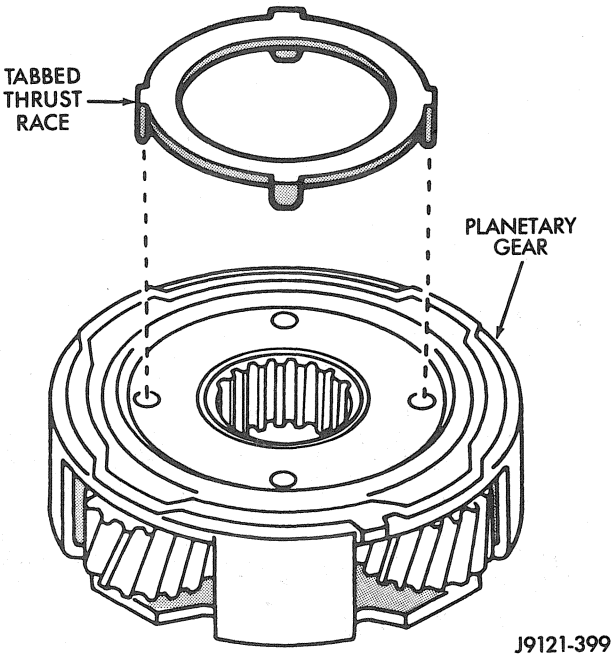


Fig. 274 Front Planetary Thrust Race Installation

(5) Install front race and bearing and forward race in ring gear (Fig. 275).

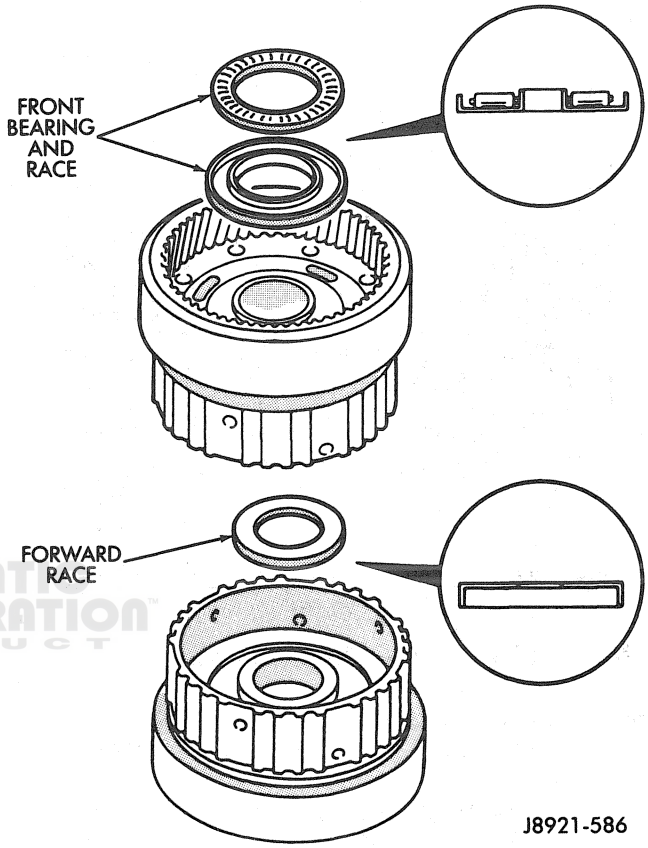
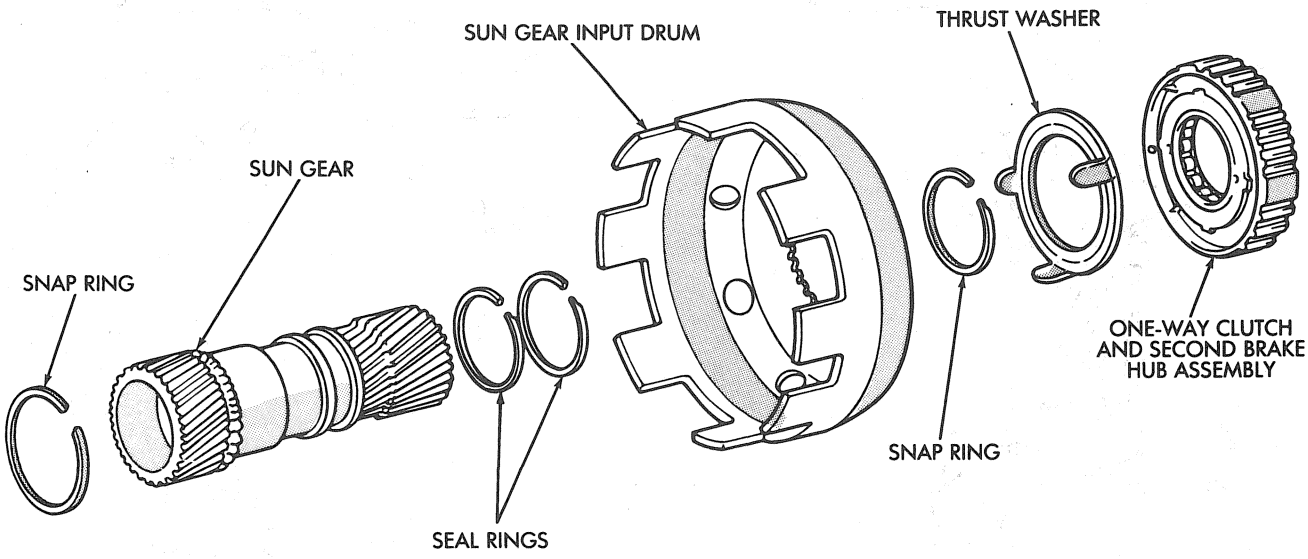


Fig. 275 Front Planetary Front Bearing And Races Installation

(6) Set planetary gear assembly aside for final assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

SUN GEAR AND NO. 1 ONE–WAY CLUTCH OVERHAUL



Sun Gear And One–Way Clutch Components

SUN GEAR AND CLUTCH DISASSEMBLY

(1) Hold sun gear and turn second brake hub clockwise and counterclockwise (Fig. 276). Hub should rotate freely clockwise but lock when turned counterclockwise. Replace one–way clutch and hub if they do not operate properly.

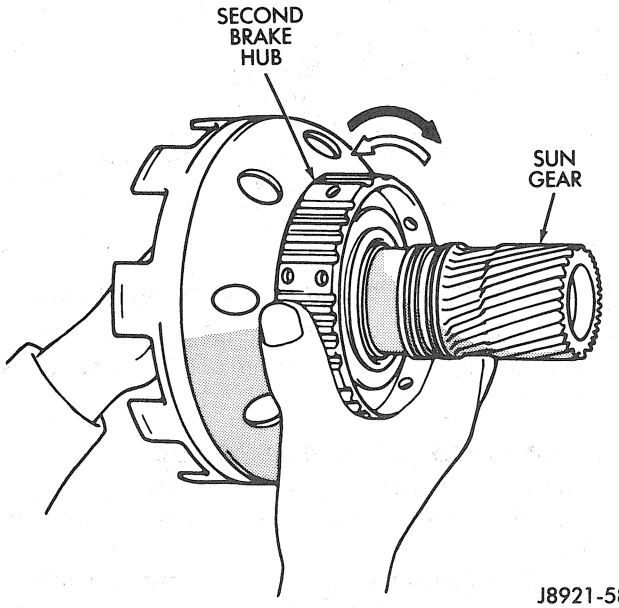


Fig. 276 Checking One–Way Clutch Operation

(2) Remove one–way clutch/second brake hub assembly from drum (Fig. 277).

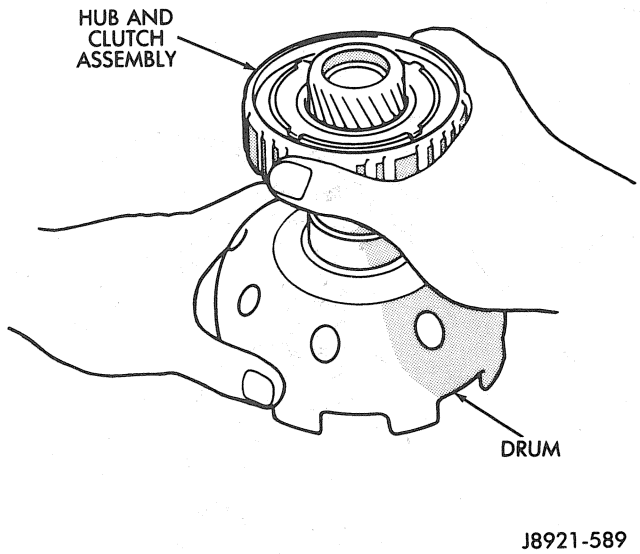


Fig. 277 Removing/Installing Brake Hub And Clutch Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove thrust washer from drum (Fig. 278).

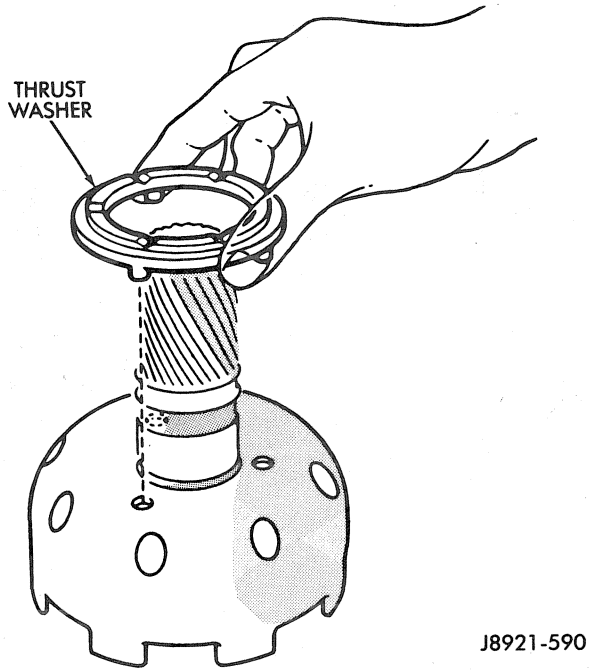


Fig. 278 Removing/Installing Thrust Washer

(4) Remove two seal rings from sun gear (Fig. 279).

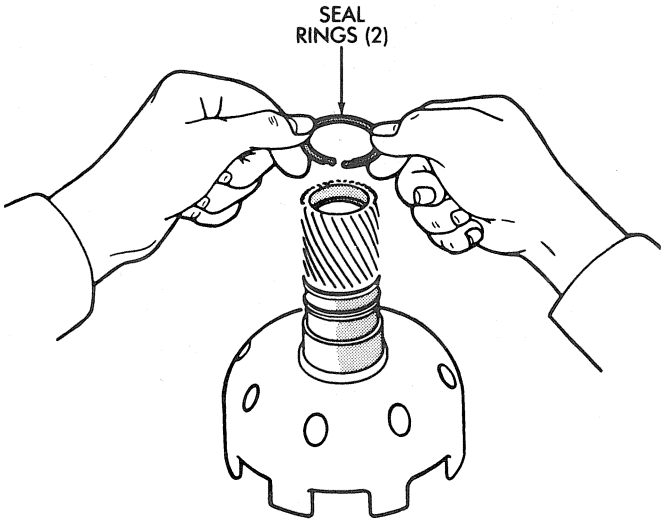


Fig. 279 Removing/Installing Sun Gear Seal Rings

(5) Support sun gear on wood block (Fig. 280). Then remove first sun gear snap ring and separate drum from gear.

(6) Remove remaining snap ring from sun gear (Fig. 281).

(7) Measure inside diameter of sun gear bushings with bore gauge or inside micrometer (Fig. 282).

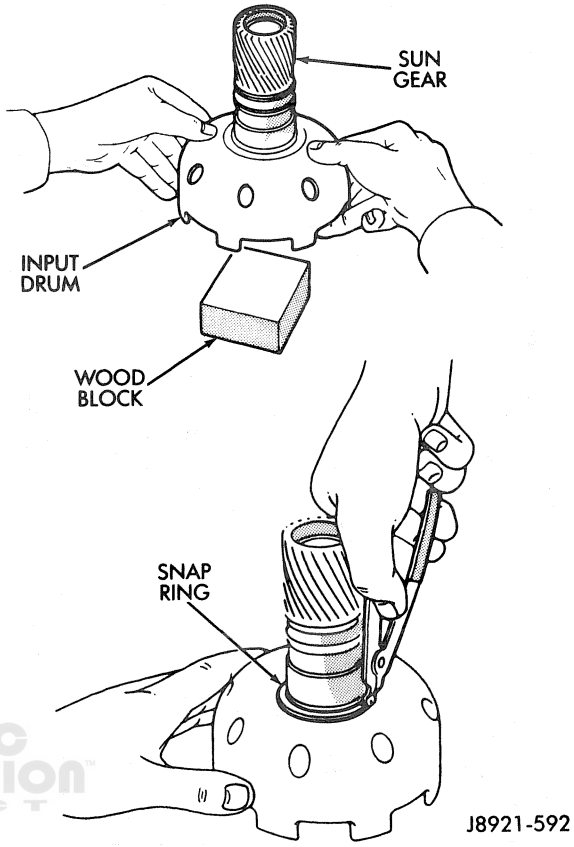


Fig. 280 Removing/Installing Sun Gear

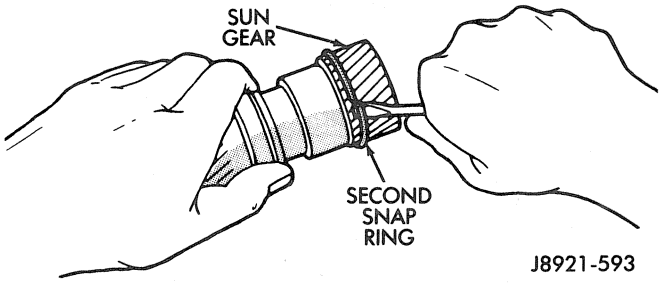


Fig. 281 Removing/Installing Second Snap Ring

Maximum allowable diameter is 27.08 mm (1.0661 in.). Replace sun gear if bushing inside diameter is greater than specified.

SUN GEAR AND CLUTCH ASSEMBLY

(1) Install first snap ring on sun gear.

(2) Install sun gear in drum and install remaining snap ring.

(3) Coat replacement seal rings with petroleum jelly and install them on sun gear. **Be sure seal ring ends are interlocked.**

(4) Install thrust washer. Be sure washer tabs are seated in drum slots.

(5) Install one–way clutch/second brake hub assembly on sun gear. Deep side of hub flange faces upward (Fig. 283).

DISASSEMBLY AND ASSEMBLY (Continued)

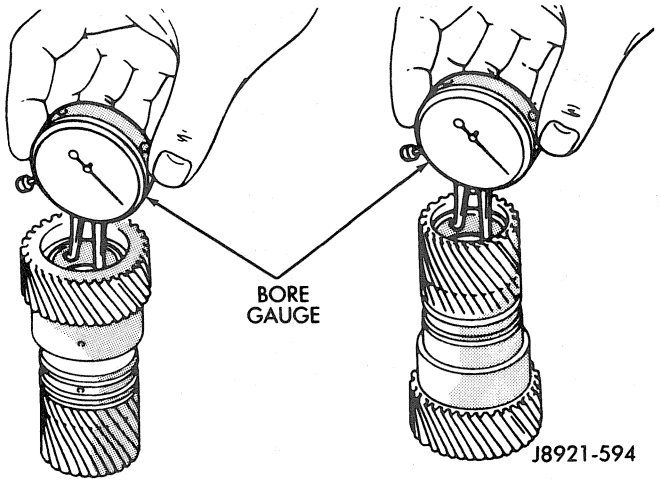


Fig. 282 Checking Sun Gear Bushings

(6) Check one–way clutch operation again (Fig. 276). Hold sun gear and turn second brake hub clockwise and counterclockwise. Hub should turn clockwise freely, but lock when turned counterclockwise.

(7) Set sun gear/clutch assembly aside for final assembly.

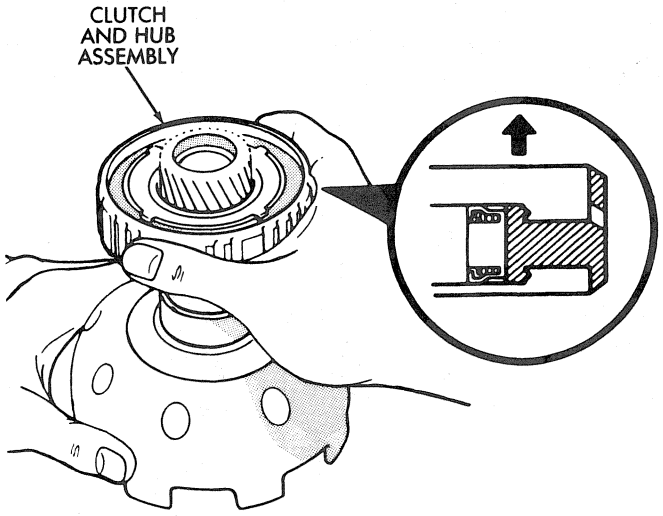
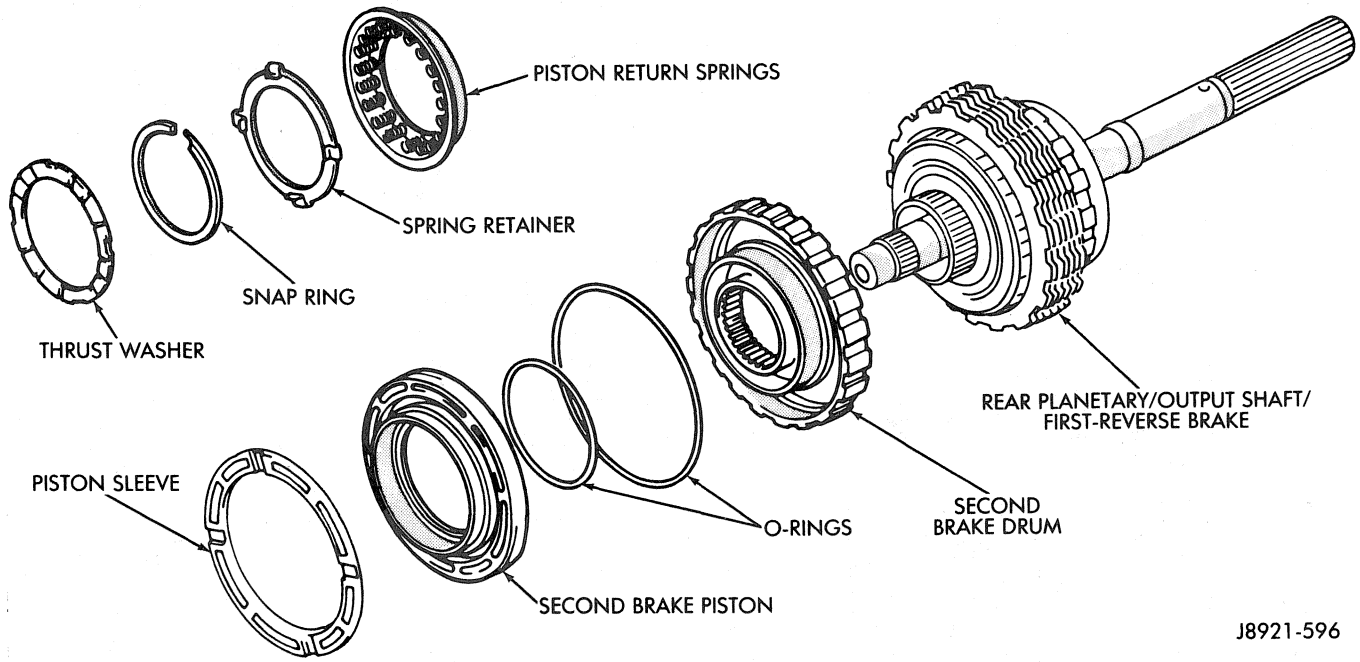


Fig. 283 Installing Clutch And Hub Assembly On Sun Gear

SECOND BRAKE OVERHAUL



Second Brake Components

DISASSEMBLY AND ASSEMBLY (Continued)

DISASSEMBLE

(1) Remove second brake drum from output shaft (Fig. 284).

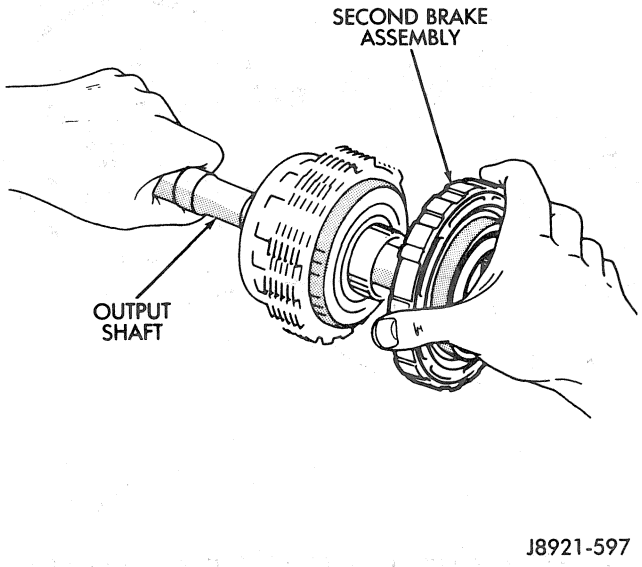


Fig. 284 Removing/Installing Second Brake Assembly

(2) Set output shaft assembly aside for overhaul. Refer to Rear Planetary Gear and Output Shaft Overhaul procedures.

(3) Remove thrust washer from second brake drum (Fig. 285).

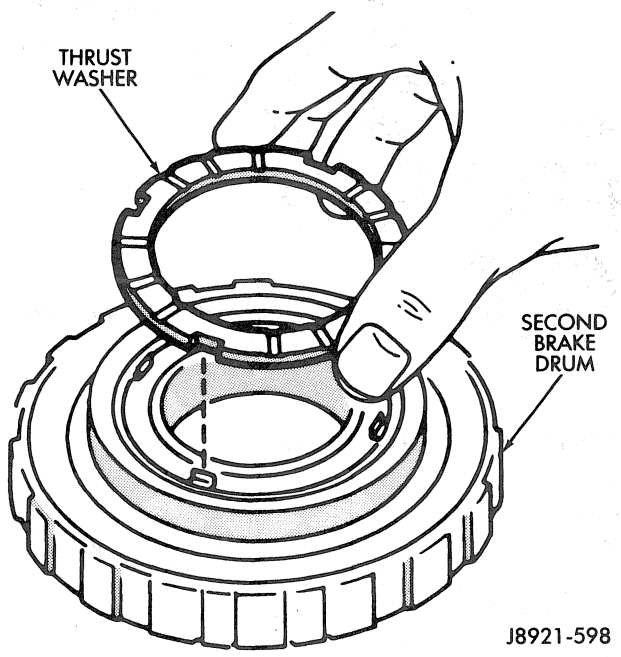


Fig. 285 Removing/Installing Second Brake Drum Thrust Washer

(4) Compress piston return springs with shop press and tool 7538. Then remove piston snap ring (Fig. 286).

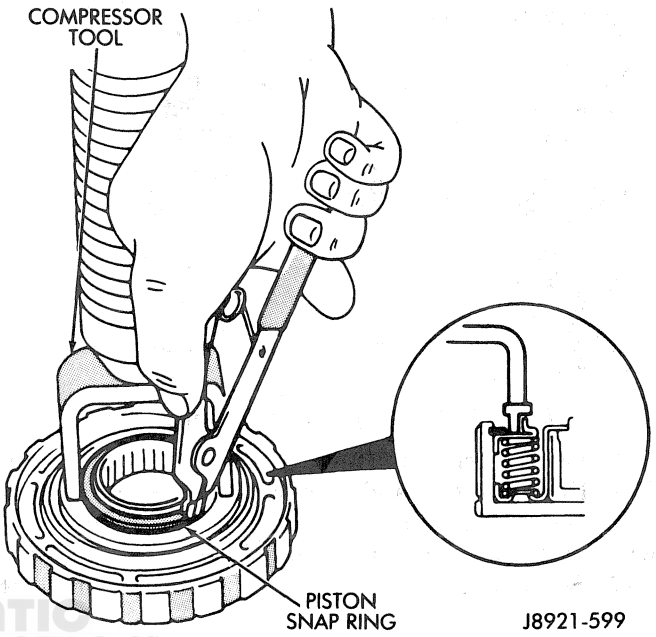


Fig. 286 Removing/Installing Second Brake Piston Snap Ring

(5) Remove compressor tool and remove spring retainer and return springs.

(6) Remove second brake piston and sleeve from drum with compressed air (Fig. 287). Use only enough air pressure to ease piston out of drum.

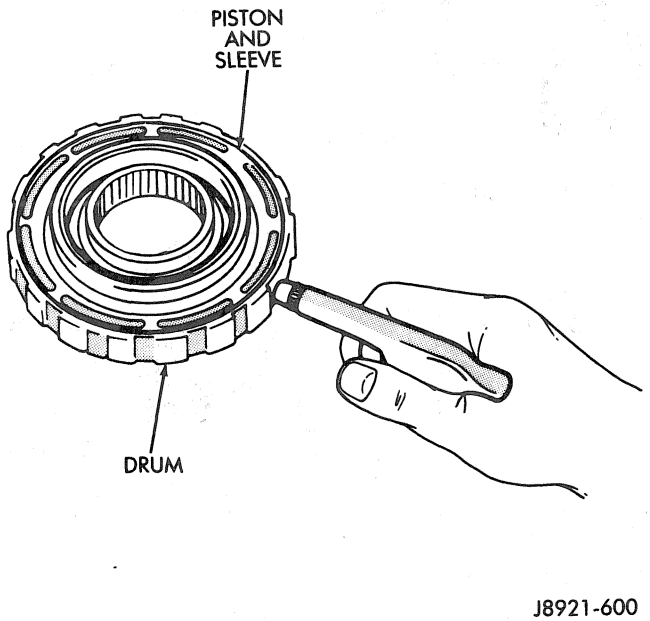


Fig. 287 Removing/Installing Piston And Sleeve

(7) Remove and discard brake piston O–rings.

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Measure free length of piston return springs with springs mounted in retainer (Fig. 288). Length should be approximately 16.05 mm (0.632 in.). Replace return springs if length is less than specified.

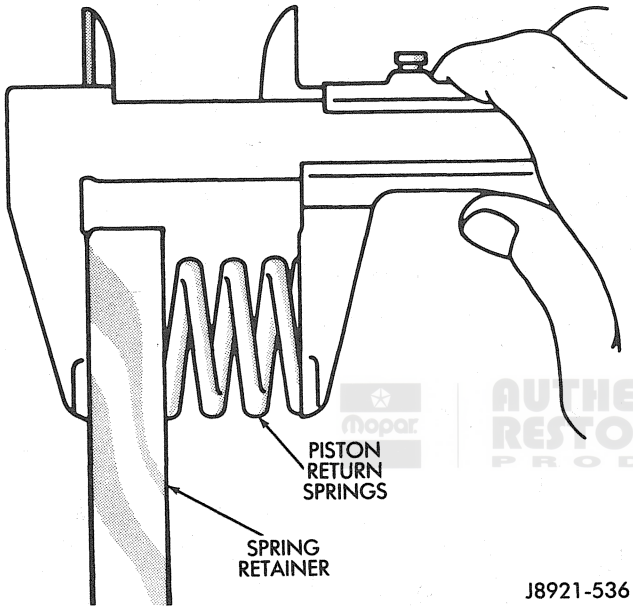


Fig. 288 Measuring Second Brake Piston Return Springs

SECOND BRAKE ASSEMBLY

(1) Lubricate and install new O–rings on brake piston. Then install brake piston in drum.

(2) Install return springs and retainer on brake piston.

(3) Compress return springs with shop press and Compressor Tool 7538. Install piston snap ring and remove brake assembly from press.

(4) Check brake piston operation with low pressure compressed air (Fig. 289). Apply air pressure through feed hole in drum. Piston should move smoothly when applying–releasing air pressure.

(5) Coat thrust washer with petroleum jelly and install it in drum. Be sure washer notches are aligned with tabs on spring retainer (Fig. 290).

(6) Set brake components aside for final assembly.

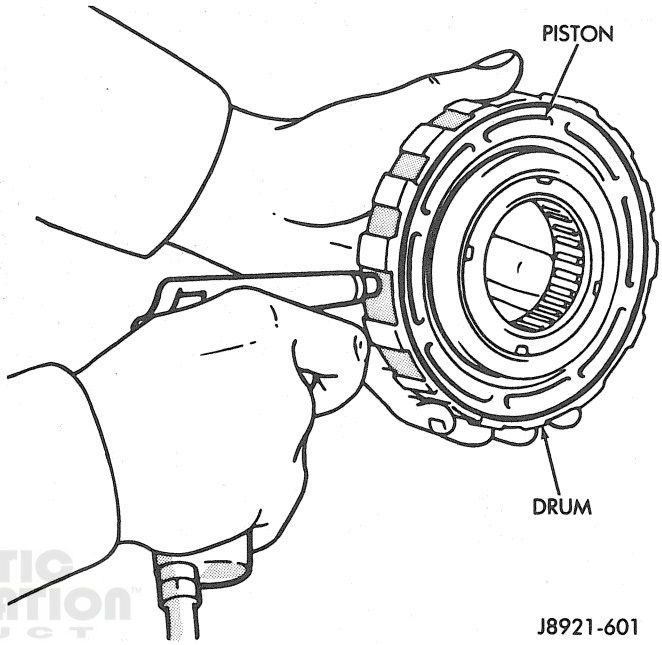


Fig. 289 Checking Second Brake Piston Operation

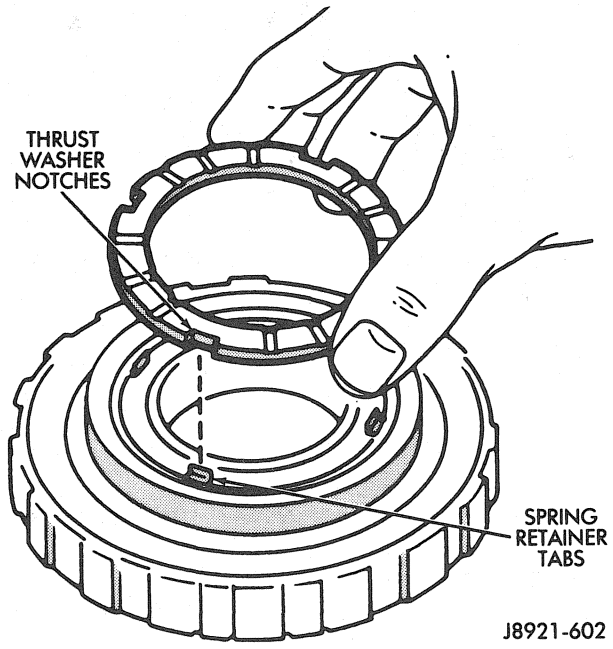
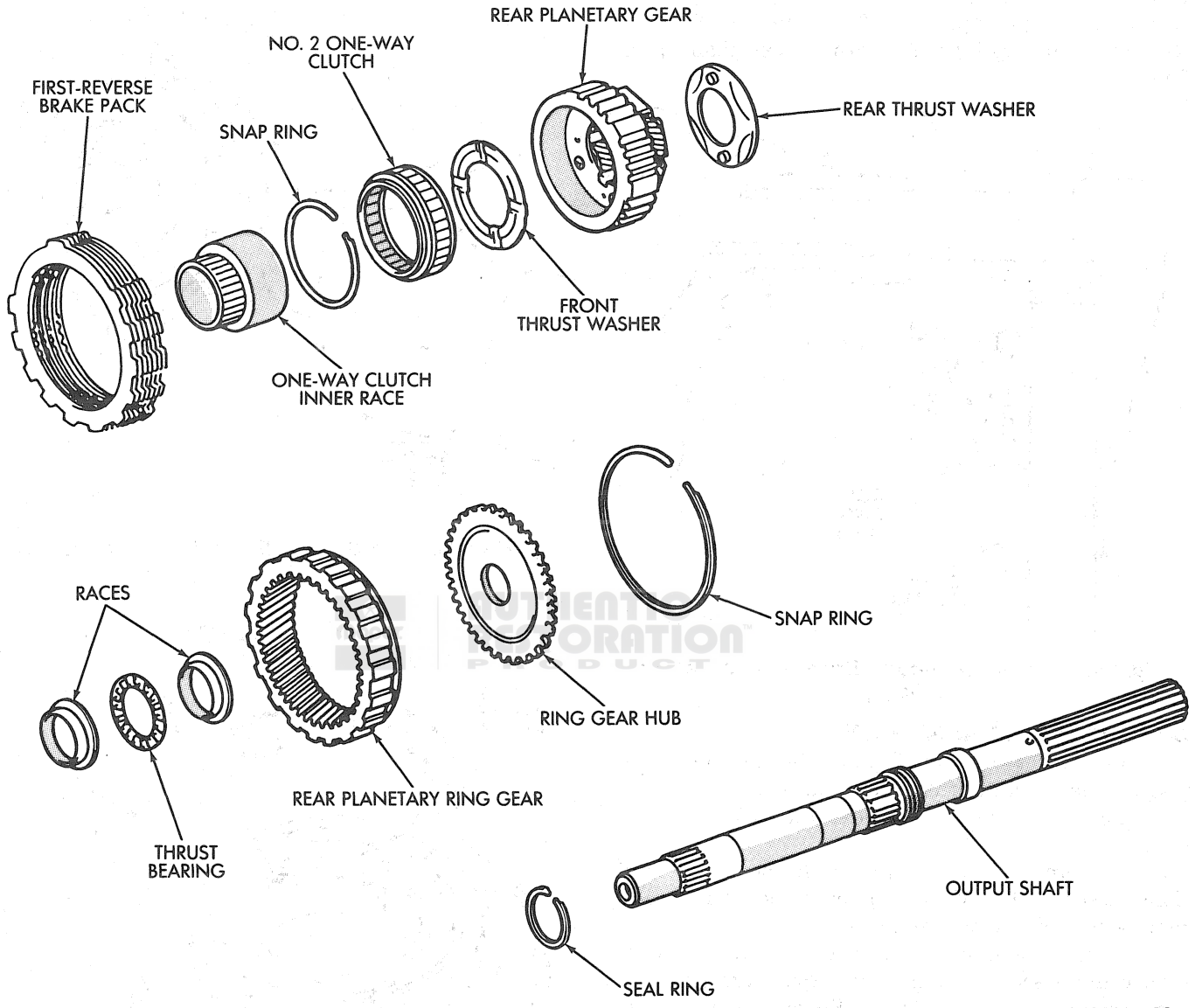


Fig. 290 Installing Second Brake Thrust Washer

DISASSEMBLY AND ASSEMBLY (Continued)

PLANETARY/BRAKE PACK/OUTPUT SHAFT



Rear Planetary, Brake Pack, Output Shaft Components

DISASSEMBLE

(1) Remove output shaft from gear assembly (Fig. 291).

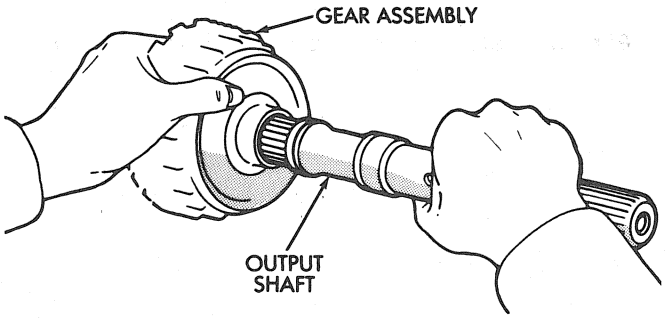


Fig. 291 Removing/Installing Output Shaft

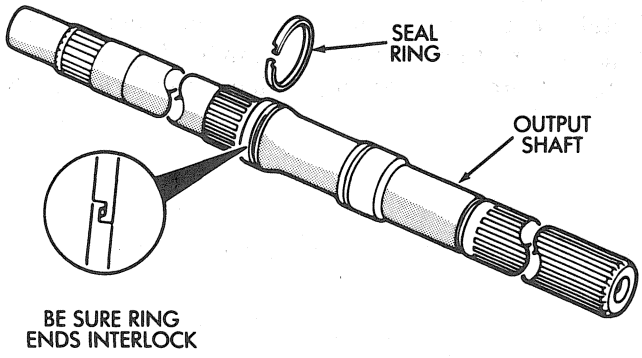


Fig. 292 Removing/Installing Shaft Seal Ring

(2) Remove and discard shaft seal ring (Fig. 292).

DISASSEMBLY AND ASSEMBLY (Continued)

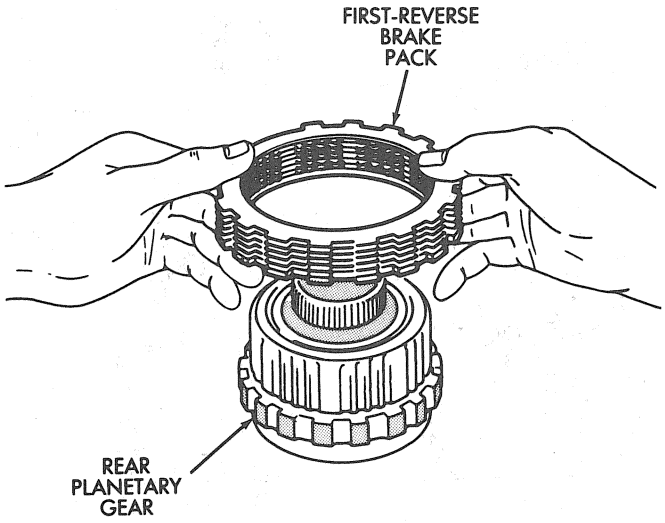


Fig. 293 Removing/Installing First–Reverse Brake Pack

(3) Remove brake pack from planetary gear (Fig. 293).

(4) Measure thickness of each brake pack disc. Minimum thickness is 1.51 mm (0.0594 in.). Replace all discs if any disc is thinner than specified.

(5) Remove planetary gear from ring gear (Fig. 294).

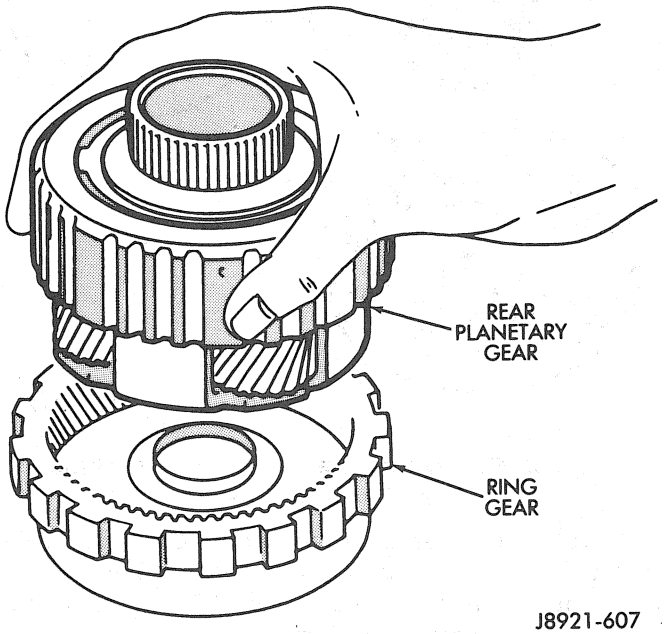


Fig. 294 Removing/Installing Rear Planetary

(6) Check No. 2 one–way clutch (Fig. 295). Hold planetary gear and turn clutch inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise. Replace one–way clutch if necessary.

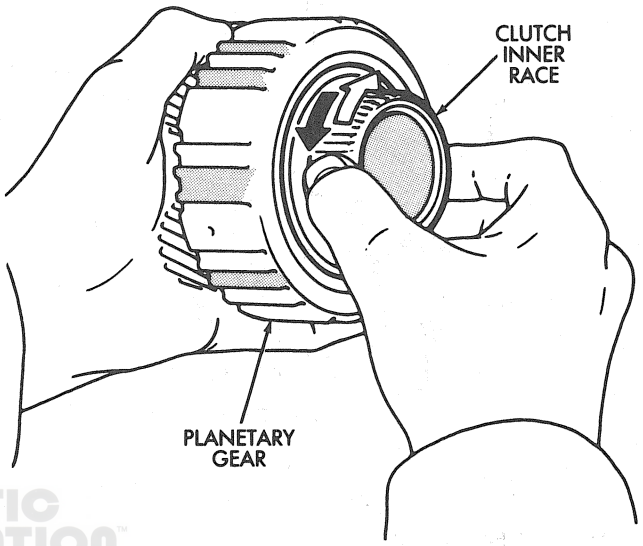


Fig. 295 Checking No. 2 One–Way Clutch Operation

(7) Remove clutch inner race from planetary gear (Fig. 296).

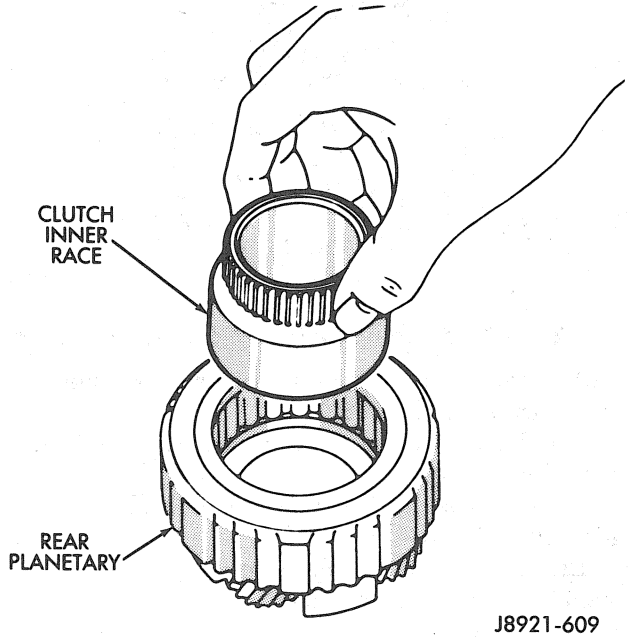
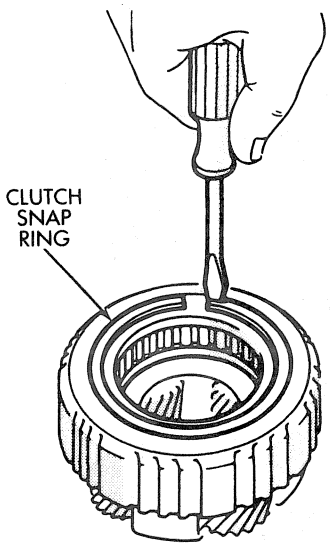


Fig. 296 Removing/Installing Clutch Inner Race

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Remove clutch snap ring and remove No. 2 one–way clutch from planetary (Fig. 297).



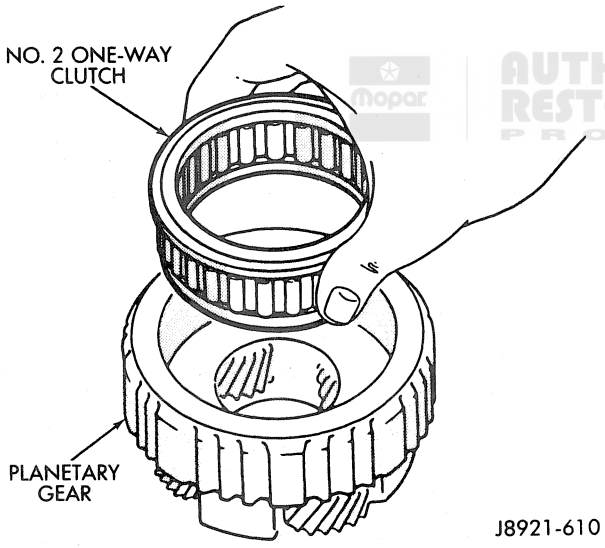


Fig. 297 Removing/Installing One–Way Clutch

(9) Remove front and rear thrust washers from planetary gear (Fig. 298).

(10) Remove thrust bearing and washers from ring gear (Fig. 299).

(11) Remove ring gear snap ring and remove ring gear hub (Fig. 300).

(12) Inspect and replace any worn or damaged planetary gear components.

ASSEMBLING REAR PLANETARY, BRAKE PACK, CLUTCH AND SHAFT

(1) Install hub and snap ring in ring gear (Fig. 300)

(2) Identify ring gear thrust bearing and races by following dimensions (Fig. 299):

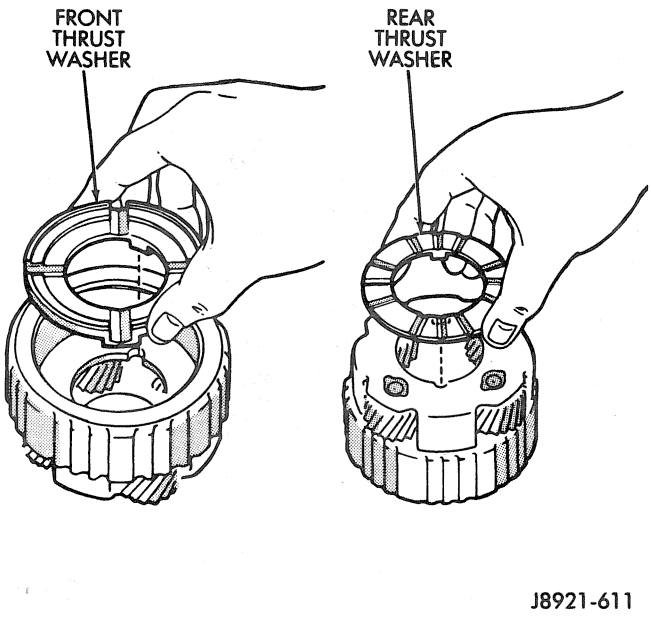


Fig. 298 Removing/Installing Rear Planetary Thrust Washers

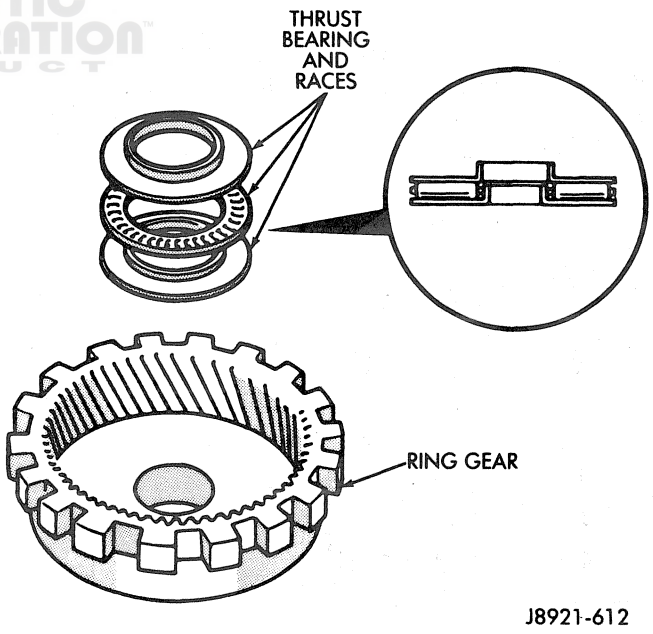


Fig. 299 Removing/Installing Ring Gear Thrust Bearing And Races

- Outer diameter of bottom race is 44.8 mm (1.764 in.) and inner diameter is 27.6 mm (1.087 in.).
- Outer diameter of bearing is 44.7 mm (1.760 in.) and inner diameter is 30.1 mm (1.185 in.).
- Outer diameter of upper race is 44.8 mm (1.764 in.) and inner diameter is 28.8 mm (1.134 in.).

(3) Lubricate ring gear thrust bearing and races with petroleum jelly and install them in ring gear (Fig. 299).

DISASSEMBLY AND ASSEMBLY (Continued)

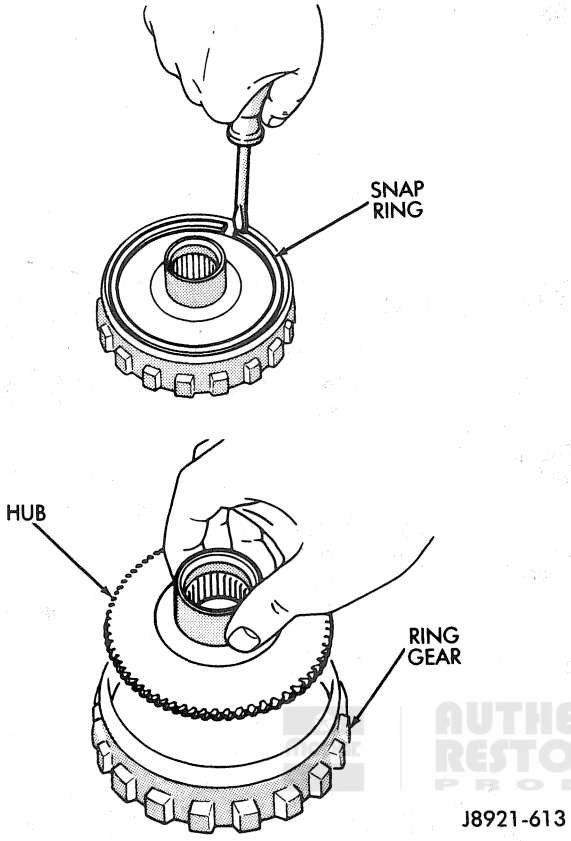


Fig. 300 Removing/Installing Ring Gear Hub

(4) Coat planetary thrust washers with petroleum jelly and install them in gear (Fig. 298).

(5) Install No. 2 one–way clutch in planetary gear. Be sure flanged side of clutch faces upward (Fig. 301).

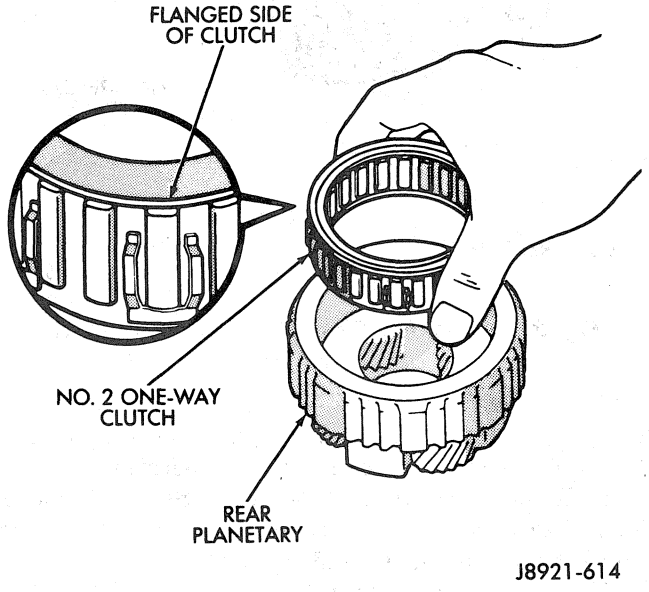


Fig. 301 Installing No. 2 One–Way Clutch

(6) Install clutch retaining snap ring and install clutch inner race (Fig. 296). Turn race counterclockwise to ease installation.

(7) Verify one–way clutch operation. Hold gear and turn inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise.

(8) Install planetary gear in ring gear.

(9) Assemble clutch discs and clutch plates (Fig. 293). Sequence is disc first, then a plate. Use seven discs and plates in a 6–cyl. transmission.

(10) Install brake pack on planetary gear (Fig. 293).

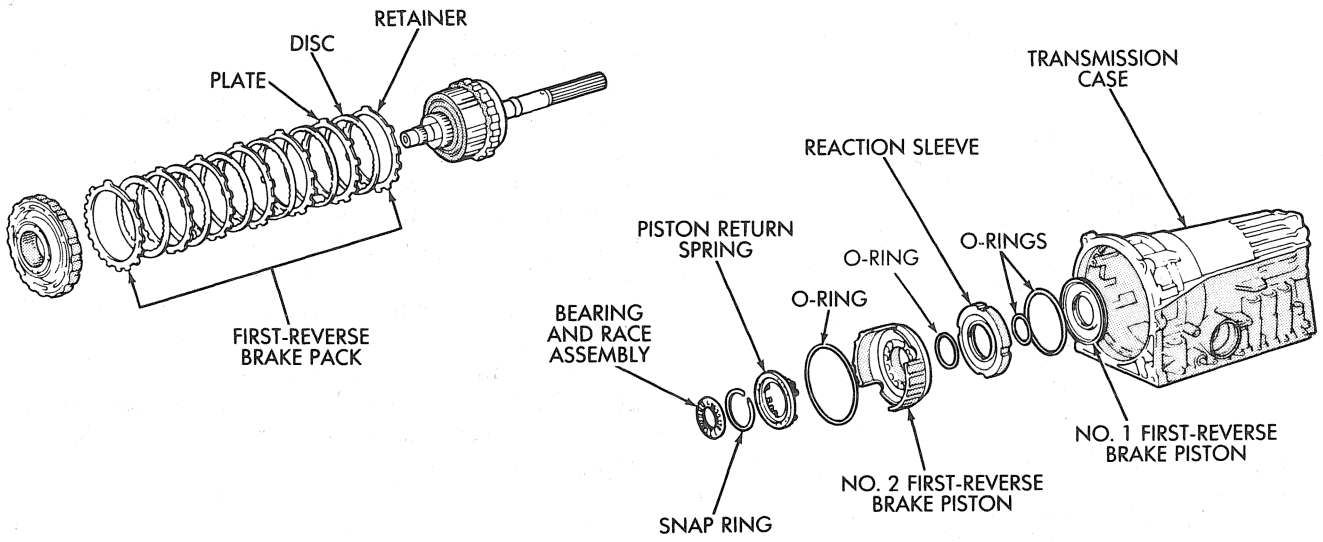
(11) Install new seal ring on output shaft (Fig. 292). Be sure ring ends are interlocked as shown.

(12) Set assembled components aside for final assembly.

AUTHENTIC RESTORATION PRODUCT

DISASSEMBLY AND ASSEMBLY (Continued)

FIRST/REVERSE BRAKE PISTON AND TRANSMISSION CASE OVERHAUL



First–Reverse Brake Pistons And Transmission Case

BRAKE DISASSEMBLY AND INSPECTION

(1) Remove bearing and race assembly from transmission case (Fig. 302).

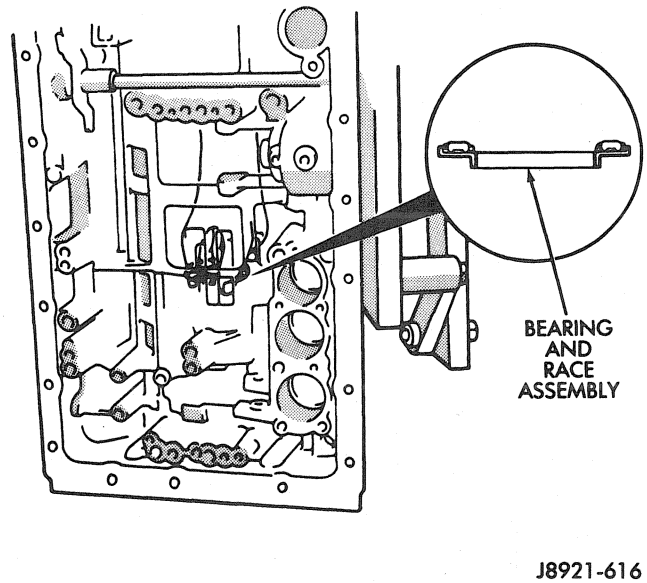


Fig. 302 Removing/Installing Bearing And Race Assembly

(2) Check first/reverse brake piston operation with compressed air (Fig. 303). Piston should move smoothly and not bind or stick. If piston operation is incorrect, case or piston may require replacement.

(3) Compress piston return springs with Tool 7539 and remove piston snap ring (Fig. 304).

(4) Remove Tool 7539 and remove piston return springs.

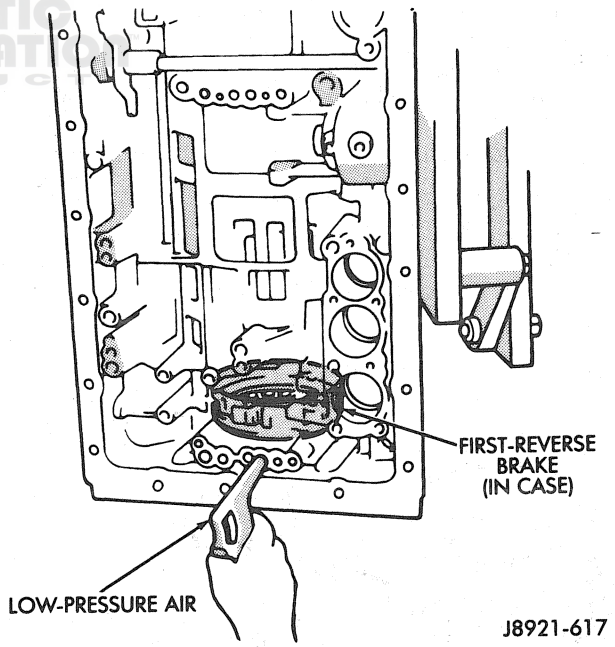


Fig. 303 Checking First–Reverse Brake Piston Operation

(5) Remove No. 2 first–reverse brake piston with compressed air. Apply air through same transmission feed hole used for checking piston operation.

(6) Remove reaction sleeve with Sleeve Remover Tool 7542 (Fig. 305). Insert tool flanges under sleeve and lift tool and sleeve out of case.

(7) Remove No. 1 first/reverse brake piston with Piston Puller 7543 (Fig. 306). Slip tool under piston and lift tool and piston out of case.

DISASSEMBLY AND ASSEMBLY (Continued)

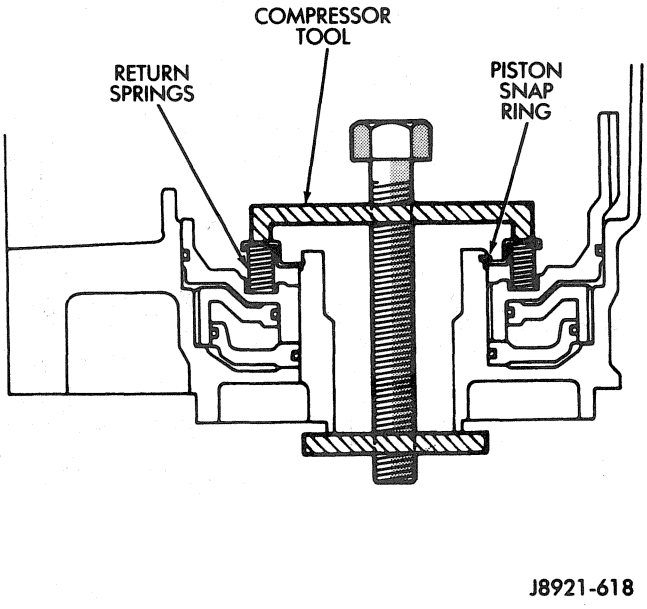


Fig. 304 Removing/Installing Piston Snap Ring

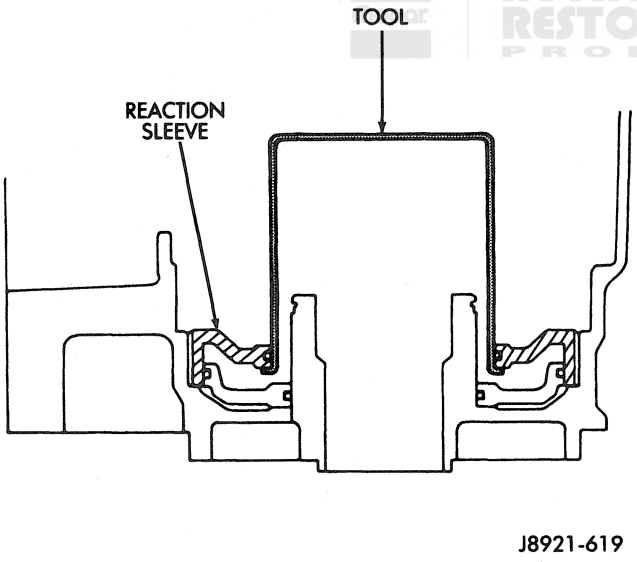


Fig. 305 Removing/Installing Reaction Sleeve

(8) Measure free length of piston return springs with springs mounted in retainer. Length should be 18.382 mm (0.724 in.). Replace springs if length is less than this.

(9) Clean transmission case thoroughly with solvent and dry it with compressed air. Blow compressed air through oil feed passages to remove solvent residue and ensure that passages are clear. Inspect the case for wear or damage. Replace case if necessary.

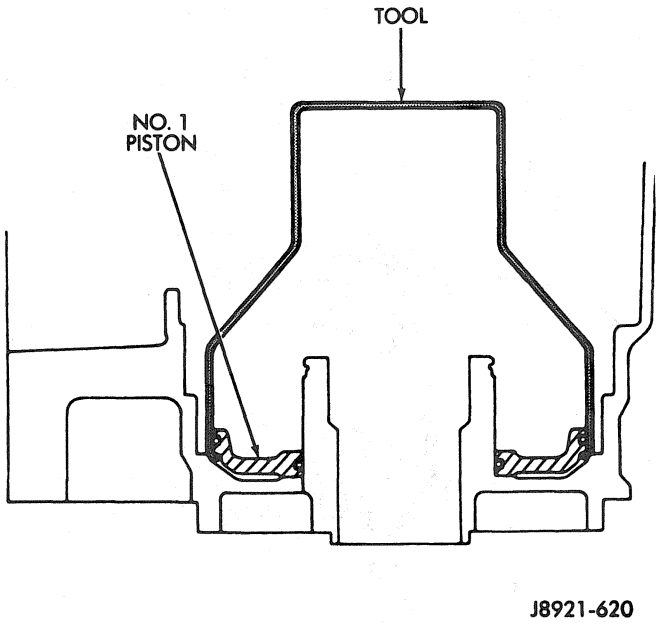


Fig. 306 Removing/Installing First–Reverse Brake No.1 Piston

ASSEMBLING FIRST/REVERSE BRAKE PISTON

(1) Lubricate and install new O–rings on No. 1 first/reverse brake piston and on reaction sleeve (Fig. 307). Then install piston in sleeve.

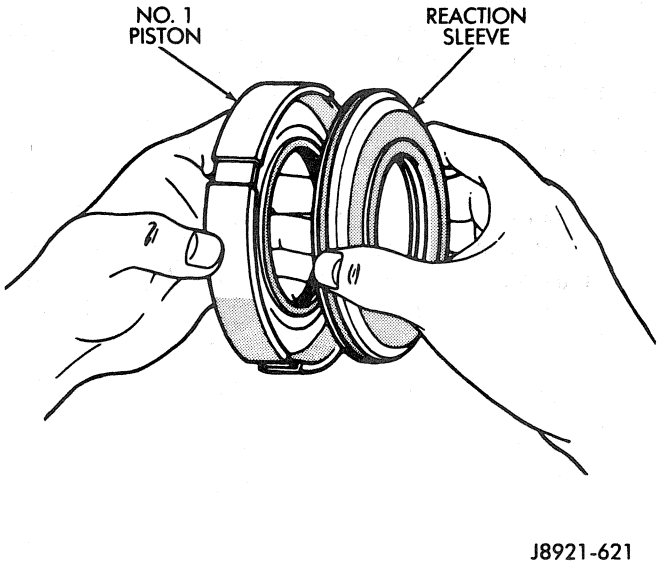


Fig. 307 Assembling No. 1 Piston And Sleeve

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Lubricate and install new O–ring on No. 2 brake piston.

(3) Install assembled No. 1 piston and reaction sleeve on No. 2 piston (Fig. 308).

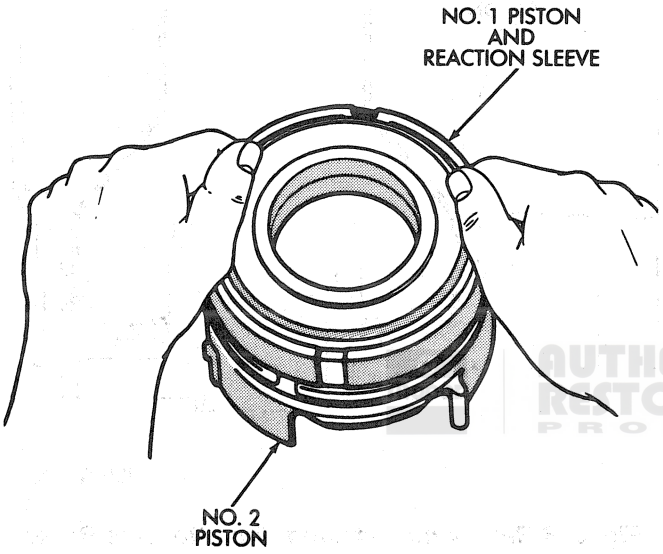


Fig. 308 Assembling First–Reverse Brake Pistons

(4) Lubricate and install piston assembly in case (Fig. 309). Align piston and case slots and press piston assembly into case with hand pressure.

(5) Position piston return springs on No. 2 piston.

(6) Compress piston return springs with Tool 7539 and install piston snap ring (Fig. 303). Be sure snap ring end gap is not aligned with any tangs on return spring retainer.

(7) Verify piston operation with compressed air as outlined in disassembly procedure.

(8) Coat bearing and race assembly with petroleum jelly and install it in piston assembly (Fig. 302). Bearing and race assembly outer diameter is 57.7 mm (2.272 in.) and inner diameter is 39.2 mm (1.543 in.).

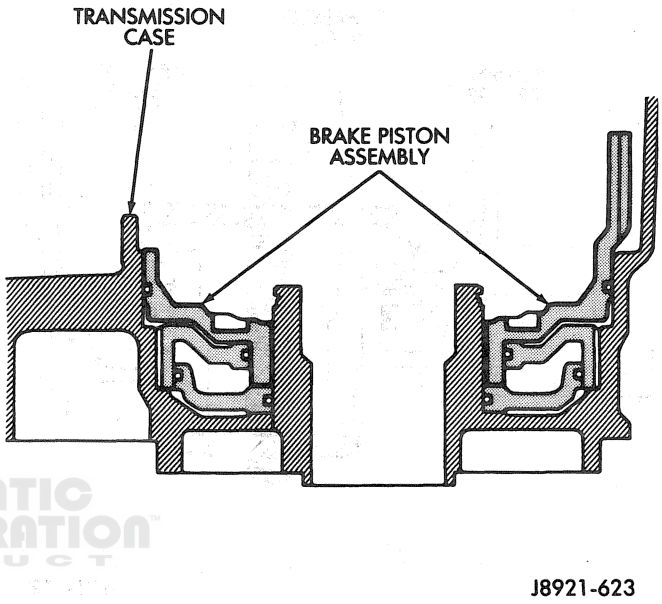


Fig. 309 Installing First–Reverse Brake Piston Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

TRANSMISSION VALVE BODY OVERHAUL

The valve body assembly consists of two sections which are the upper body and lower body (Fig. 310) and (Fig. 311). Disassembly, inspection and overhaul procedures for each section are outlined separately. Refer to the appropriate procedure as needed.

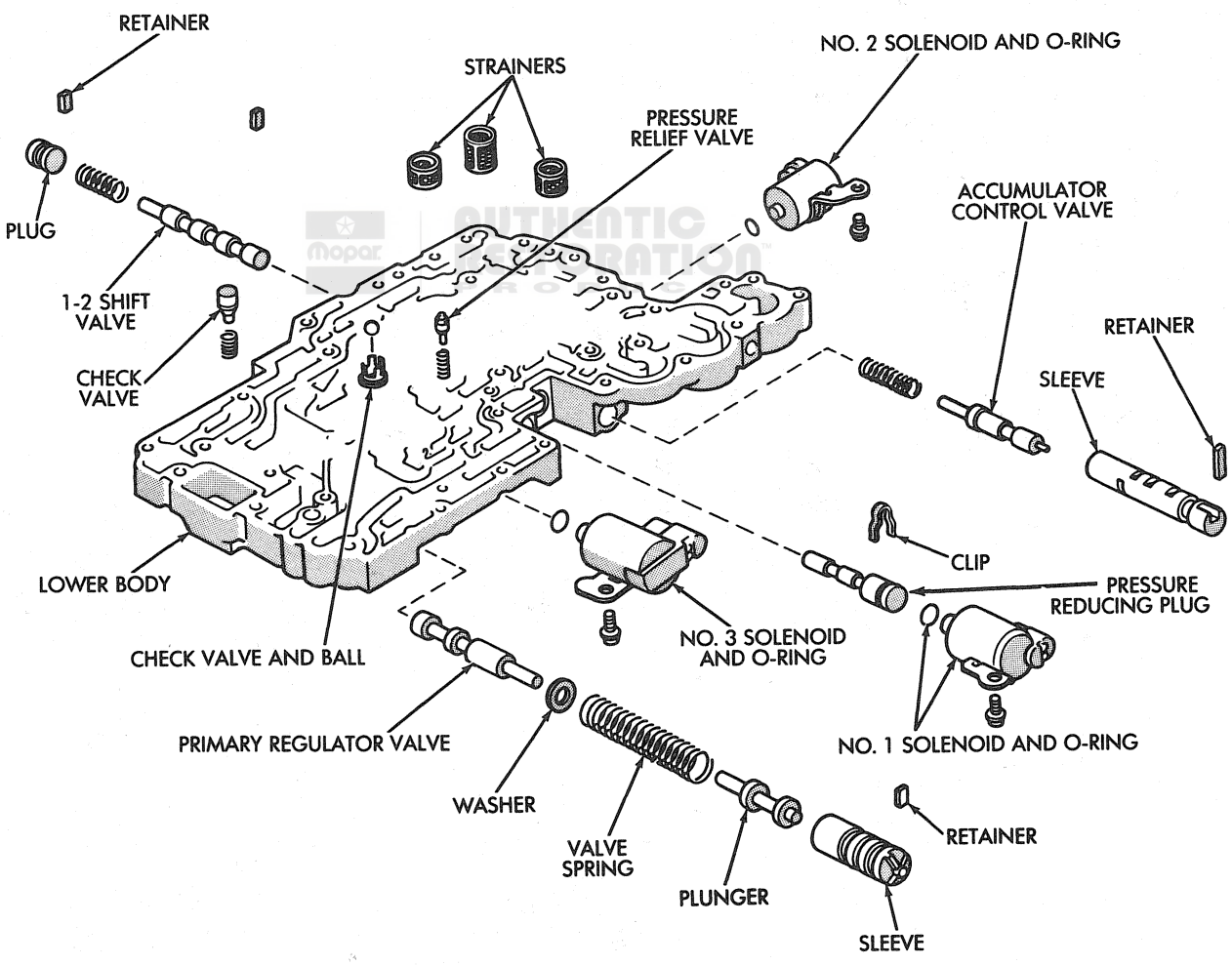


Fig. 310 Lower Body Components

DISASSEMBLY AND ASSEMBLY (Continued)

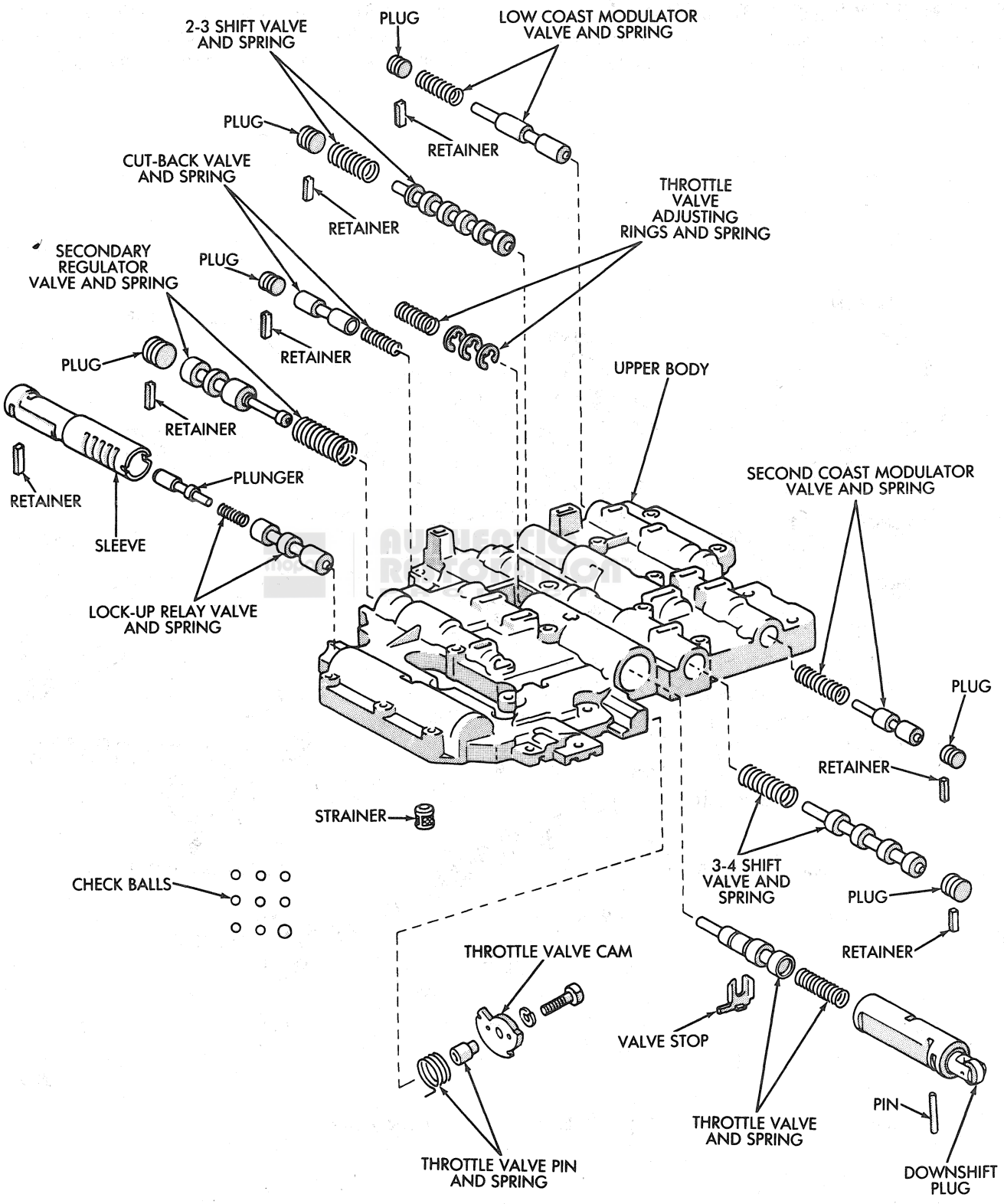


Fig. 311 Upper Body Components

CLEANING AND INSPECTION

TRANSMISSION PARTS CLEANING AND INSPECTION

Clean the transmission components with solvent and dry them with compressed air only. Do not use shop towels or rags.

Blow compressed air through all oil feed passages and channels to be sure they are clear. Inspect the transmission components for wear and damage. Replace components that are damaged or worn beyond the limits specified in the individual overhaul procedures.

Replace all O–rings, gaskets and seals. These components are not reusable. Also replace any snap ring that is distorted or damaged.

During overhaul assembly operations, lubricate the transmission components with Mopar Mercon™ automatic transmission fluid or petroleum jelly as indicated. Petroleum jelly should be used to prelubricate thrust bearings, washers and races. It can also be used to hold parts in position during assembly.

Soak replacement clutch and brake pack components in transmission fluid for at least 30 minutes before installation.

ADJUSTMENTS

TRANSMISSION THROTTLE CABLE REPLACEMENT

THROTTLE CABLE REMOVAL

(1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from engine bracket (Fig. 312).

(2) Raise vehicle.

(3) Remove transmission oil pan.

(4) Disengage cable from throttle valve cam (Fig. 313).

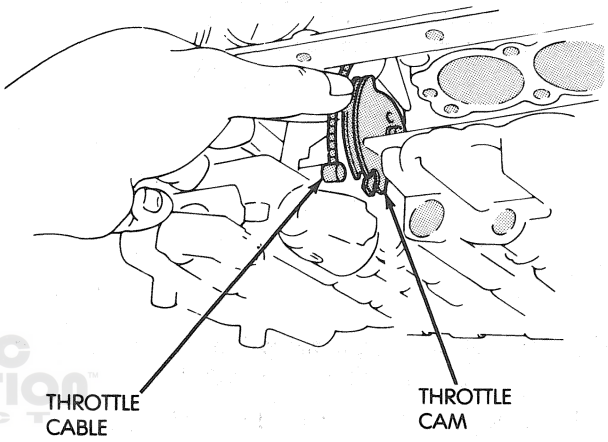


Fig. 313 Removing/Installing Transmission Throttle Cable

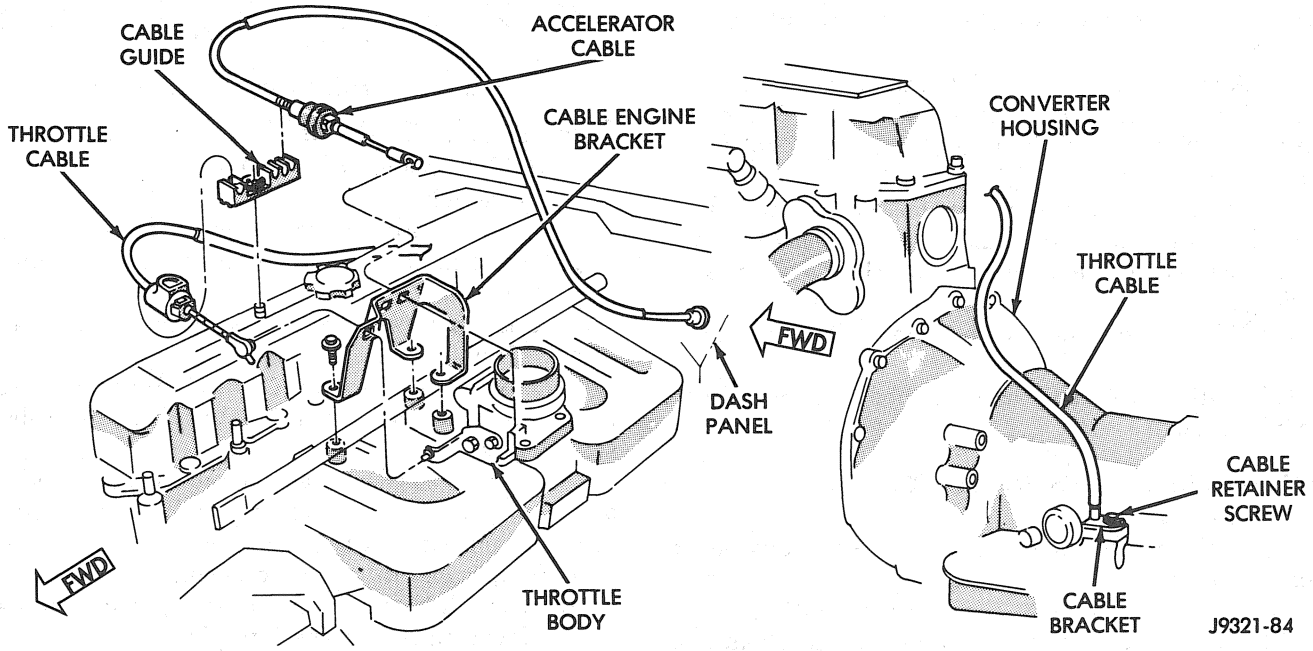


Fig. 312 Transmission Throttle Cable Attachment

ADJUSTMENTS (Continued)

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 314).

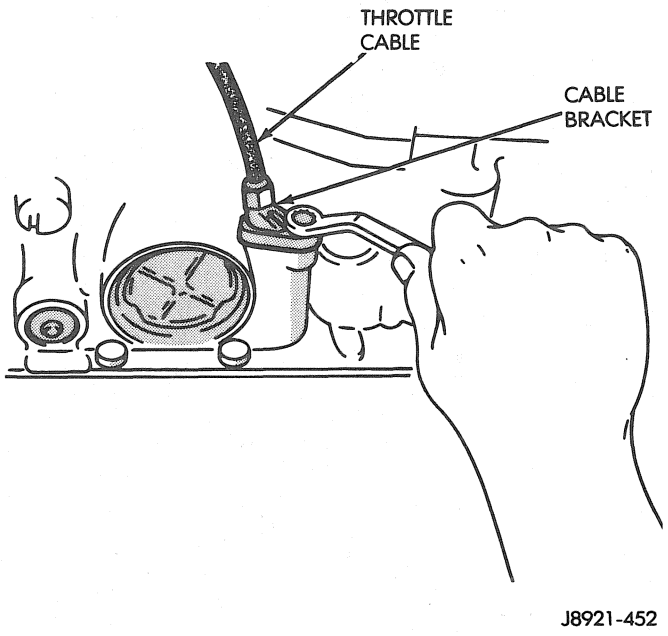


Fig. 314 Removing/Installing Transmission Throttle Cable And Bracket

(6) Remove and discard cable seal.

THROTTLE CABLE INSTALLATION

(1) Lubricate and install new seal on cable.
(2) Insert cable in transmission case.
(3) Attach cable to throttle cam (Fig. 313).
(4) Install cable bracket on case and tighten attaching bolt to 10 N·m (7 ft. lbs.) torque (Fig. 314).
(5) Remove old sealer material from oil pan and transmission case. Clean oil pan with solvent and dry it with compressed air.
(6) Apply bead of Loctite 599 sealer to oil pan sealing surface. Sealer bead should be at least 3 mm (1/8 in.) wide. Then install pan and tighten pan bolts to 7 N·m (65 in. lbs.) torque.
(7) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N·m (15 ft. lbs.) torque.
(8) Connect cable to engine bracket and throttle linkage.
(9) Fill transmission with Mopar Dexron/Mercon IIE.
(10) Adjust the cable as described in cable adjustment procedure.

TRANSMISSION THROTTLE CABLE ADJUSTMENT

(1) Shift transmission into Park, shut engine off and raise hood.
(2) Press cable release button (Fig. 315).
(3) Push cable conduit back into cable sheath as far as possible (Fig. 316).

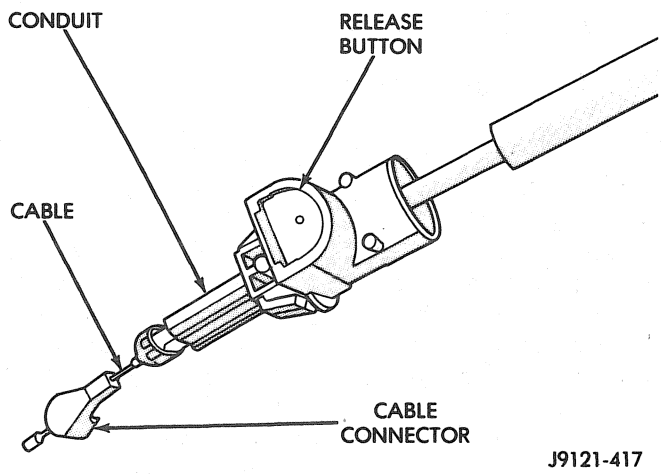


Fig. 315 Throttle Cable Components

(4) Rotate lever on throttle body to wide open throttle position. Cable will ratchet to correct adjustment point as lever is rotated (Fig. 316).

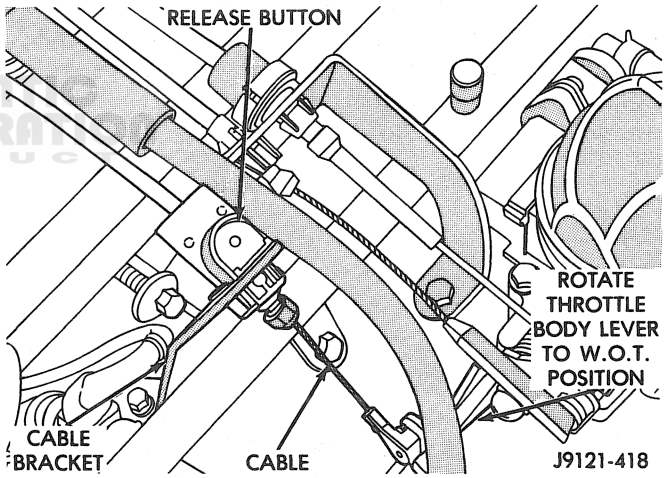
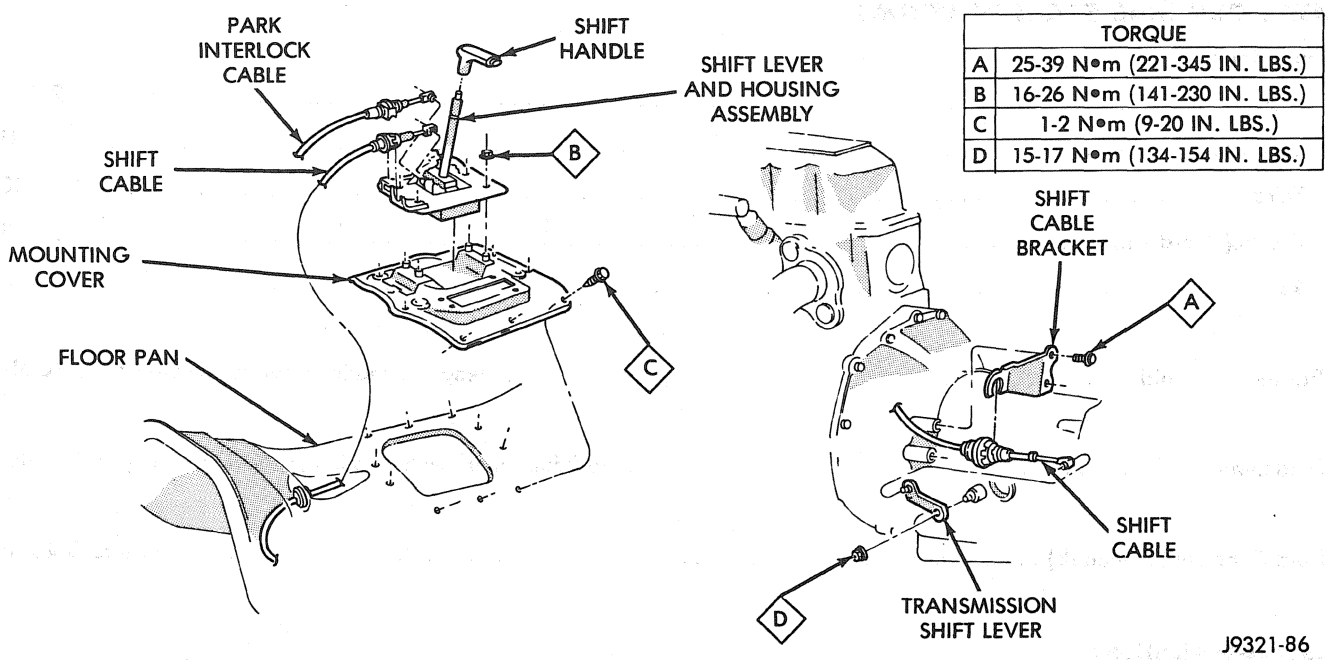


Fig. 316 Throttle Cable Adjustment

SHIFT CABLE ADJUSTMENT

(1) Shift transmission into Park.
(2) Raise vehicle.
(3) Release cable adjuster clamp to unlock cable (Fig. 317) and (Fig. 318). Clamp is at transmission end of cable.
(4) Unsnap cable from transmission cable bracket (Fig. 317) and (Fig. 318).
(5) Move transmission shift lever fully rearward to Park detent. Lever is on manual valve shaft at driver side of case.
(6) Verify positive engagement of park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
(7) Snap cable into cable bracket.
(8) Lock shift cable by pressing cable adjuster clamp down until it snaps into place.

ADJUSTMENTS (Continued)



TORQUE	
A	25-39 N•m (221-345 IN. LBS.)
B	16-26 N•m (141-230 IN. LBS.)
C	1-2 N•m (9-20 IN. LBS.)
D	15-17 N•m (134-154 IN. LBS.)

Fig. 317 Shift And Interlock Cables

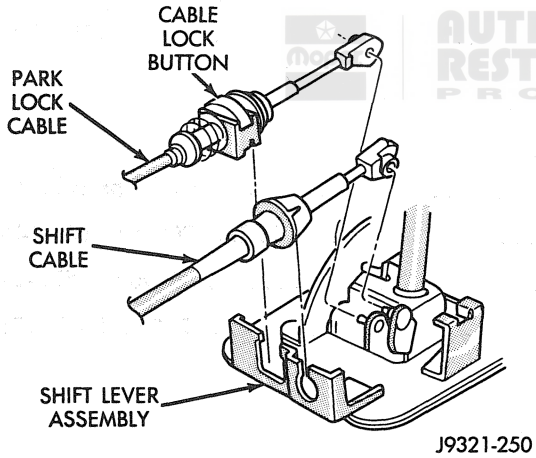


Fig. 318 Park Lock Cable Attachment

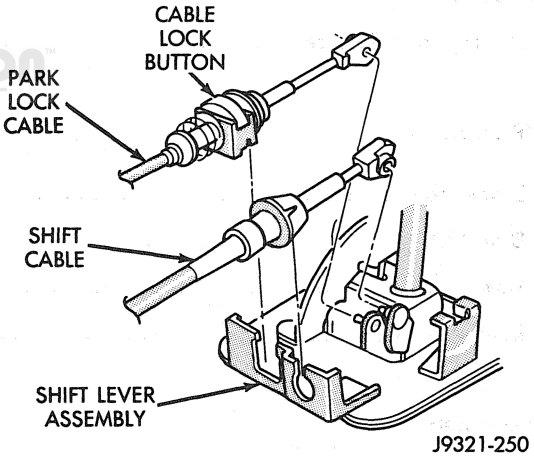


Fig. 319 Park Lock Cable Attachment

(9) Check engine starting. Engine should start only in Park and Neutral.

(10) Lower vehicle.

PARK INTERLOCK CABLE ADJUSTMENT

(1) Shift transmission into Park.

(2) Turn ignition switch to Lock position.

(3) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.

(4) Pull cable lock button up to release cable (Fig. 319).

(5) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.

(6) Check adjustment as follows:

(a) Check movement of release shift handle button (floor shift) or release lever (column shift). You should not be able to press button inward or move column lever.

(b) Turn ignition switch to On position.

(c) Press floor shift lever release button or move column lever. Then shift into Neutral. If cable adjustment is correct, ignition switch can not be turned to Lock position. Perform same check with transmission in D range.

(7) Move shift lever back to Park and check ignition switch operation. You should be able to turn switch to Lock position and shift lever release button/lever should not move.

SPECIFICATIONS

AW-4 AUTOMATIC TRANSMISSION

SPECIFICATIONS (Continued)

AW-4 GENERAL SPECIFICATIONS

Gear Ratios:

First	2.804:1
Second	1.531:1
Third	1.000:1
Fourth (Overdrive)	0.753:1
Reverse	2.393:1

Transmission Fluid	Jeep automatic transmission fluid or DEXRON® II
Fluid Level	To "Full" mark with fluid hot (normal operating temperature)
Fluid Capacity (all models)	8.0 Liters (8.45 qts.)

Test Specifications

Stall Speed:

In D Range and Reverse	2100–2400 rpm

mopar AUTHENTIC RESTORATION PRODUCT

Line Pressure:

In D at Curb Idle	61–70 psi (421–481 kPa)
In D at WOT	173–209 psi (1196–1442 kPa)
In Reverse at Curb Idle	75–90 psi (519–618 kPa)
In Reverse at WOT	213–263 psi (1471–1814 kPa)

Time Lag Test:

Engagement in D Range	1.2 seconds
Engagement in Reverse	1.5 seconds

Valve Body Solenoid Resistance	11–15 ohms
Transmission Fluid Normal Operating Temperature	50–80°C (122–176°F)
TPS Input Voltage (AU)	5.0 Volts (approx.)

TPS Output Voltage

4-Cylinder	0.2 Volts (approx.)
6-Cylinder	4.2 Volts (approx.)

SPECIFICATIONS (Continued)

AW-4 OIL PUMP WEAR LIMITS

Drive Gear

Tip Clearance:

Standard ..... 0.11-0.14 mm (0.0043-0.0055 in.)

Maximum Allowance ..... 0.3 mm (0.012 in.)

Gear-to-Pump Body

End Clearance:

Standard ..... 0.02-0.05 mm (0.0008-0.0020 in.)

Maximum Allowance ..... 0.1 mm (0.004 in.)

Mopar AUTHENTIC RESTORATION PRODUCT

Driven Gear-to-Pump

Body Clearance:

Standard ..... 0.07-0.15 mm (0.0028-0.0059 in.)

Maximum Allowance ..... 0.3 mm (0.012 in.)

J8921-740

AW-4 CLUTCH DISC AND PLATE THICKNESS

Component	Minimum Allowable Thickness
Clutch Disc (all except first-reverse and forward clutch discs)	1.84 mm (0.0724 in.)
6-Cylinder Forward Clutch Disc	1.51 mm (0.0594 in.)
6 Cylinder Direct Clutch Plates: Thin Plate (1) Thick Plates (3)	 2.3 mm (0.905 in.) 3.0 mm (0.118 in.)
6-Cylinder Forward Clutch Plate	1.8 mm (0.070 in.)
First-Reverse Brake Disc (all)	1.51 mm (0.0594 in.)

J9121-402

SPECIFICATIONS (Continued)

AW-4 BUSHING AND PISTON CLEARANCE

BUSHING INSIDE DIAMETER (MAXIMUM)

Bushing Location	Maximum Allowance Inside Diameter
Extension Housing	38.09 mm (1.4996 in.)
Direct Clutch Drum	53.97 mm (2.1248 in.)
Overdrive Planetary Gear	11.27 mm (.4437 in.)
Overdrive Direct Clutch Drum	27.11 mm (1.0673 in.)
Stator Shaft (Front)	21.58 mm (.8496 in.)
Stator Shaft (Rear)	27.08 mm (1.0661 in.)
Oil Pump Body	38.19 mm (1.5035 in.)
Transmission Case	38.18 mm (1.5031 in.)

Mopar AUTHENTIC RESTORATION PRODUCT

PISTON STROKE LENGTH

Piston Location	Specification
Direct Clutch (all)	1.37–1.67 mm (.0539–.0657 in.)
6-Cylinder Overdrive Brake	1.40–1.70 mm (.0551–.0669 in.)
Second Coast Brake (all)	1.5–3.0 mm (.059–.118 in.)
6-Cylinder Forward Clutch	3.55–3.73 (.1397–.1468 in.)
Overdrive Direct Clutch (all)	1.85–2.15 mm (.0728–.0846 in.)

END PLAY AND CLEARANCE

Component	Specification
Output Shaft End Play	.27–.86 mm (.0106–.0339 in.)
6-Cylinder First-Reverse Brake Pack Clearance	.70–1.20 mm (.028–.047 in.)
6-Cylinder Second Brake Pack Clearance	.62–1.98 mm (.024–.078 in.)

SPECIFICATIONS (Continued)

AW-4 RETAINER AND PISTON SPECIFICATIONS

OVERDRIVE BRAKE RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
26	3.3 mm (.130 in.)	11	3.8 mm (.150 in.)
25	3.5 mm (.138 in.)	23	3.9 mm (.154 in.)
12	3.6 mm (.142 in.)	Not Marked	4.0 mm (.157 in.)
24	3.7 mm (.146 in.)	—	—

DIRECT CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
33	3.0 mm (.118 in.)	29	3.4 mm (.134 in.)
32	3.1 mm (.122 in.)	28	3.5 mm (.138 in.)
31	3.2 mm (.126 in.)	27	3.6 mm (.142 in.)
30	3.3 mm (.130 in.)	34	3.7 mm (.146 in.)

OVERDRIVE CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
16	3.6 mm (.142 in.)	19	3.3 mm (.130 in.)
17	3.5 mm (.138 in.)	20	3.2 mm (.126 in.)
18	3.4 mm (.134 in.)	21	3.1 mm (.122 in.)

SECOND COAST BRAKE PISTON ROD SELECTION

Rod	Rod Length
No. 1	71.4 mm (2.811 in.)
No. 2	72.9 mm (2.870 in.)

FORWARD CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
42	4.0 mm (.157 in.)	61	3.0 mm (.118 in.)
44	3.8 mm (.149 in.)	62	3.6 mm (.142 in.)
45	3.4 mm (.134 in.)	63	4.2 mm (.165 in.)
60	3.2 mm (.126 in.)	64	4.4 mm (.173 in.)

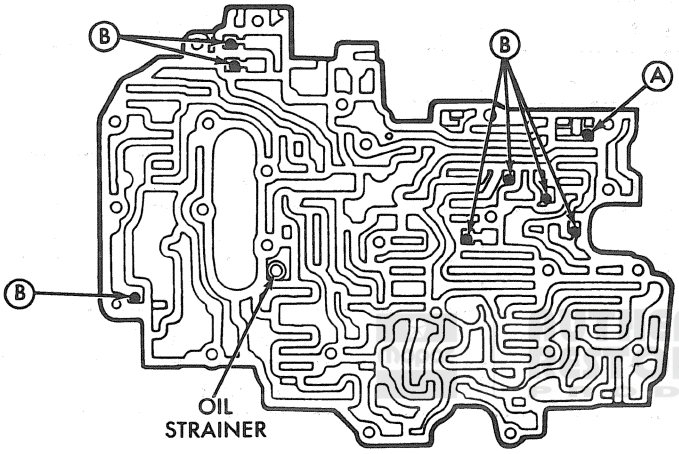
FIRST-REVERSE BRAKE CLEARANCE SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
50	5.0 mm (.197 in.)	53	4.4 mm (.173 in.)
51	4.8 mm (.189 in.)	54	4.2 mm (.165 in.)
52	4.6 mm (.181 in.)	55	4.0 mm (.157 in.)

SPECIFICATIONS (Continued)

AW-4 VALVE BODY BALL DIMENSIONS

Check Ball	Diameter
(A) Rubber Ball	6.35 mm (0.250 in.)
(B) Rubber Ball	5.535 mm (.218 in.)



J9121-405

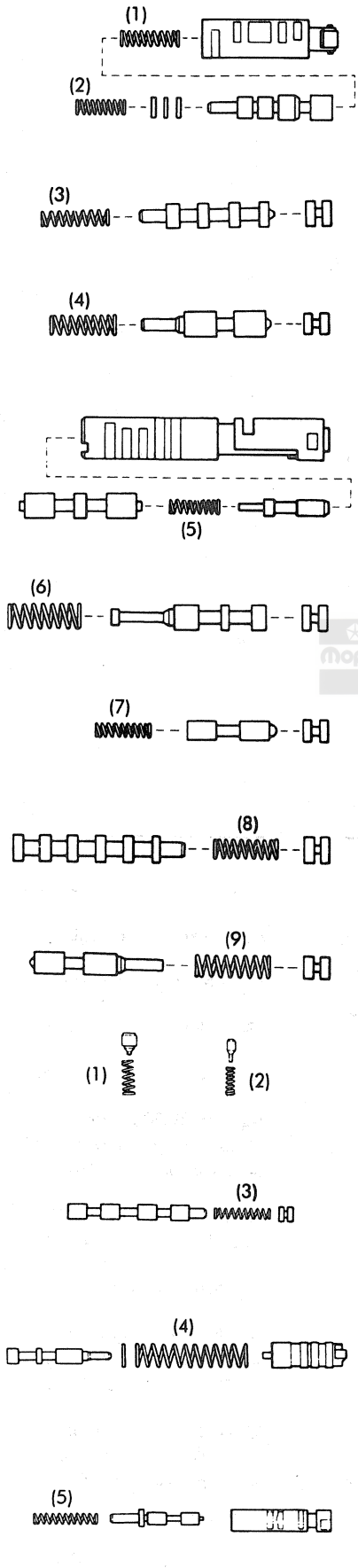
AW-4 CLUTCH AND BRAKE PACK REQUIREMENTS

Component	Discs Required	Plates Required	Retainers Required
6-Cylinder Overdrive Brake	4	3	2
6-Cylinder Second Brake	5	5	1
6-Cylinder Overdrive Direct Clutch	2	2	1
6-Cylinder Direct Clutch	4	4	1
6-Cylinder Forward Clutch	6	6	1
6-Cylinder First-Reverse Brake	7	7	1

J9121-406

SPECIFICATIONS (Continued)

AW-4 VALVE AND SPRING IDENTIFICATION



Spring	Free Length
(1) Downshift Plug	27.3 mm (1.074 in.)
(2) Throttle Valve	20.6 mm (.811 in.)
(3) 3-4 Shift Valve	30.8 mm (1.212 in.)
(4) Second Coast Modulator Valve	25.3 mm (.996 in.)
(5) Lockup Relay Valve	21.4 mm (.843 in.)
(6)Secondary Regulator Valve	30.9 mm (1.217 in.)
(7) Cut-Back Valve	21.8 mm (.858 in.)
(8) 2-3 Shift Valve	30.8 mm (1.212 in.)
(9) Low Coast Modulator Valve	27.8 mm (1.094)

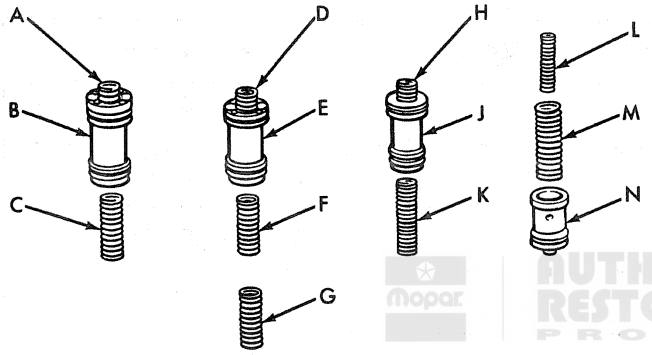
Spring	Spring Length
(1) Check Valve	20.2 mm (.797 in.)
(2) Pressure Relief Valve	11.2 mm (.441 in.)
(3) 1-2 Shift Valve	30.8 mm (1.213 in.)
(4) Primary Regulator Valve	62.3 mm (2.453 in.)
(5) Accumulator Control Valve	29.8 mm (1.173 in.)

J9121-408

SPECIFICATIONS (Continued)

AW-4 ACCUMULATOR COMPONENT IDENTIFICATION

	Component	Approximate Outside Diameter
SECOND BRAKE ACCUMULATOR	SPRING A	14.17 mm (.558 in.)
	PISTON B	36.9 mm (1.453 in.)
	SPRING C	19.91 mm (.784 in.)
DIRECT CLUTCH ACCUMULATOR	SPRING D	12.07 mm (.475 in.)
	PISTON E	36.9 mm (1.453 in.)
	SPRING F	20.19 mm (.795 in.)
	SPRING G	14.81 mm (.583 in.)
OVERDRIVE BRAKE ACCUMULATOR	SPRING H	14.10 mm (.555 in.)
	PISTON J	31.9 mm (1.256 in.)
	SPRING K	19.99 mm (.785 in.)
OVERDRIVE CLUTCH ACCUMULATOR	SPRING L	14.0 mm (0.551 in.)
	SPRING M	20.3 mm (0.799 in.)
	PISTON N	29.9 mm (1.177 in.)



J9121-407

AW-4 TORQUE SPECIFICATIONS

Description	Torque
Converter Housing Bolts	
10 mm	32-36 N•m (23-27 ft. lbs.)
12 mm	55-59 N•m (40-43 ft. lbs.)
Cooler Line Retaining Clip Nuts	2-4 N•m (18-35 in. lbs.)
Cooler Line Bracket Nuts	5-11 N•m (48-96 in. lbs.)
Cooler Line Fitting Nuts (at auto. trans. fittings)	18-23 N•m (160-200 in. lbs.)
Detent Spring Bolt	9-11 N•m (80-96 in. lbs.)
Dust Cover Nuts/Bolts	18-23 N•m (159-203 in. lbs.)
Extension Housing Bolts	32-36 N•m (23-27 ft. lbs.)
Fill Tube Bracket Bolt	50-64 N•m (37-47 ft. lbs.)
Neutral Switch	
Bolt	12-14 N•m (8-10 ft. lbs.)
Nut	6-8 N•m (53-70 in. lbs.)
OD Support Bolt (to case)	23-27 N•m (18-20 ft. lbs.)
Oil Pan Bolts	6-8 N•m (53-70 in. lbs.)
Oil Pan Drain Plug	19-21 N•m (14-16 ft. lbs.)
Oil Pump Bolt (to case)	21-23 N•m (16-18 ft. lbs.)
Oil Pump Bolt (to stator shaft)	9-11 N•m (80-96 in. lbs.)
Oil Screen Bolt	9-11 N•m (80-96 in. lbs.)
Park Pawl Bracket	9-11 N•m (80-96 in. lbs.)
Propeller Shaft Clamp Screws	16-23 N•m (140-200 in. lbs.)

Description	Torque
Rear Mount-To-Transmission Bolts	60-81 N•m (44-66 ft. lbs.)
Rear Mount-To-Clevis Bracket Bolt/Nut	54-75 N•m (40-55 ft. lbs.)
Rear Mount Clevis Bracket-To-Crossmember Nuts	33-49 N•m (24-36 ft. lbs.)
Shift Cable Bracket Screws At Transmission	25-39 N•m (221-345 in. lbs.)
Shift Lever Mounting Cover Screws	1-2 N•m (9-20 in. lbs.)
Shift Lever Housing Nuts	16-26 N•m (141-230 in. lbs.)
Solenoid Harness Bolt	6-8 N•m (57-75 in. lbs.)
Speedometer Adapter Clamp Screw	10-12 N•m (90-110 in. lbs.)
Speed Sensor Coupling Nut	14-20 N•m (125-175 in. lbs.)
Throttle Cable Engine Bracket Screws	7-11 N•m (63-94 in. lbs.)
Throttle Cable Retaining Screw (at transmission)	8-10 N•m (70-98 in. lbs.)
Transfer Case Mounting Nuts	30-41 N•m (22-30 ft. lbs.)
Transmission Shift Lever Nut	15-17 N•m (134-154 in. lbs.)
Transmission-To-Engine Block Bolts	50-64 N•m (37-47 ft. lbs.)
Valve Body Bolts (to case)	9-11 N•m (80-96 in. lbs.)
Valve Body Bolts (to valve body)	6-7 N•m (54-58 in. lbs.)

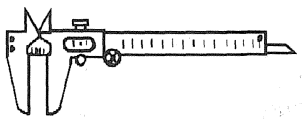
J9321-88

SPECIAL TOOLS

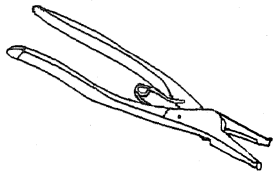
OVERHAUL SERVICE TOOLS

The special tools needed to overhaul the AW–4 transmission are provided in Tool Kit 6294. However, Pressure Test Port Adapter 7554 is not included in this kit and must be ordered separately. The overhaul tool kit and test port adapter are available through the parts division and dealer special tool program.

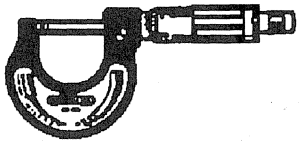
AW-4



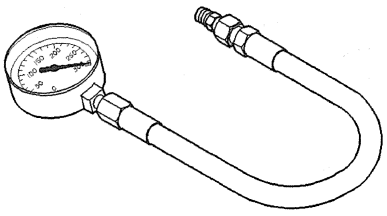
C-4959 Caliper, Metric Vernier



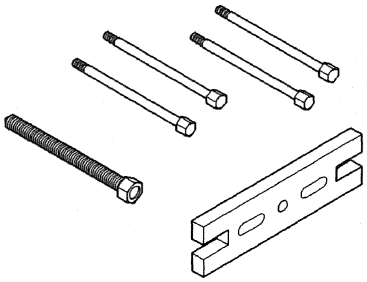
C-484 Snap Ring Plier



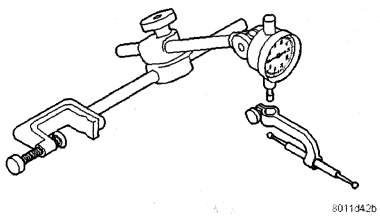
C-4960 Micrometer



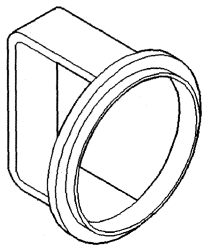
C-3293-SP Gauge



7536 Puller, Oil Pump

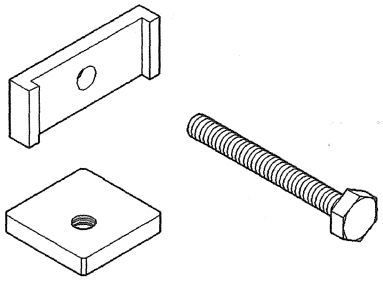


C-3339 Dial Indicator Set

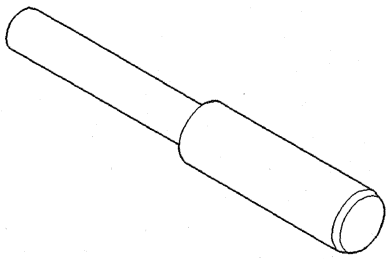


7538 Compressor, Piston #2 Spring

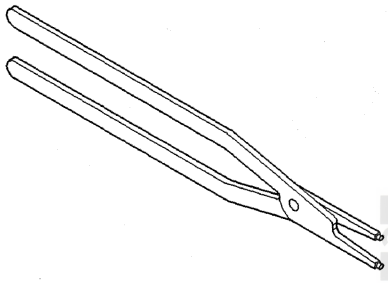
SPECIAL TOOLS (Continued)



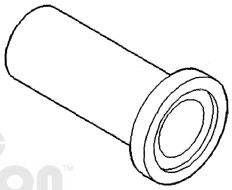
7539 Compressor, Piston #3 Spring



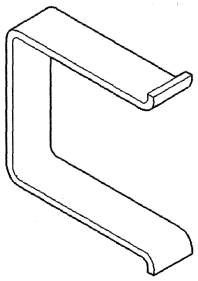
7544 Installer, Brake Drum Seal



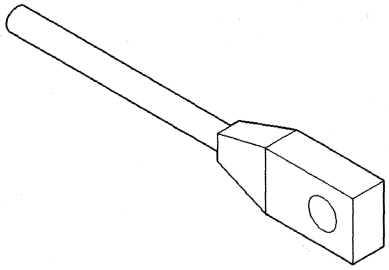
7540 Pliers, Large Snap Ring



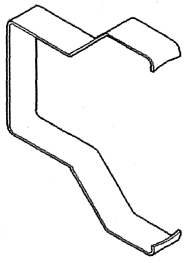
7549 Installer, Seal



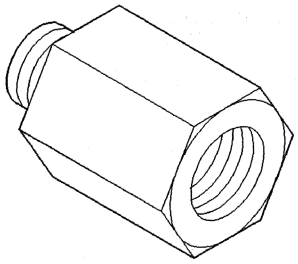
7542 Puller, Reaction Sleeve



7552 Gauge, 3.0 mm Wire



7543 Puller, Piston #1



7554 Adapter, Pressure Port

NV231 TRANSFER CASE

INDEX

page

GENERAL INFORMATION
GENERAL INFORMATION 289
RECOMMENDED LUBRICANT AND FILL LEVEL 289
TRANSFER CASE IDENTIFICATION 289
DIAGNOSIS AND TESTING
NV231 DIAGNOSIS 291
REMOVAL AND INSTALLATION
NV231 TRANSFER CASE 292
SHIFT LEVER 292

page

DISASSEMBLY AND ASSEMBLY
NV231 TRANSFER CASE 293
CLEANING AND INSPECTION
NV231 TRANSFER CASE 306
ADJUSTMENTS
SHIFT LINKAGE ADJUSTMENT 309
SPECIFICATIONS
TORQUE 310
SPECIAL TOOLS
NV231 310

GENERAL INFORMATION

GENERAL INFORMATION

The NV 231 is a part-time transfer case with a low range reduction gear mechanism (Fig. 1). It is used in XJ models with four or six cylinder engines.

The NV 231 has three operating ranges plus a Neutral position. The reduction gear mechanism consists of a planetary and annulus gear that provide a 2.7:1 reduction ratio when engaged. The annulus gear is fixed in the case; it does not rotate.

The input gear is splined to the transmission output shaft. It drives the mainshaft through the planetary gear and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft (Fig. 1). The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchro mechanism for shifting.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

NV 231 operating ranges are:

- 2-wheel drive high (2H)
- 4-wheel drive high (4H)
- 4-wheel drive low (4L)

Two-wheel drive range is for use on all road surfaces. The 4-wheel drive high and low ranges are not for use on paved roads. They are only recommended for off-road use on unpaved, low traction surfaces. The only time 4-wheel drive can be used on paved roads, is when the road surface is covered with snow or ice.

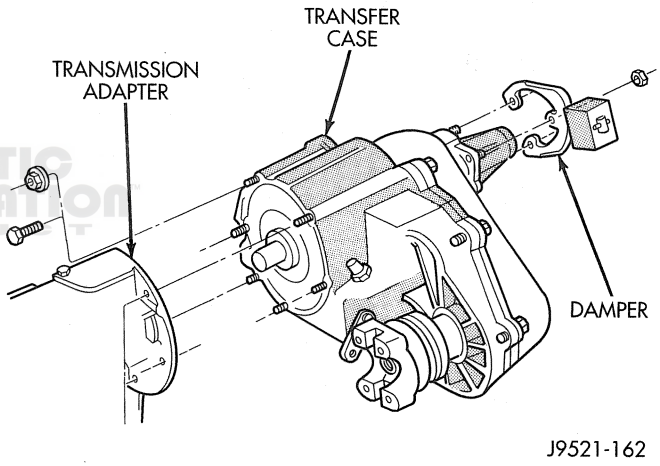


Fig. 1 NV 231 Transfer Case

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate, or on the shift knob.

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 2). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build. For example, a serial number of 7-10-95 would represent July 10, 1995.

RECOMMENDED LUBRICANT AND FILL LEVEL

Recommended lubricant for the NV 231 transfer case is Mopar Dexron II, or ATF Plus. Approximate lubricant fill capacity is 1.18 liters (2.2 pints).

GENERAL INFORMATION (Continued)

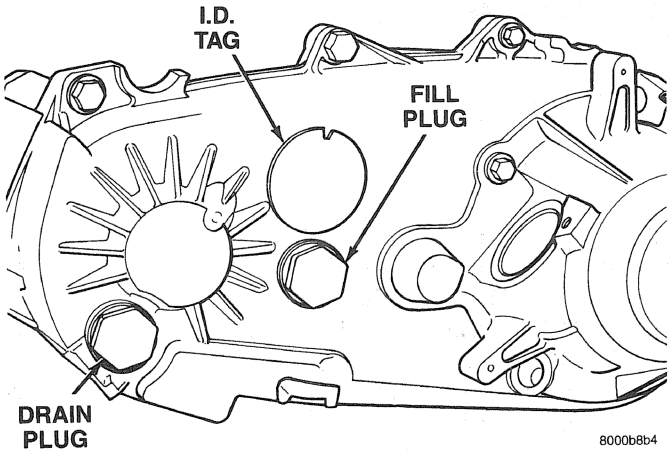


Fig. 2 Fill/Drain Plug And I.D. Tag Locations

The fill and drain plugs are both in the rear case (Fig. 2). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING

NV231 DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Vehicle speed too great to permit shifting.	(1) Stop vehicle and shift into desired range. Or reduce speed to 3-4 km/h (2-3 mph) before attempting to shift.
	(2) If vehicle was operated for extended period in 4H mode on dry paved surface, driveline torque load may cause difficulty.	(2) Stop vehicle, shift transmission to Neutral, shift transfer case to 2H mode and operate vehicle in 2H on dry paved surfaces.
	(3) Transfer case external shift linkage binding.	(3) Lubricate, repair or replace linkage bushings or tighten loose components as necessary.
	(4) Insufficient or incorrect lubricant.	(4) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid.
	(5) Internal components binding, worn or damaged.	(5) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE MODES	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. Check for leaks and repair if necessary. **Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.**
NOISY IN – OR JUMPS OUT OF – FOUR WHEEL DRIVE LOW RANGE	(1) Transfer case not completely engaged in 4L position.	(1) Stop vehicle, shift transfer case to Neutral, then shift back into 4L position.
	(2) Shift linkage out of adjustment.	(2) Adjust linkage.
	(3) Shift linkage loose or binding.	(3) Tighten, lubricate or repair linkage as necessary.
	(4) Range fork damaged, inserts worn, or fork is binding on shift rail.	(4) Disassemble unit and repair as necessary.
	(5) Low range gear worn or damaged.	(5) Disassemble and repair as necessary.
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clear or replace vent if necessary.
	(3) Output shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.
ABNORMAL TIRE WEAR	(1) Extended operation on dry hard surface (paved) roads in 4H range.	(1) Operate in 2H on hard surface (paved) roads.

Mopar AUTHENTIC RESTORATION PRODUCT

J9021-118

REMOVAL AND INSTALLATION

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.
(2) Raise vehicle.
(3) Loosen adjusting trunnion locknut and slide shift rod out of trunnion (Fig. 3). If rod lacks enough travel to come out of trunnion, push trunnion out of torque shaft.
(4) Lower vehicle.
(5) Remove console. Refer to park brake section in Group 5 for procedures.
(6) Remove screws attaching lever assembly to floorpan and remove assembly and shift rod (if left attached).

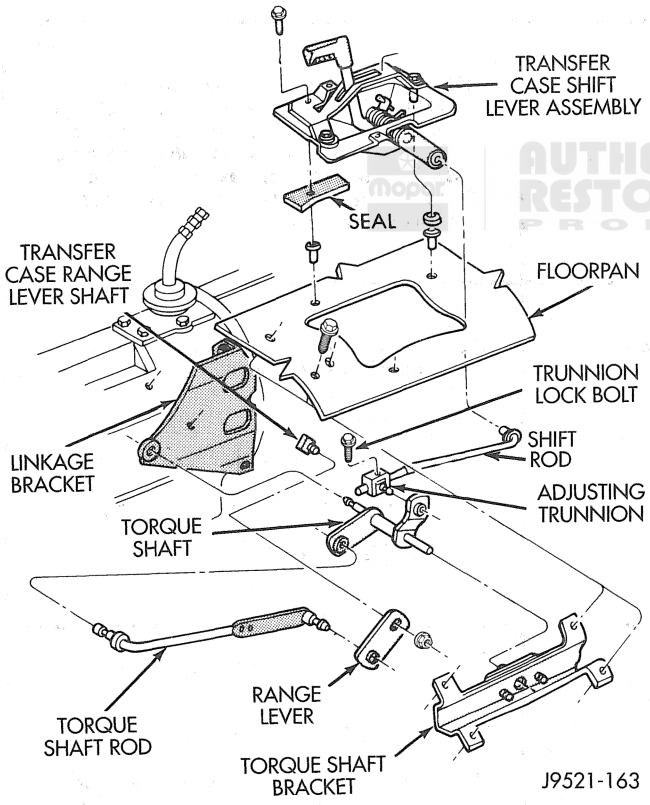


Fig. 3 Shift Linkage

INSTALLATION

(1) If shift rod was not removed from lever assembly, work rod down through floorpan opening. Then position lever assembly on floorpan and install assembly attaching screws.
(2) Install console.
(3) Raise vehicle.
(4) Connect trunnion to torque shaft arm. Or, slide shift rod into trunnion on range lever. Be sure shift rod slides freely in trunnion.
(5) Verify that range lever is in 4L position. Then tighten trunnion lock bolt.
(6) Lower vehicle and check transfer case shift operation.

NV231 TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.
(2) Raise vehicle.
(3) Drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember, or skid plate.
(7) Disconnect front/rear propeller shafts at transfer case.
(8) Disconnect vehicle speed sensor wires.
(9) Disconnect transfer case linkage rod from range lever.
(10) Disconnect transfer case vent hose, and indicator or vacuum switch harness.
(11) Support transfer case with transmission jack.
(12) Remove nuts attaching transfer case to transmission.
(13) Secure transfer case to jack with chains.
(14) Pull transfer case and jack rearward to disengage transfer case.
(15) Remove transfer case from under vehicle.
(16) If transfer case was removed for overhaul, remove damper from rear retainer.

TRANSFER CASE INSTALLATION

(1) Mount transfer case on a transmission jack. Secure transfer case to jack with chains.
(2) Position transfer case under vehicle.
(3) Align transfer case and transmission shafts and install transfer case on transmission.
(4) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.
(5) Install damper on rear retainer (Fig. 4). Tighten damper attaching nuts to 54 N·m (40 ft. lbs.) torque.
(6) Connect vehicle speed sensor wires, and vent hose.
(7) Connect indicator or vacuum switch harness to transfer case switch. Secure wire harnesses to clips on transfer case.
(8) Align and connect propeller shafts. Tighten shaft attaching bolts to 19 N·m (170 in. lbs.) torque.
(9) Fill transfer case with Mopar Dexron II fluid.
(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
(11) Remove transmission jack and support stand.
(12) Connect shift rod to transfer case range lever.
(13) Adjust transfer case shift linkage.

REMOVAL AND INSTALLATION (Continued)

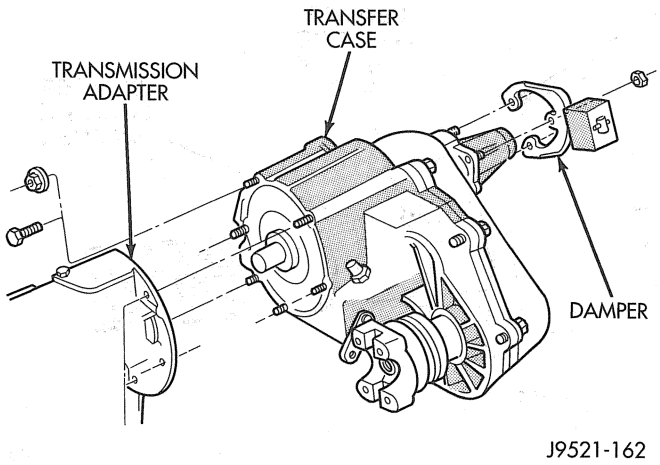


Fig. 4 Transfer Case Mounting

(14) Lower vehicle and verify transfer case shift operation.

DISASSEMBLY AND ASSEMBLY

NV231 TRANSFER CASE

DISASSEMBLE

SPEEDOMETER/YOKE/RANGE LEVER REMOVAL

(1) Remove speedometer adapter and pinion if not previously removed previously.

(2) Remove front yoke nut: Move range lever to 4L position. Then remove nut with 1–1/8 socket and impact wrench (Fig. 5).

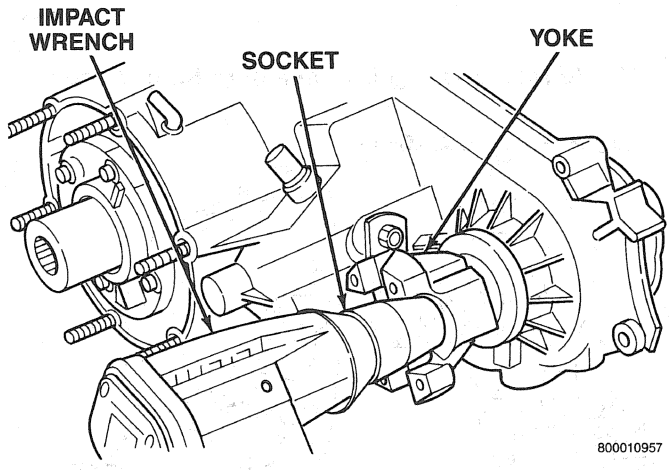


Fig. 5 Yoke Nut Removal

(3) Remove yoke. If yoke is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller (Fig. 6). Be sure puller tool is positioned on yoke and not on slinger as slinger will be damaged.

(4) Remove seal washer from front output shaft. Discard washer as it should not be reused.

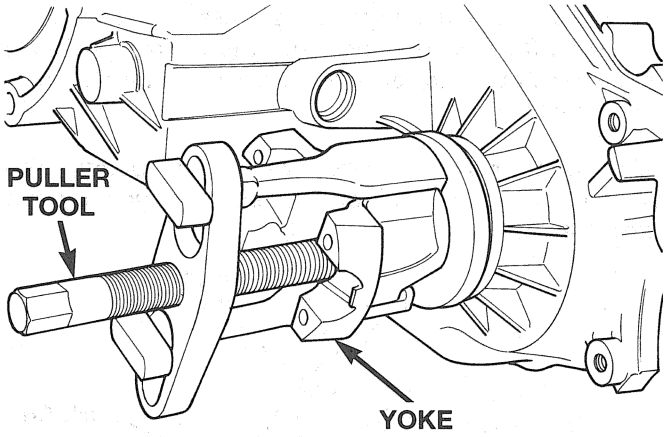


Fig. 6 Yoke Removal

(5) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft. (Fig. 7)

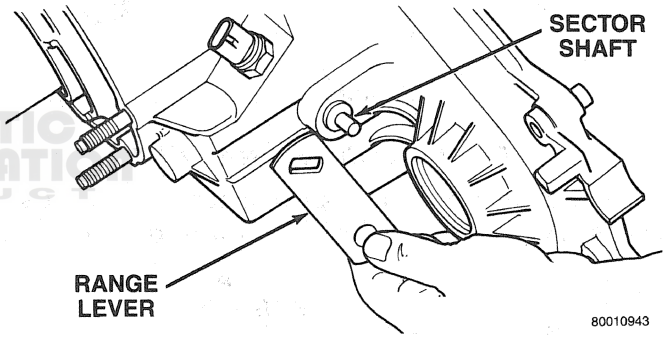


Fig. 7 Range Lever Removal

REAR RETAINER REMOVAL AND DISASSEMBLY

(1) Remove mainshaft boot. Spread band clamp that secures boot on slinger with pliers and screwdriver. Then slide boot off shaft (Fig. 8).

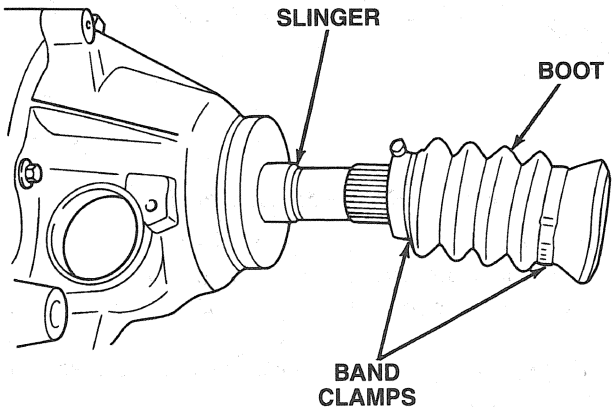


Fig. 8 Mainshaft Boot Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Remove rear slinger with brass drift and hammer (Fig. 9). Rotate slinger and tap at four positions 90 degrees apart to remove it. Discard slinger as it is not reusable.

CAUTION: Exercise care when removing the slinger. The rear retainer can be damaged by the drift punch.

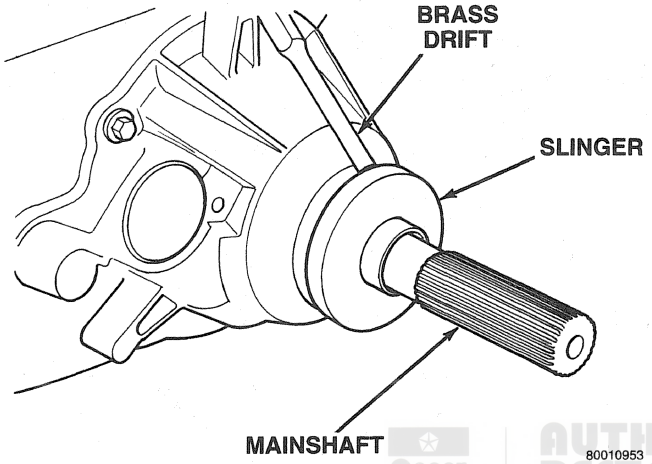


Fig. 9 Rear Slinger Removal

(3) Remove rear seal from retainer (Fig. 10). Use pry tool, or collapse seal with punch to remove it.

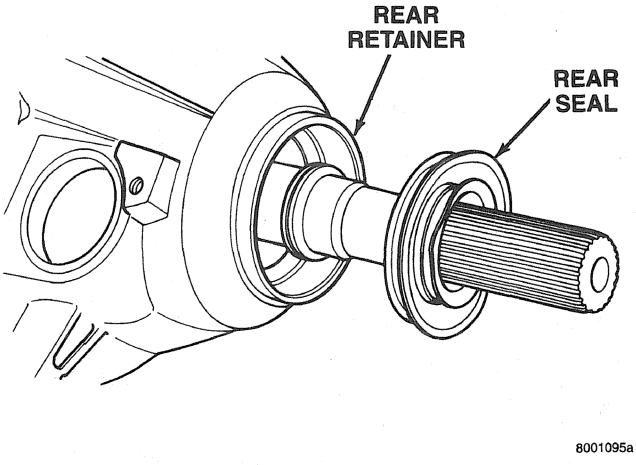


Fig. 10 Rear Seal Removal

(4) Remove slinger locating washer and locating retaining ring from output shaft (Fig. 11)

(5) Remove rear output bearing I.D. retaining ring (Fig. 12).

(6) Remove rear retainer bolts with 10mm socket and air ratchet.

(7) Remove rear retainer. Tap retainer with mallet and pry upward to break sealer bead. Then slide retainer off case and mainshaft (Fig. 13).

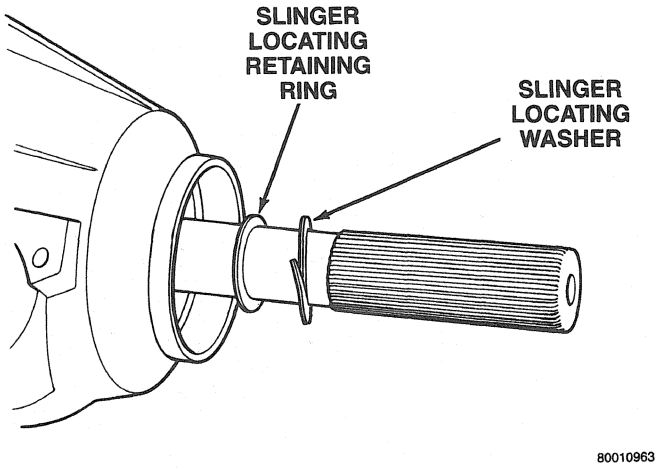


Fig. 11 Slinger Locating Washer And Retaining Ring Removal

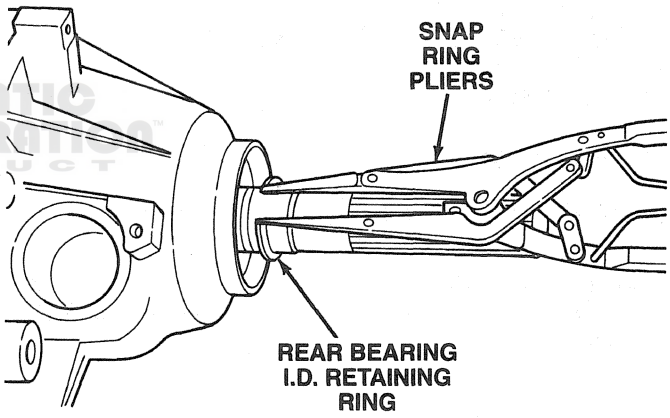


Fig. 12 Rear Bearing I.D. Retaining Ring Removal

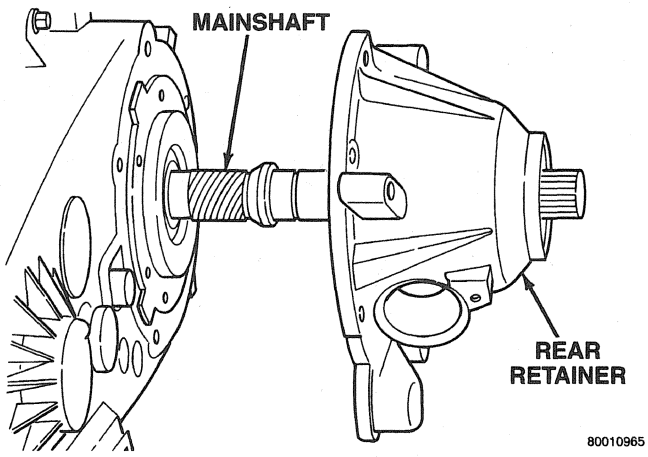


Fig. 13 Rear Retainer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

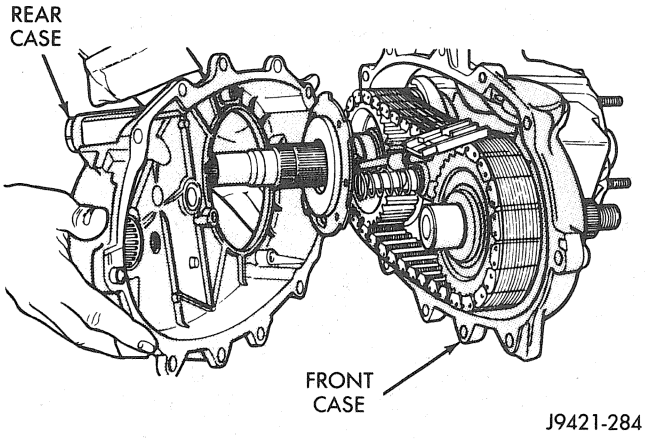


Fig. 14 Oil Pump/Rear Case Removal

(8) Remove rear bearing O.D. retaining ring with snap ring pliers. Then tilt pump and slide it off mainshaft (Fig. 15)

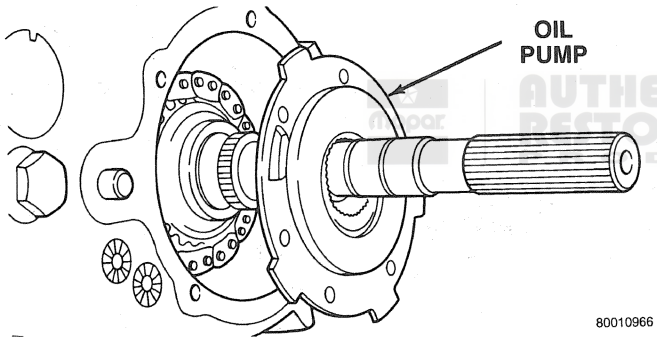


Fig. 15 Oil Pump Removal

(9) Remove pickup tube O-ring from pump (Fig. 16) but do not disassemble pump; it is not a repairable part.

(10) Remove seal from oil pump with pry tool.

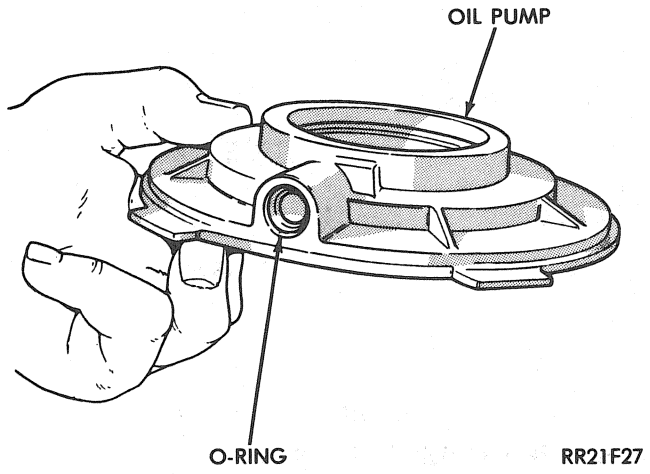


Fig. 16 Pickup Tube O-Ring Location

(11) Remove bolts attaching rear case to front case. A 10 mm, 12 point socket is needed for the spline head bolt (Fig. 14). A 15 mm socket is needed for the remaining bolts. Note position of the two black finish bolts at each end of the case. These bolts go through the case dowels and require a washer under the bolt head (Fig. 17)

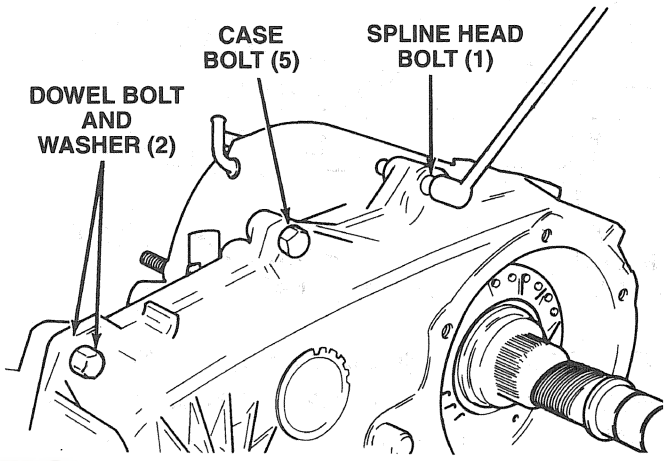


Fig. 17 Spline And Dowel Bolt Locations

(12) Remove rear case from front case (Fig. 18). Insert screwdrivers into slots cast into each end of case. Then pry upward to break sealer bead and remove rear case.

CAUTION: Do not pry on the sealing surface of either case half as the surfaces will become damaged.

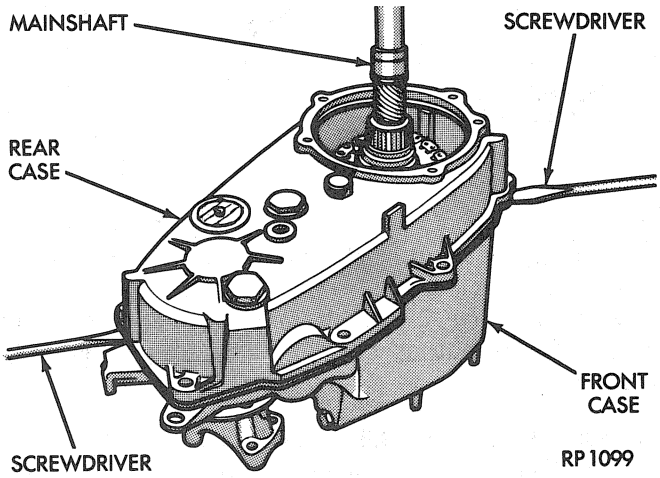


Fig. 18 Loosening/Removing Rear case

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Remove oil pickup tube and screen from rear case (Fig. 19).

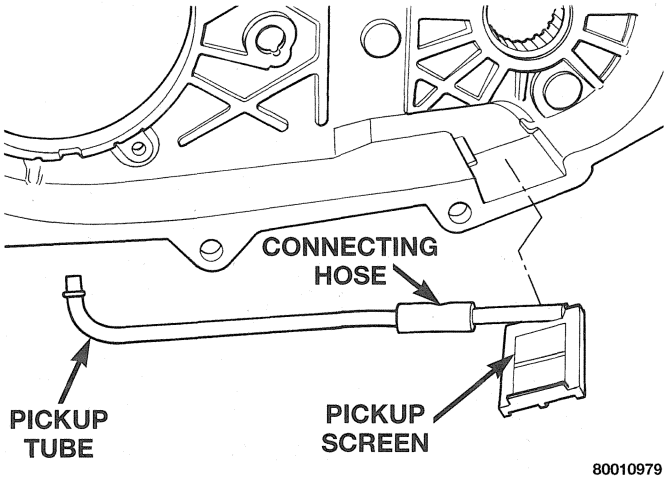


Fig. 19 Oil Pickup Screen, Hose And Tube Removal

FRONT SHAFT/DRIVE CHAIN/POPPET REMOVAL

(1) Remove poppet plug, spring and plunger (Fig. 20).

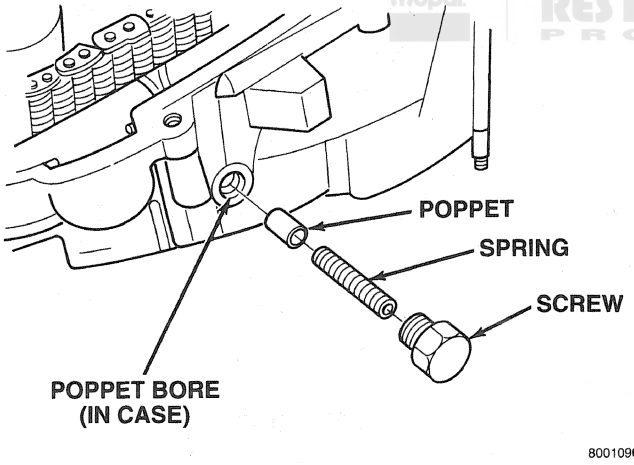


Fig. 20 Poppet Components

(2) Pull front output shaft upward and out of front bearing (Fig. 21).

(3) Slide drive chain off mainshaft sprocket and remove front output shaft and chain as assembly (Fig. 22).

MAINSHAFT REMOVAL AND DISASSEMBLY

(1) Grasp end of mainshaft and remove shaft, drive sprocket and mode hub as assembly (Fig. 23).

(2) Remove mode hub retaining ring with heavy duty snap ring pliers (Fig. 24).

(3) Slide mode hub off mainshaft (Fig. 25).

(4) Slide drive sprocket off mainshaft (Fig. 26).

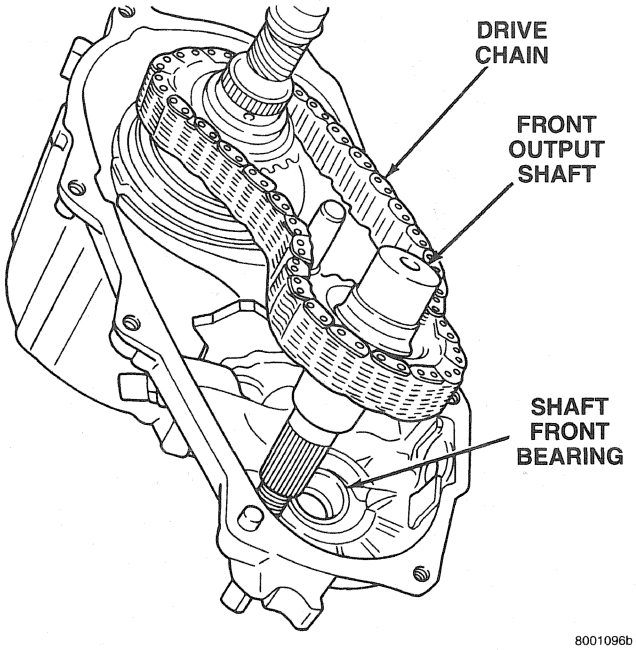


Fig. 21 Disengaging Front Output Shaft From Front Bearing

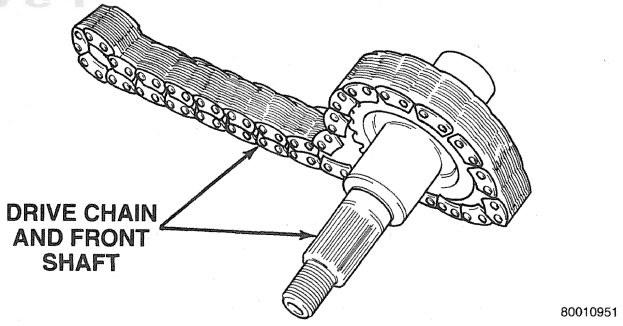


Fig. 22 Front Output Shaft And Drive Chain Removal

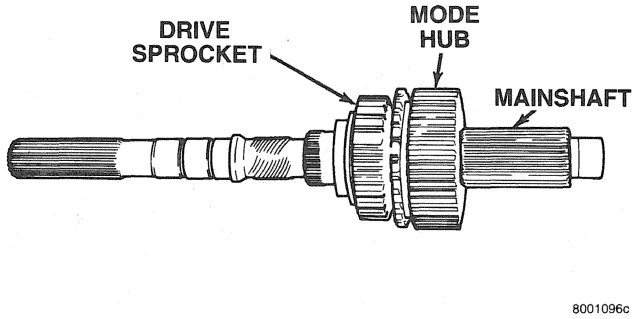


Fig. 23 Mainshaft Assembly Removal

SHIFT FORK/SLEEVE/HUB REMOVAL

(1) Remove mode spring from end of mode fork rail.

DISASSEMBLY AND ASSEMBLY (Continued)

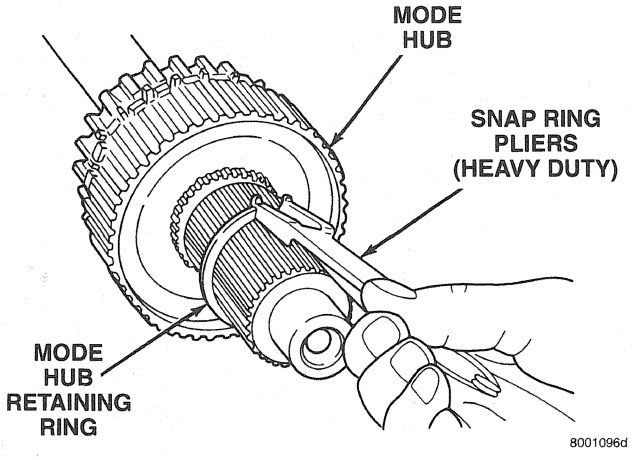


Fig. 24 Mode Hub retaining Ring Removal

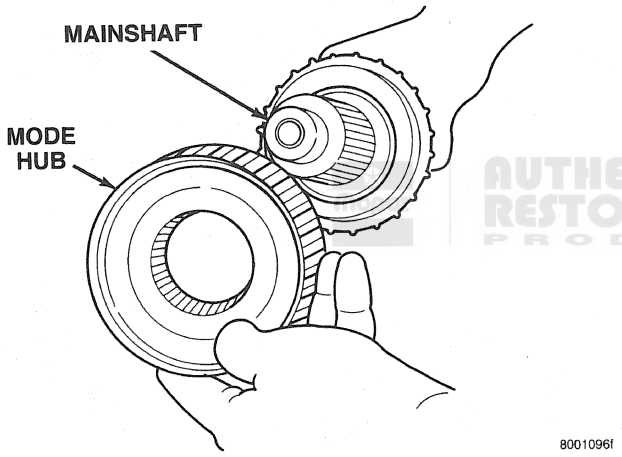


Fig. 25 Mode Hub Removal

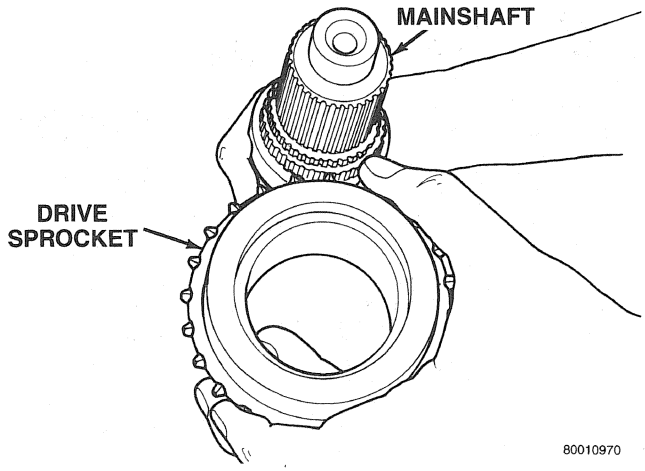


Fig. 26 Drive Sprocket Removal

(2) Remove mode fork and sleeve as assembly (Fig. 27). Note position of sleeve for assembly installation (short side of sleeve faces up).

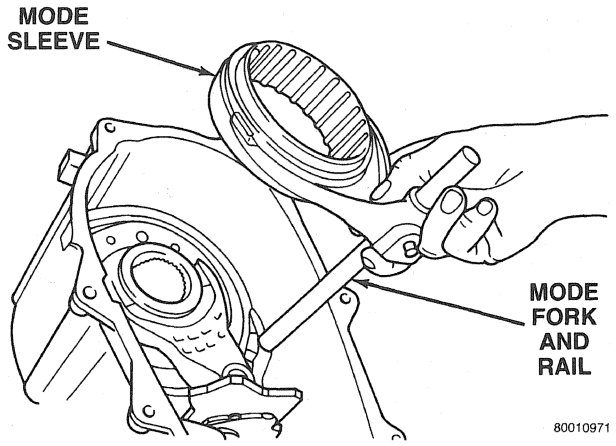


Fig. 27 Mode Fork And Sleeve Removal

(3) Remove range fork and hub as assembly. Note fork position for installation reference (Fig. 28).

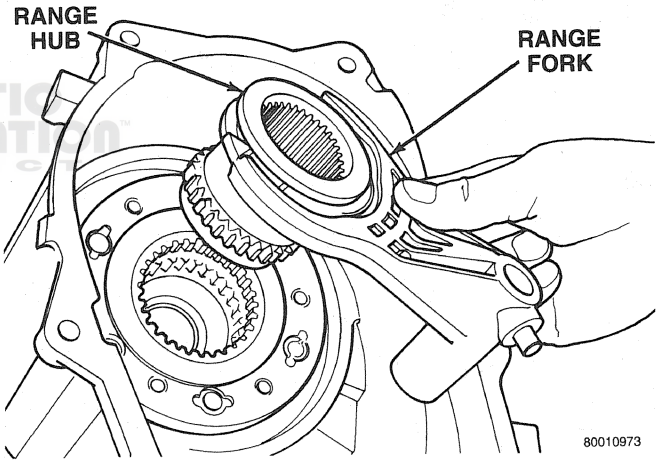


Fig. 28 Range Fork And Hub Removal

(4) Remove shift sector from front case (Fig. 29).

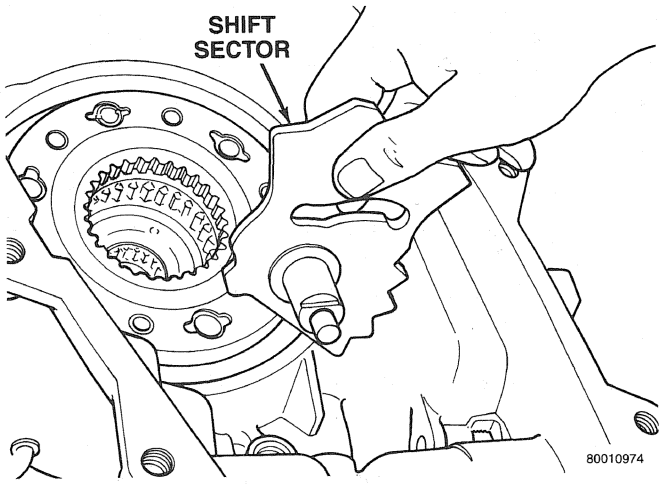


Fig. 29 Shift Sector Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Remove sector shaft O-ring seal and nylon retainer (Fig. 30)

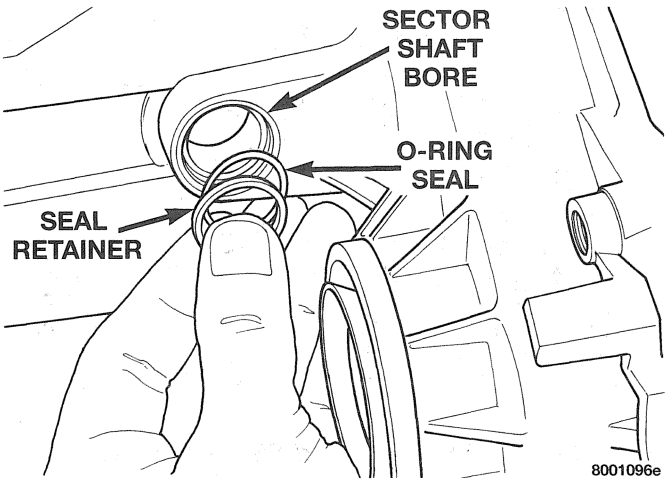


Fig. 30 Sector Shaft Seal And Retainer Removal

INPUT GEAR/PLANETARY CARRIER REMOVAL AND DISASSEMBLY

(1) Remove input retainer attaching bolts with 10mm socket and air ratchet.

(2) Remove input retainer. Pry retainer loose with screwdriver positioned in slots at each end of retainer (Fig. 31)

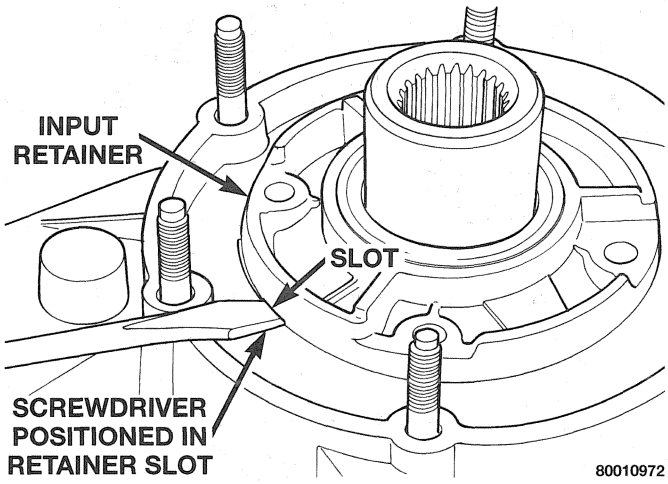


Fig. 31 Input Retainer Removal

(3) Remove input retainer seal. Position retainer upside down over front case bearing. Then tap seal out with drift and hammer.

(4) Remove input gear bearing retaining ring with heavy duty snap ring pliers (Fig. 32)

(5) Place front case in horizontal position. Then remove input gear and planetary carrier as assembly (Fig. 33). Tap gear out of bearing with plastic mallet if necessary.

(6) Remove carrier lock retaining ring (Fig. 34).

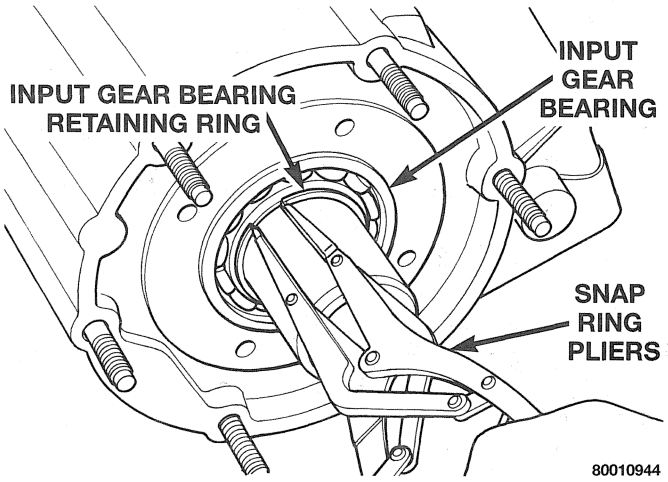


Fig. 32 Removing Input Bearing retaining ring

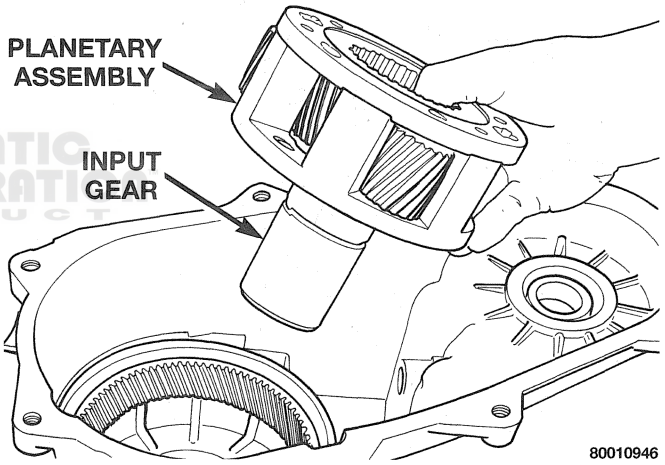


Fig. 33 Input Gear And Planetary Carrier Removal

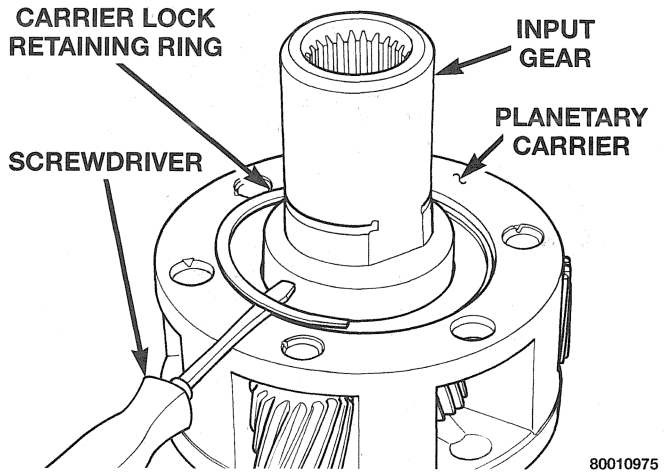


Fig. 34 Carrier Lock Retaining Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Remove input gear, lock ring, and front thrust washer from planetary carrier (Fig. 35).

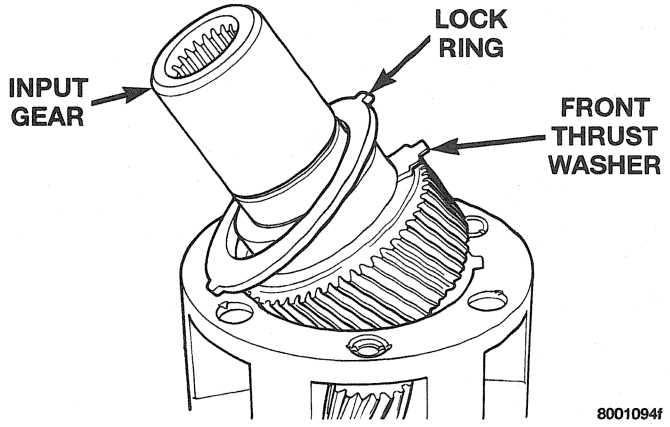


Fig. 35 Input Gear, Carrier Lock Ring, And Rear thrust Washer Removal

(8) Remove rear thrust washer from carrier (Fig. 36).

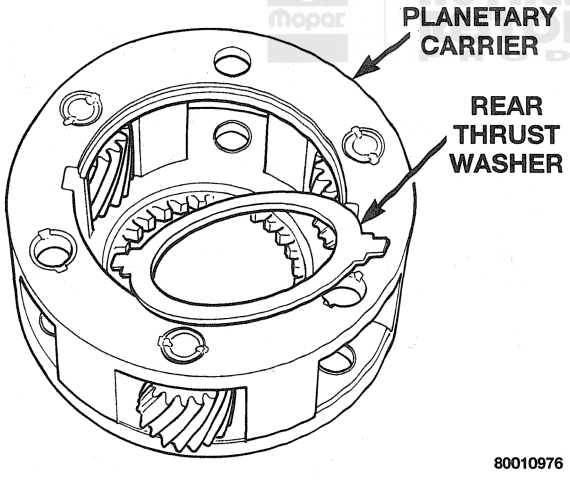


Fig. 36 Rear Thrust washer Removal

(9) Remove pilot bearing from input gear with Tool MD-998346 as follows:

(a) Turn puller tool bolt until jaws retract enough to fit into bearing (Fig. 37)

(b) .

(c) Insert puller bolt and jaws into bearing. Then turn puller bolt clockwise so ramp on bolt spreads jaws forcing them under bearing (Fig. 38).

(d) Install puller bridge over puller bolt (Fig. 39). Then install flat washer and nut on bolt.

(e) Hold puller bridge from turning with locking pliers. Then tighten nut on puller bolt in clockwise direction to draw bearing out of input gear (Fig. 40).

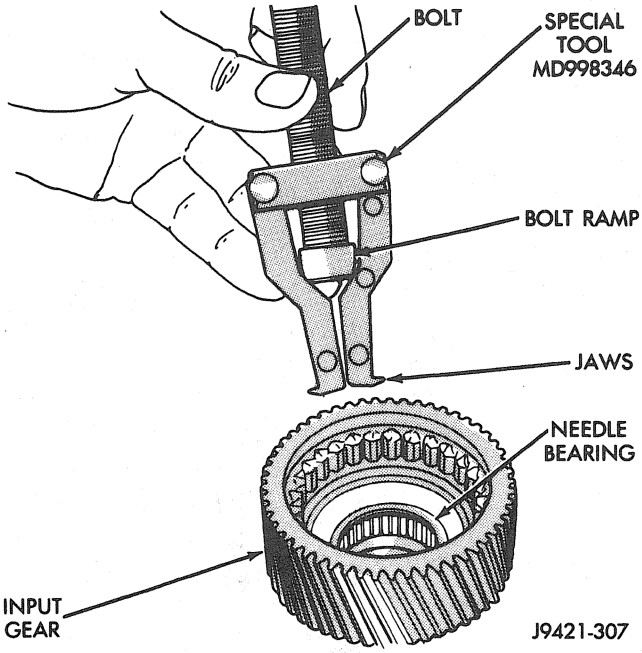


Fig. 37 Puller Jaws In Retracted Position

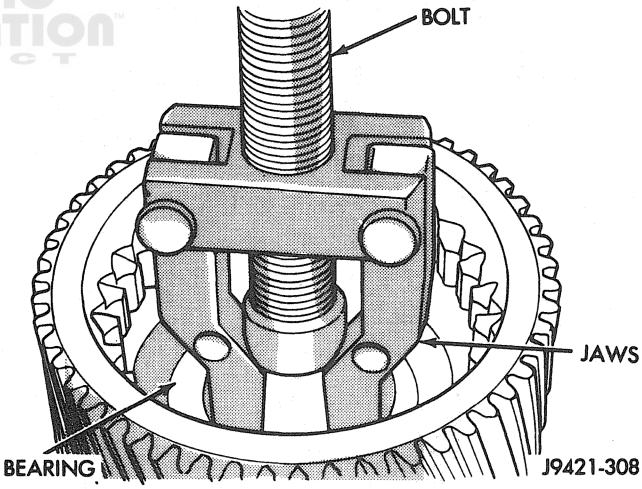


Fig. 38 Puller Bolt And Jaws Seated Under Pilot Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

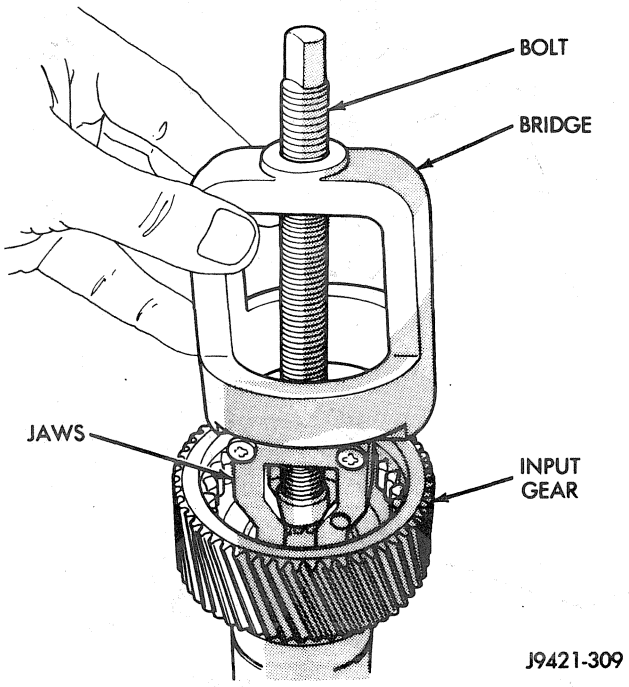


Fig. 39 Installing Puller Bridge

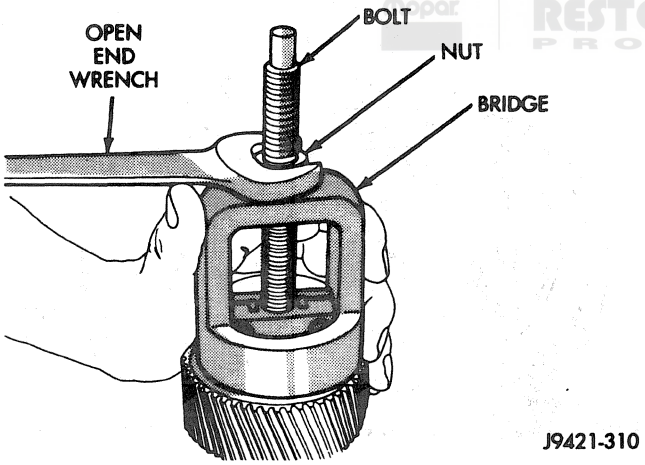


Fig. 40 Pilot Bearing Removal

FRONT/REAR CASE BEARING AND SEAL REMOVAL

(1) Remove front output shaft front bearing and seal as follows:

(a) Remove seal from case with pry tool (Fig. 41).

(b) Remove bearing retaining ring with screwdriver (Fig. 42).

(c) Remove bearing with Tool Handle C-4171 and Tool 5065 (Fig. 43).

(2) Remove front output shaft rear bearing from rear case with Tool MD-998346 (Fig. 44). Be sure tool jaws are seated under bearing before tightening puller nut.

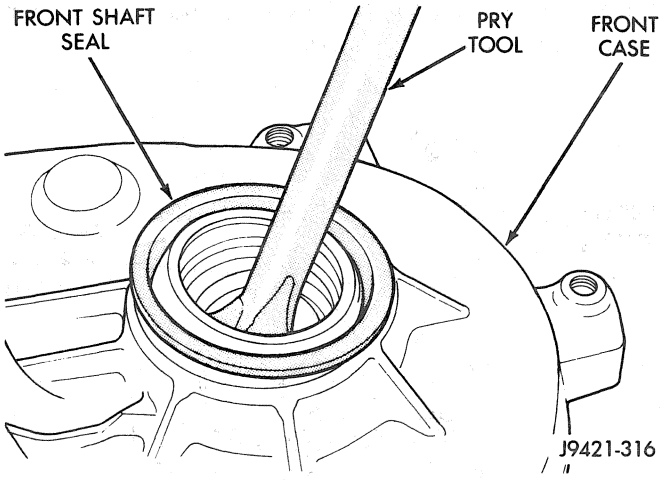


Fig. 41 Front Output Seal Removal

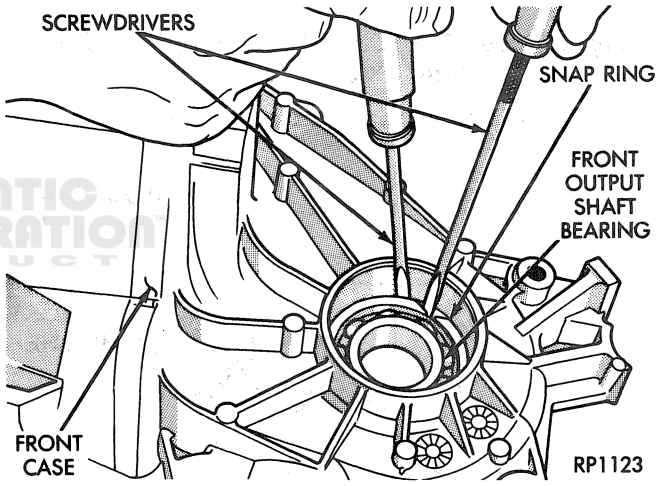


Fig. 42 Front Shaft Front Bearing Retaining Ring Removal

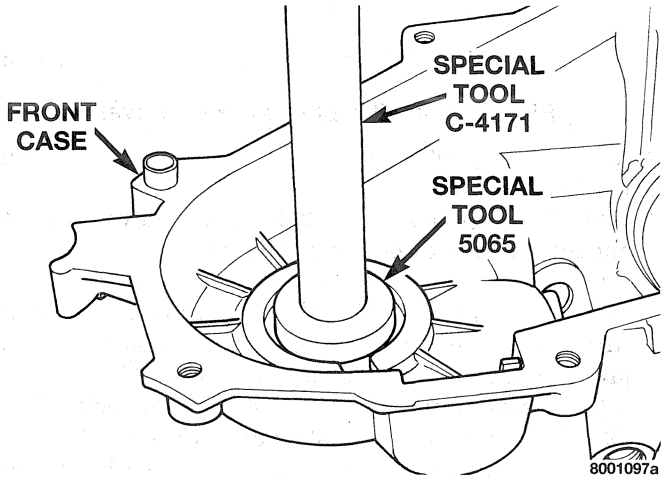


Fig. 43 Front Shaft Front Bearing Removal

(3) Remove input bearing from front case. Tap bearing out from inside of case with brass drift and hammer.

DISASSEMBLY AND ASSEMBLY (Continued)

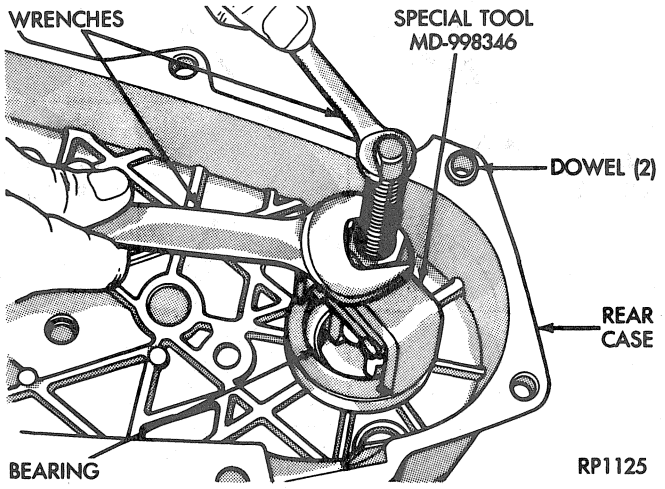


Fig. 44 Front Shaft Rear Bearing Removal

NV231 TRANSFER CASE ASSEMBLE

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

INPUT GEAR, PLANETARY CARRIER, AND INPUT RETAINER INSTALLATION

(1) Lubricate bearings, input gear, and planetary carrier with transmission fluid during installation. Seals can be lubricated with transmission fluid, petrolatum, or Ru-Glyde if desired.

(2) Install new input bearing in front case. Start bearing in bore with copper mallet. Tap bearing at 6–8 points around outer race to start it evenly. Mount case in shop press and seat bearing in case using hard wood block as press tool. Press bearing inward until bearing locating ring stops against case surface (Fig. 45).

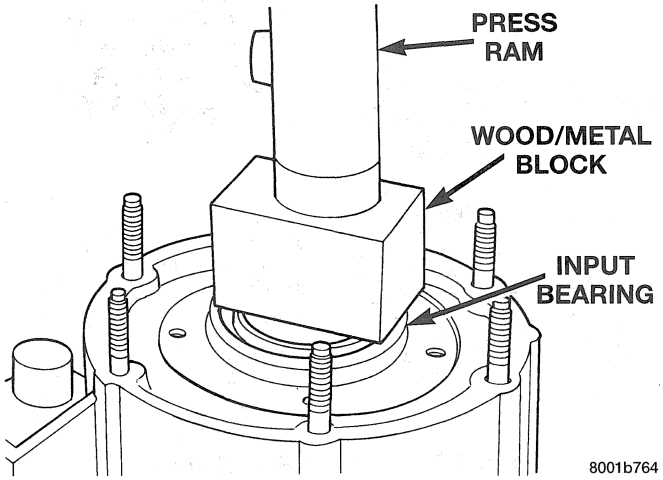


Fig. 45 Input Bearing Installation

(3) Install front output shaft front bearing in case with Tool Handle C-4171 and Installer 5064 (Fig. 46).

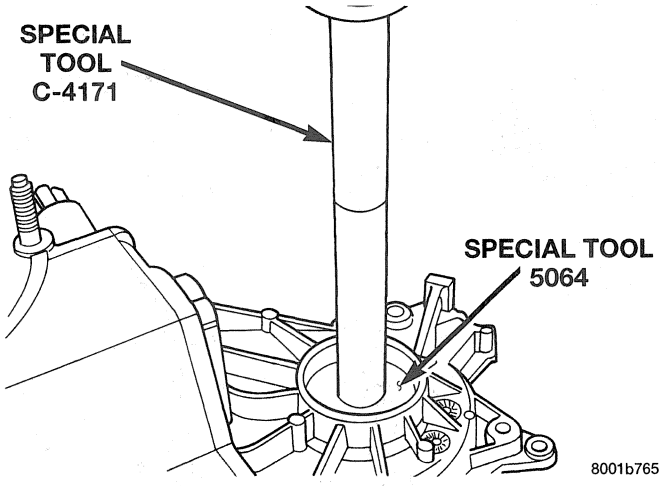


Fig. 46 Front Shaft Front Bearing Installation

(4) Install shaft front bearing retaining ring (Fig. 47). Start ring into place by hand. Then use small screwdriver to work ring into case groove. Be sure ring is fully seated before proceeding.

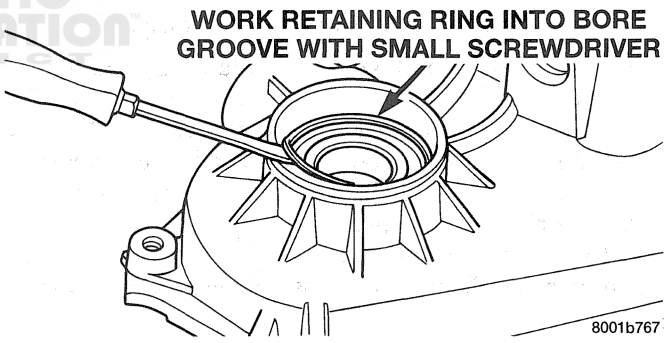


Fig. 47 Installing Front Bearing Retaining Ring

(5) Install new front output seal in case bore with Tools C-4171 and 7934 (Fig. 48).

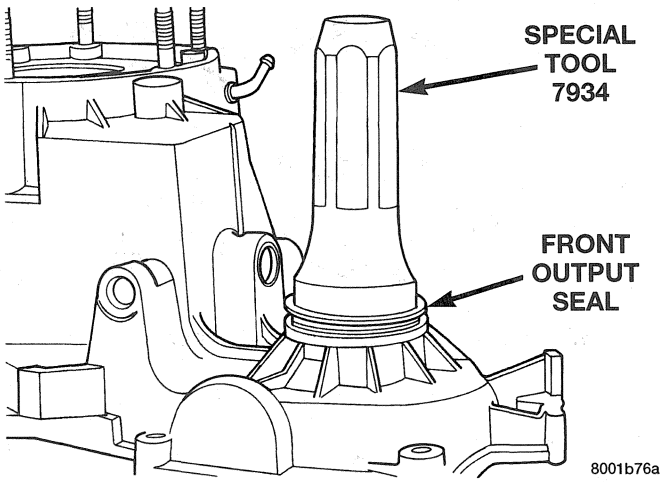


Fig. 48 Front output Seal Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install pilot bearing in input gear with Tools C-4171 and 5065 (Fig. 49).

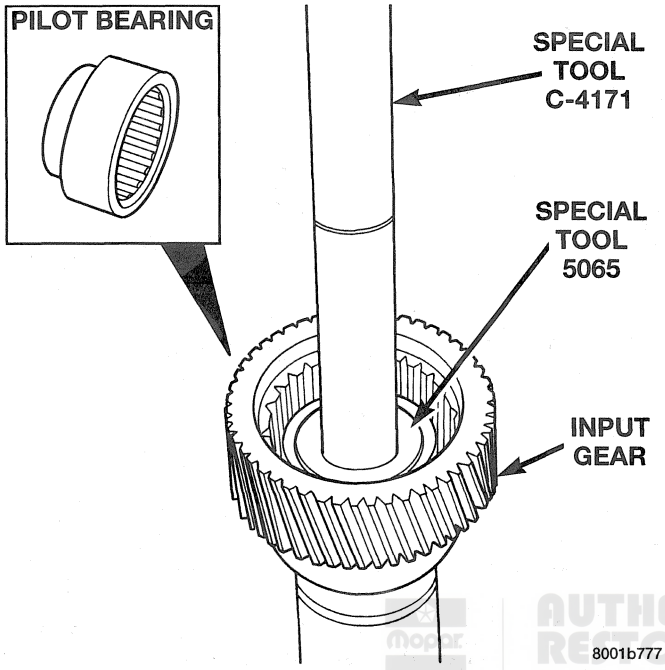


Fig. 49 Pilot Bearing Installation

(7) Assemble input gear and planetary carrier as follows:

(a) Install rear thrust washer in carrier. Be sure washer tabs are aligned and seated in carrier slots (Fig. 50). Also note that washers are the same and therefore interchangeable.

(b) Position front thrust washer and lock ring on input gear. Then install assembled parts in carrier (Fig. 51)

(c) Install carrier lock retaining ring. Use small screwdriver to work ring into place. Be sure ring is fully seated before proceeding (Fig. 52).

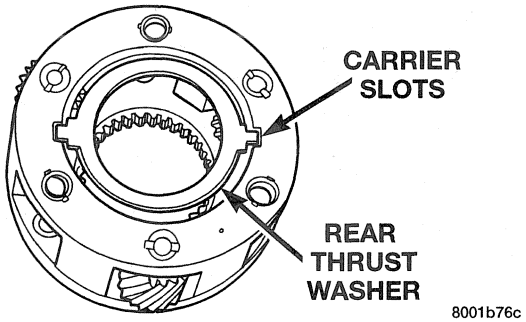


Fig. 50 Input Gear Rear Thrust Washer Installation

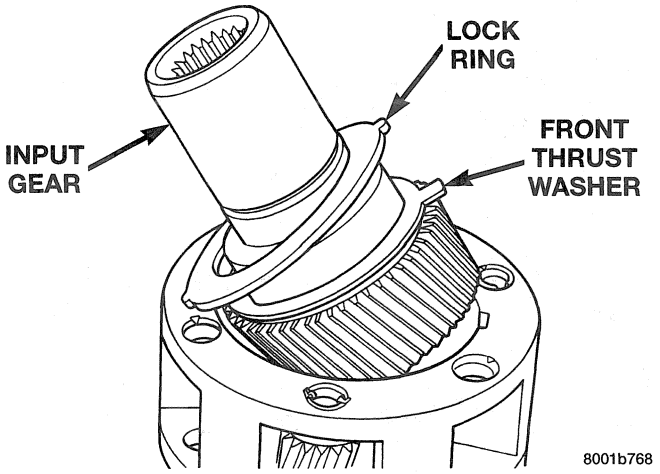


Fig. 51 Input Gear, Front Thrust Washer, And Carrier Lock Ring Installation

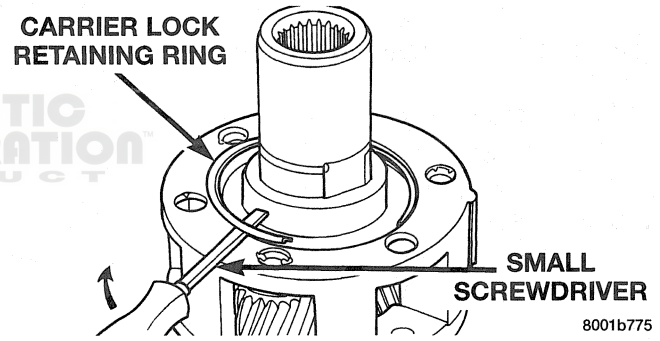


Fig. 52 Carrier Lock Retaining Ring Installation

(8) Install assembled input gear/planetary carrier in front case (Fig. 53). Be sure to align carrier pinions in annulus gear. Use wood hammer handle or rawhide mallet to seat assembly if necessary.

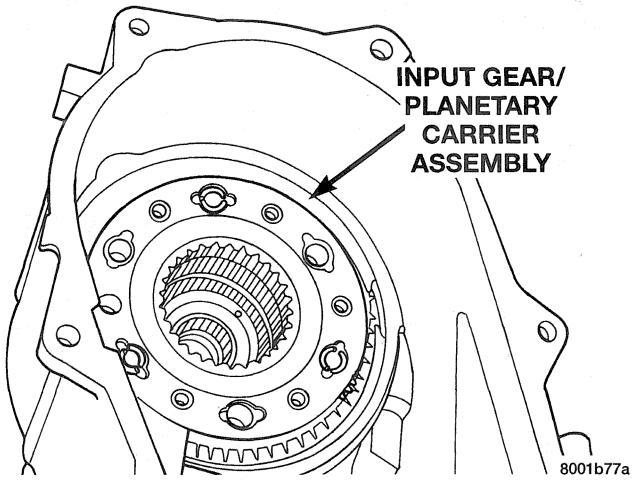


Fig. 53 Input Gear And Carrier Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Install input gear retaining ring (Fig. 54). Be sure to install the correct retaining ring as the input gear and mode hub retaining rings are almost the same diameter. The difference is in ring thickness with the input gear retaining ring being substantially thicker.

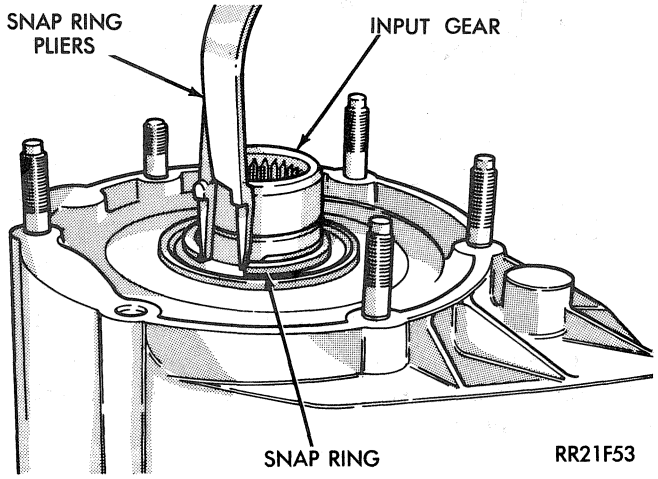


Fig. 54 Input Gear Retaining Ring Installation

(10) Install new seal in input retainer with Tools C-4171 and 7884 (Fig. 55).

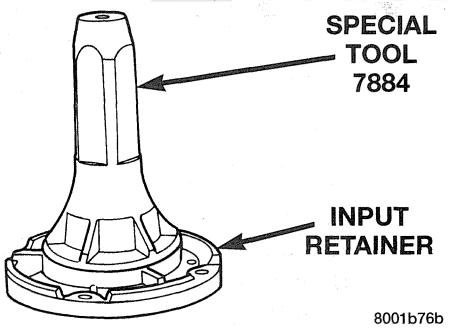


Fig. 55 Input Retainer Seal Installation

(11) Apply 3 mm bead of Mopar Sealer P/N 82300234, or Loctite Ultra Gray to front bearing retainer seal surface (Fig. 56).

(12) Align oil channel in retainer with oil feed hole in front case (Fig. 57).

(13) Align and install input retainer on front case (Fig. 58).

(14) Install and tighten input retainer bolts to 16–24 N.m (12–18 ft. lbs.) torque.

SHIFT SECTOR/POPPET/RANGE FORK/RANGE HUB INSTALLATION

(1) Install shift sector O-ring and nylon retainer in case bore. Note that one side of retainer is slightly rounded and that the opposite side has a shallow groove. Groove side goes toward seal and rounded side faces out.

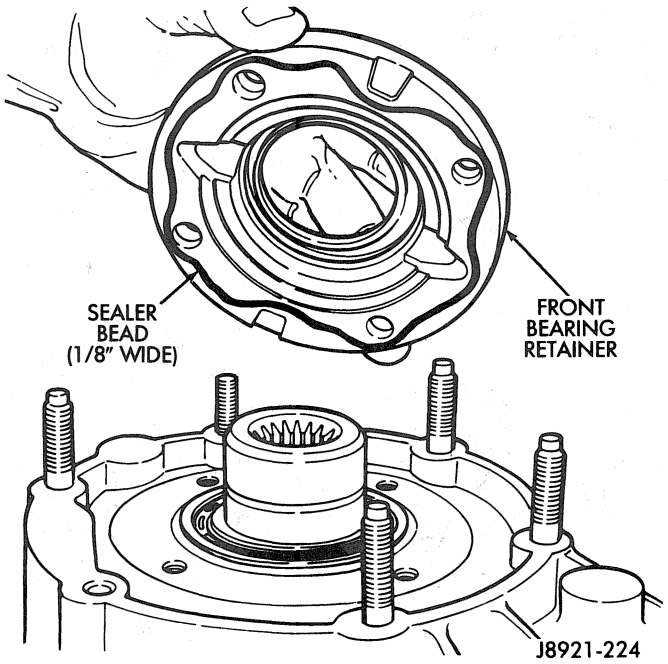


Fig. 56 Applying Sealer Bead To Input Bearing Retainer

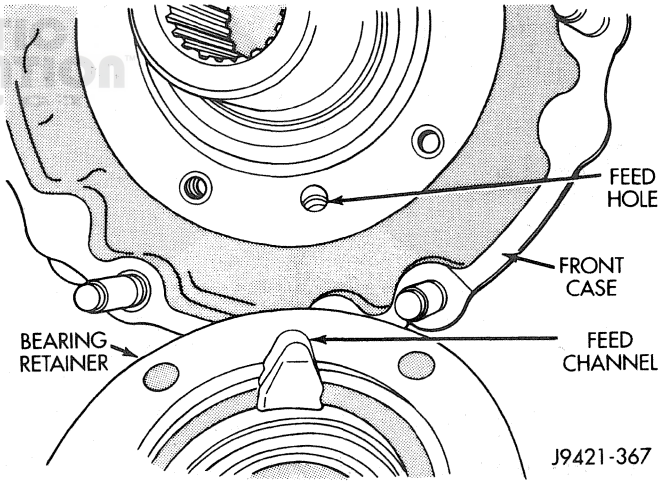


Fig. 57 Aligning Retainer Oil Channel With Feed Hole In Front Case

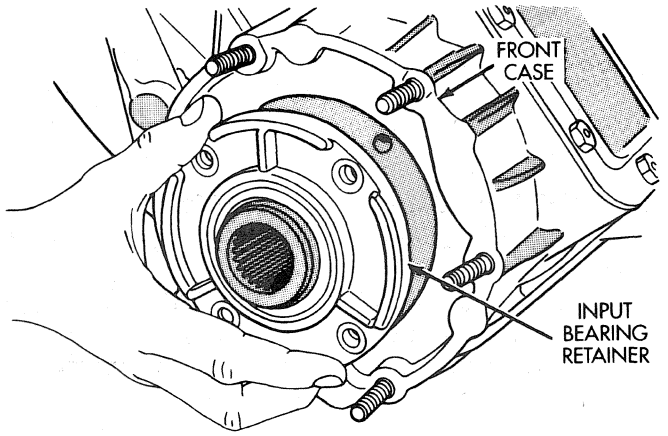


Fig. 58 Input Retainer Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Install shift sector in case (Fig. 59). Lubricate sector shaft with transmission fluid before installation.

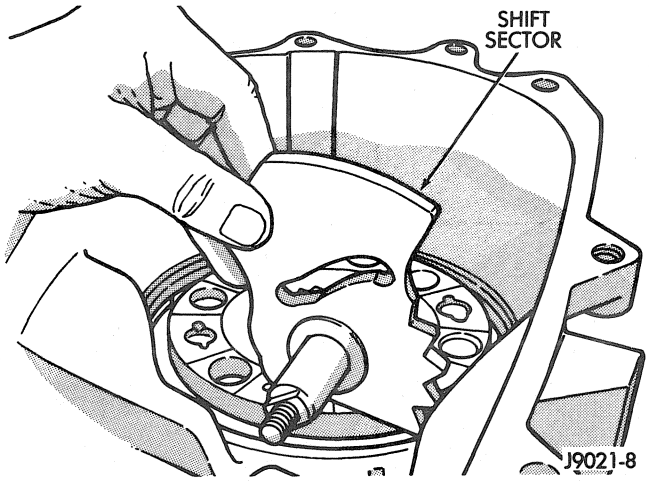


Fig. 59 Shift Sector Installation

(3) Install range lever, washer, and nut on sector shaft (Fig. 60). Tighten range lever nut to 27–34 N.m (20–25 ft. lbs.) torque.

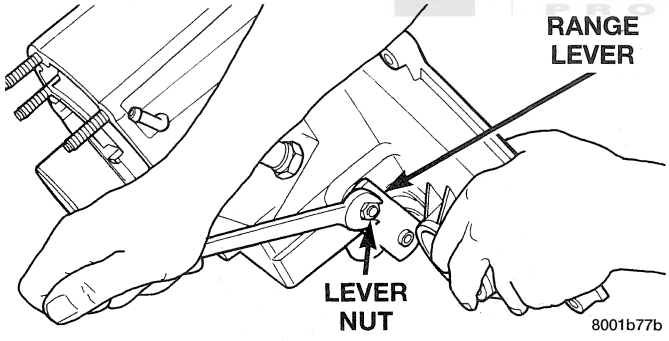


Fig. 60 Range Lever Installation

(4) Assemble and install range fork and hub (Fig. 61). Be sure hub is properly seated in planetary carrier and engaged with input gear.

(5) Align and insert range fork pin in shift sector slot.

(6) Install poppet plunger, spring, and screw plug (Fig. 20). Install new O-ring on screw plug if necessary. Tighten plug to 16–24 N.m (12–18 ft. lbs.) torque.

MAINSHAFT AND MODE FORK INSTALLATION

(1) Lubricate mainshaft and hub and sprocket bores with transmission fluid.

(2) Install drive sprocket on mainshaft.

(3) Install mode hub on mainshaft.

(4) Install mode hub retaining ring. Be sure ring is fully seated in shaft groove before proceeding.

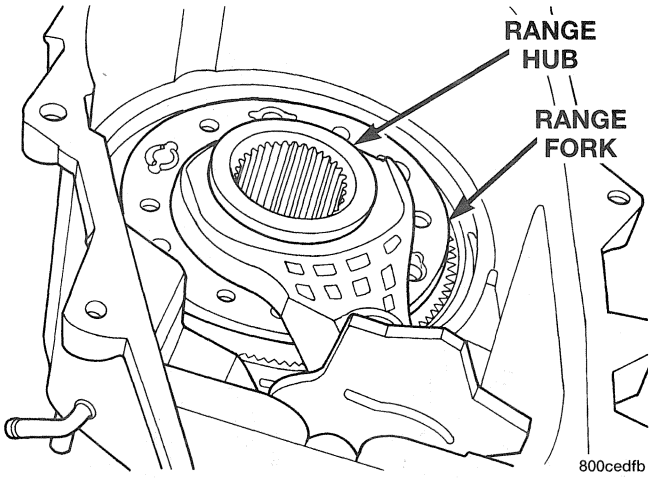


Fig. 61 Range Fork And Hub Assembly/Installation

(5) Install assembled mainshaft, sprocket and hub (Fig. 62). Be sure shaft is seated in pilot bearing, planetary, and range sleeve.

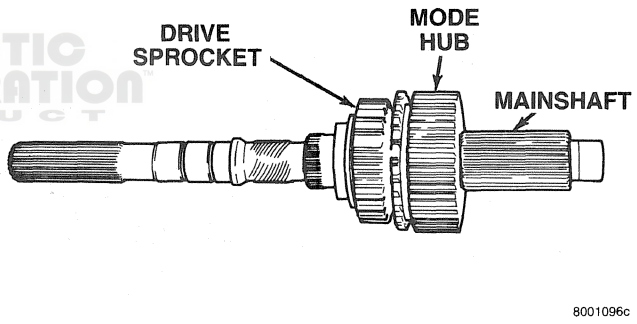


Fig. 62 Mainshaft Assembly Installation

(6) Install new pads on mode fork if necessary.

(7) Insert mode sleeve in mode fork mode fork. Be sure long side of sleeve is toward long end of shift rail (Fig. 63).

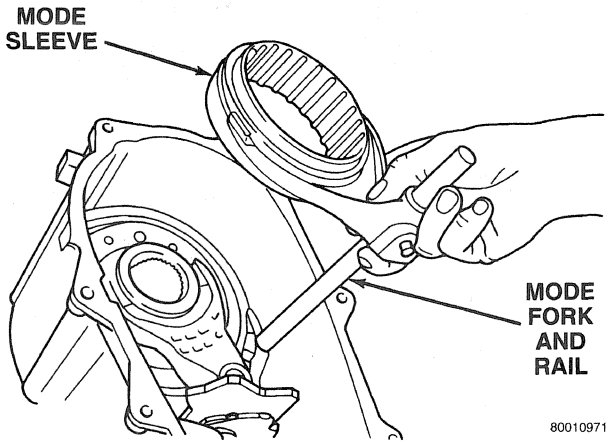


Fig. 63 Assembling Mode Fork And Sleeve

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Install assembled mode fork and sleeve (Fig. 64). Be sure fork rail goes through range fork and into case bore. Also be sure sleeve is aligned and seated on mainshaft hub.

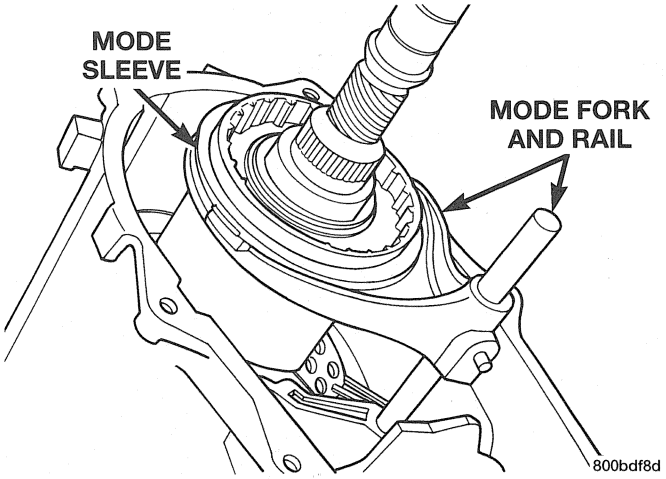


Fig. 64 Mode Fork And Sleeve Installation

DRIVE CHAIN AND FRONT OUTPUT SHAFT INSTALLATION

(1) Lubricate chain and front shaft with automatic transmission fluid.

(2) Install drive chain on front output shaft.

(3) Lift chain and shaft upward and start chain around mainshaft drive sprocket.

(4) Install front output shaft. Tilt shaft and insert it into front bearing. Then work shaft and drive chain into place (Fig. 65).

(5) Install mode spring on upper end of mode fork shift rail (Fig. 65).

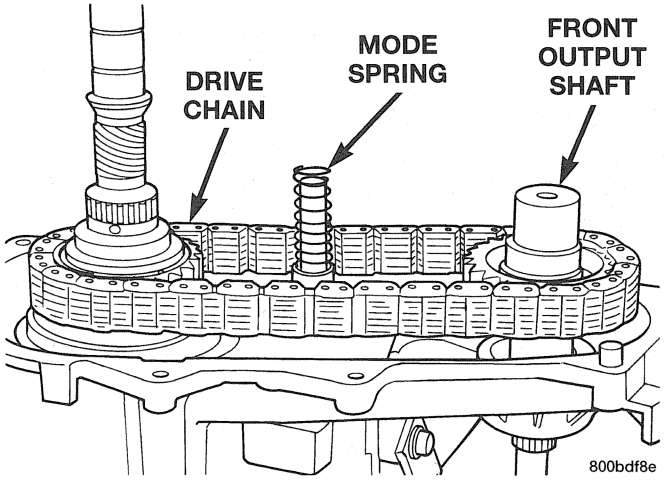


Fig. 65 Front Output Shaft And Drive Chain Installation

OIL PUMP AND REAR CASE ASSEMBLY/INSTALLATION

(1) Assemble oil pickup screen, connecting hose, and tube.

(2) Install new pickup tube O-ring in oil pump (Fig. 66).

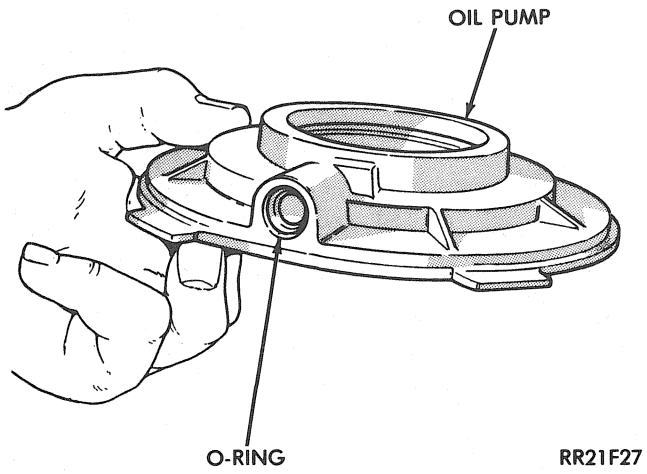


Fig. 66 Pickup Tube O-Ring Position

(3) Install new seal in oil pump with Installer Tool 7588 (Fig. 67).

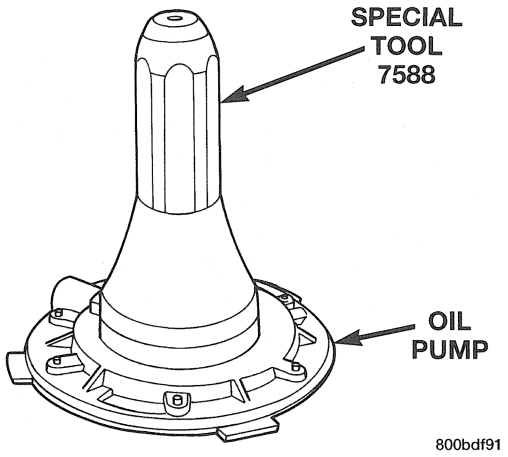


Fig. 67 Oil Pump Seal Installation

(4) Insert oil pickup tube in oil pump inlet.

(5) Position assembled oil pump and pickup tube in rear case. Be sure pickup screen is securely seated in case slot. Also be sure oil pump locating tabs are outside rear case (Fig. 68).

(6) Apply bead of sealer to mating surface of front case. Use Mopar Sealer P/N 82300234, or Loctite Ultra Gray. Sealer bead should not exceed 3/16 in. in diameter.

(7) Lift rear case and oil pump and carefully position assembly on front case. Be sure case dowels are aligned and that mode fork rail extends through rear case before seating rear case on front case.

(8) Install bolts that attach rear case to front case. Be sure to use a washer with each of the two dowel bolts (Fig. 17). Tighten all bolts (including spline head bolt), to 27– 34 N.m (20–25 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

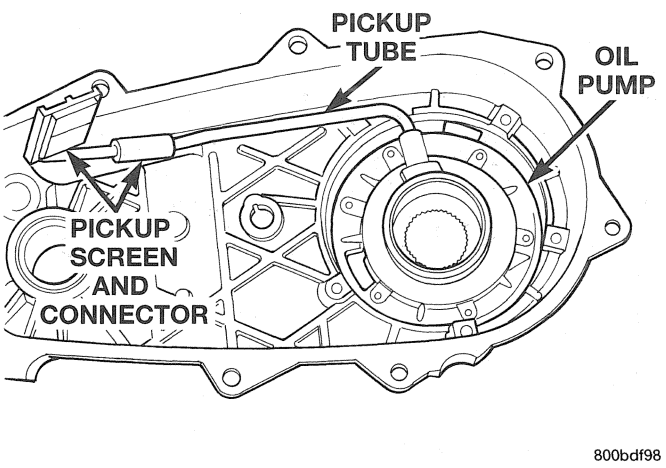


Fig. 68 Oil Pump And Pickup Tube Installation

REAR RETAINER ASSEMBLY AND INSTALLATION

(1) Install rear bearing in retainer with Tools C-4171 and 5064 (Fig. 69).

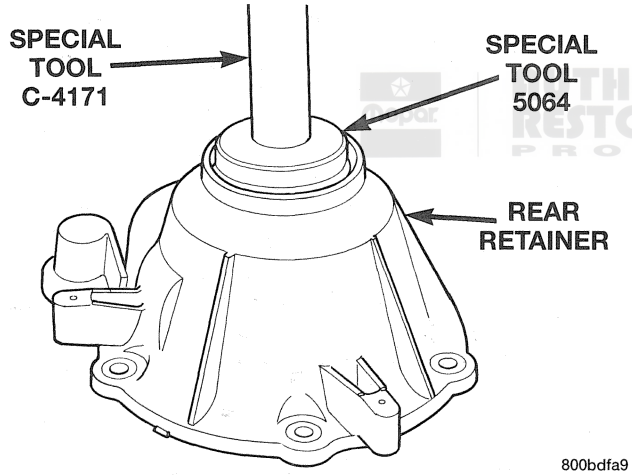


Fig. 69 Installing Rear Bearing In Retainer

(2) Install rear bearing O.D. retaining ring with snap ring pliers (Fig. 70). Be sure retaining ring is fully seated in retainer groove.

(3) Apply bead of Mopar Sealer P/N 82300234, or Loctite Ultra Gray to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

(4) Install rear retainer on rear case. Tighten retainer bolts to 20–27 N.m (15–20 ft. lbs.) torque.

(5) Install rear bearing I.D. retaining ring and spacer on mainshaft.

(6) Apply liberal quantity of petroleum jelly to new rear seal and to mainshaft. Petroleum jelly is needed to protect seal lips during installation.

(7) Slide new rear seal onto mainshaft and into place in rear retainer. Start seal in retainer by hand then carefully seat seal with hammer and Tool D-389 (Fig. 71).

(8) Install new rear slinger. Use suitable size pipe tool to tap slinger into place.

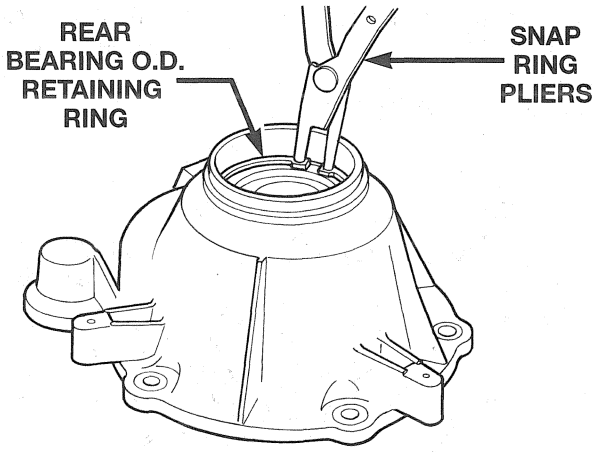


Fig. 70 Rear Bearing Retaining Ring Installation

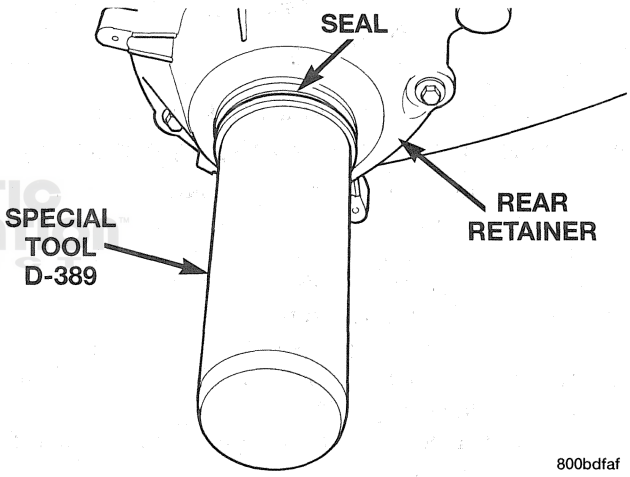


Fig. 71 Rear Seal Installation

(9) Install boot on mainshaft and slinger. Secure boot to slinger with new band clamp.

FRONT YOKE AND SWITCH INSTALLATION

(1) Install vacuum or indicator switch in front case. Tighten switch to 20–34 N.m (15–25 ft. lbs.) torque.

(2) Lubricate yoke hub with transmission fluid and install yoke on front shaft.

(3) Install new seal washer on front shaft.

(4) Install yoke on front shaft. Secure yoke with new nut.

CLEANING AND INSPECTION

NV231 TRANSFER CASE

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

CLEANING AND INSPECTION (Continued)

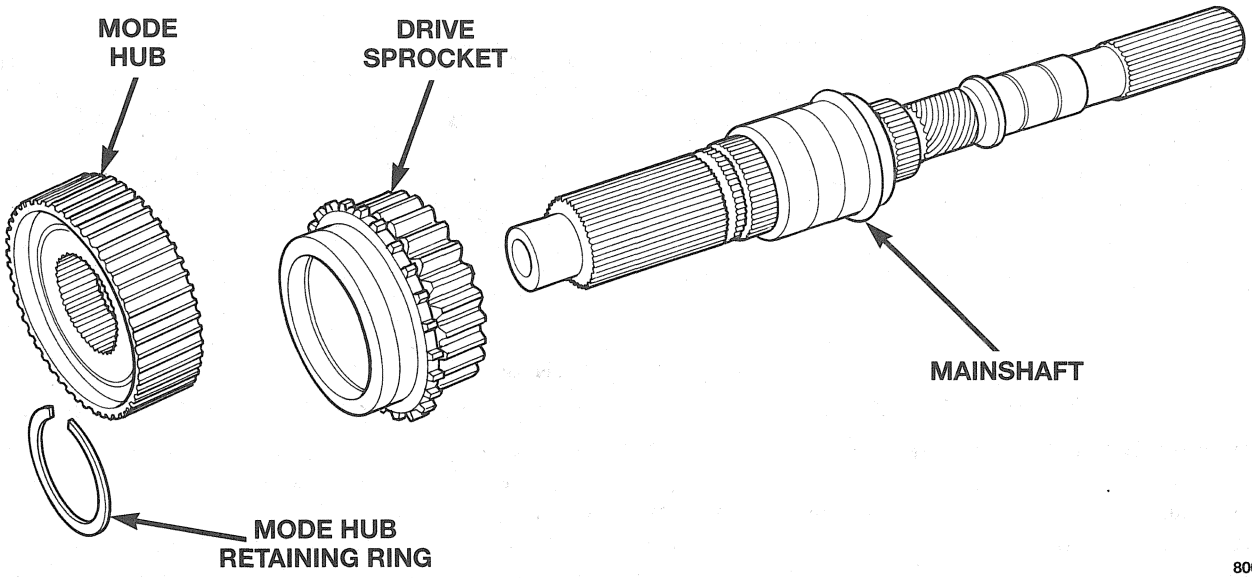


Fig. 72 Mainshaft, Mode Hub, And Drive Sprocket

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket (Fig. 72). Minor nicks and scratches can be smoothed with an oilstone, however, replace any part is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320–400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 73). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300–400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced

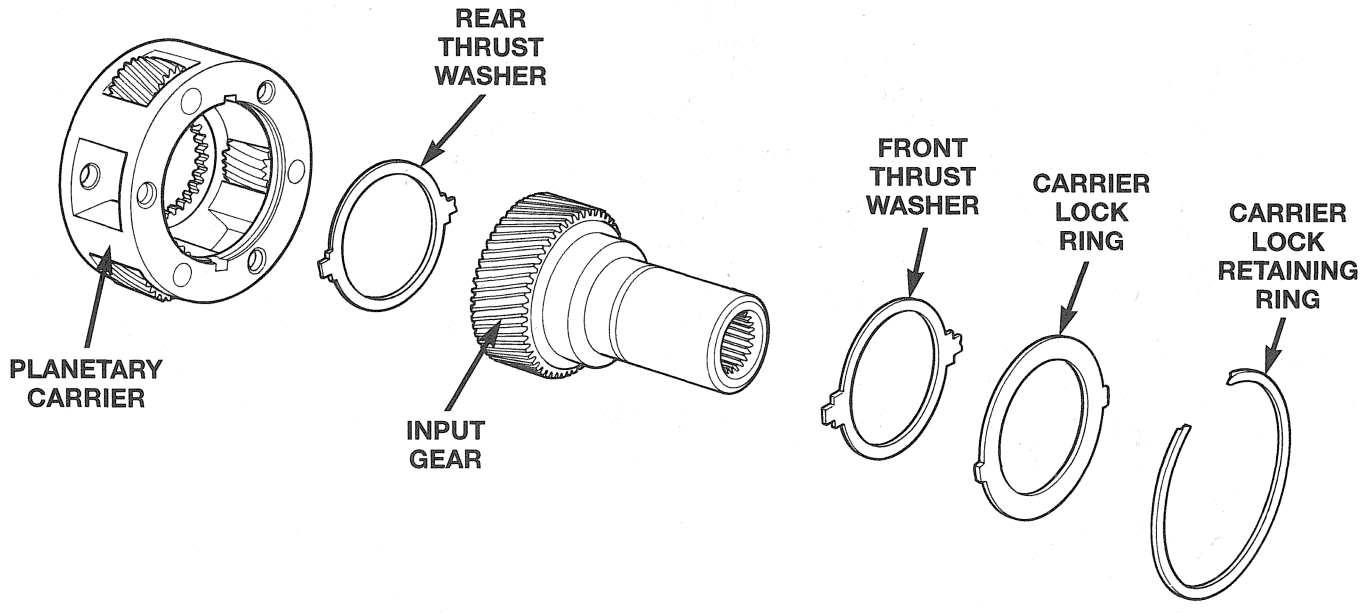


Fig. 73 Input Gear And Carrier Components

CLEANING AND INSPECTION (Continued)

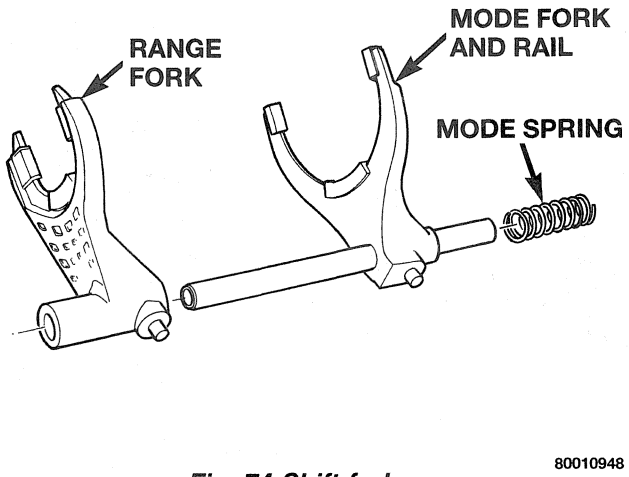


Fig. 74 Shift forks

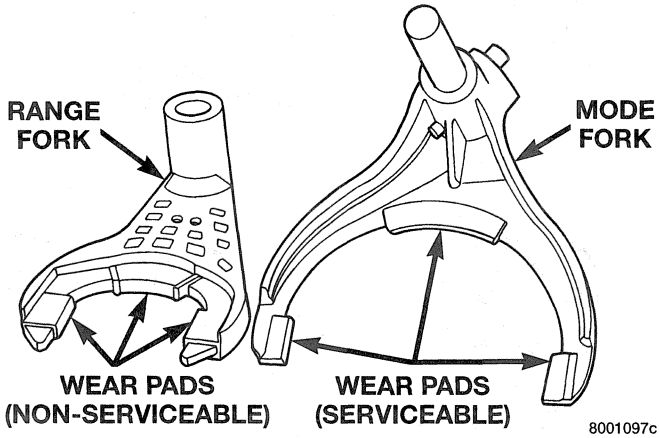


Fig. 75 Shift Fork And Wear Pad Locations

as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 74). Minor nicks on the shift rail can be smoothed with 320–400 grit emery cloth.

Inspect the shift fork wear pads (Fig. 75). The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are not serviceable. The fork must be replaced as an assembly if the pads are worn or damaged.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/ BOOT

Inspect the retainer components (Fig. 76). Replace the bearing if rough or noisy. Check the retainer for

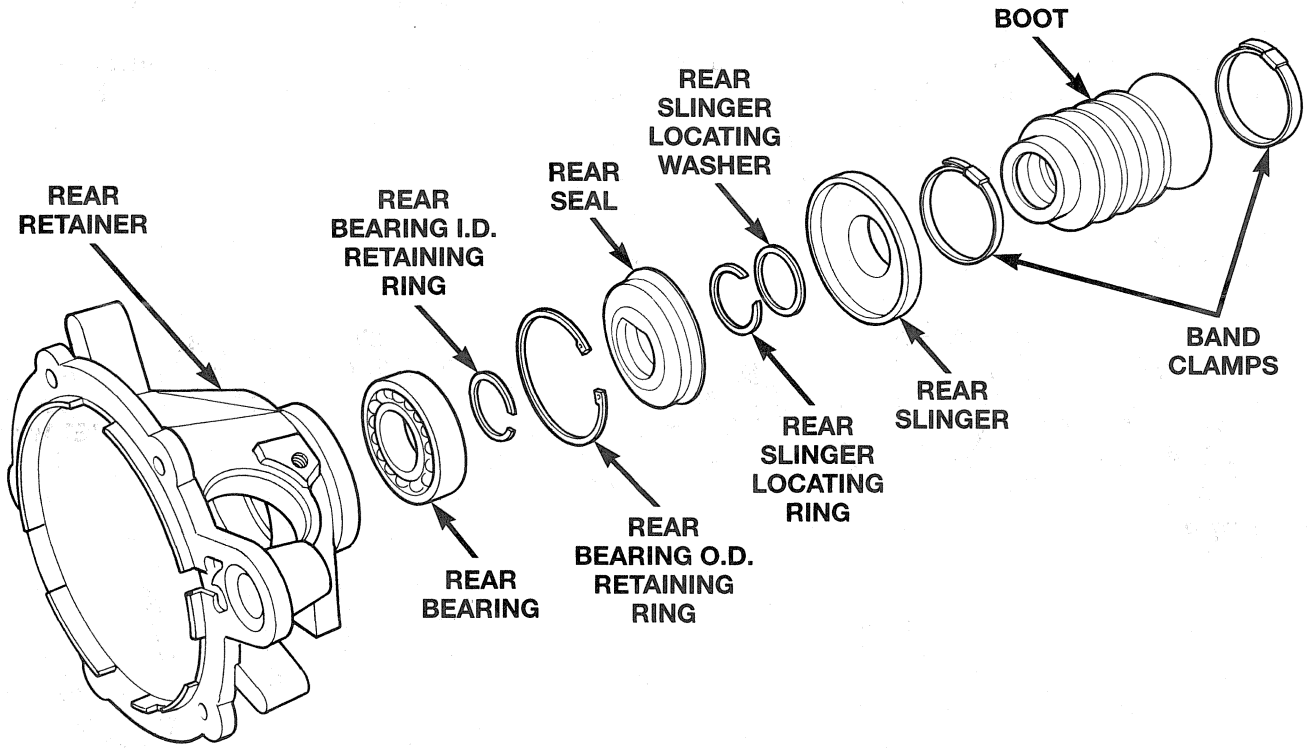


Fig. 76 Rear Retainer Components

CLEANING AND INSPECTION (Continued)

cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Inspect the retaining rings and washers. Replace any part if distorted, bent, or broken. Reuse is not recommended. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 77). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320–400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. replace the chain if stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

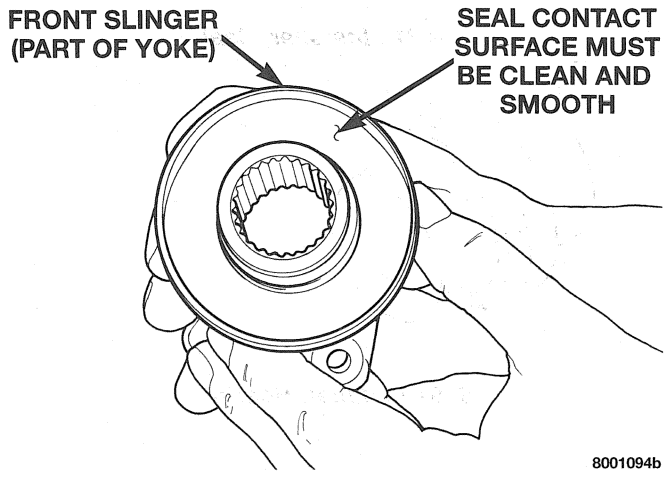


Fig. 77 Seal Contact Surface Of Yoke Slinger

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 78)

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and

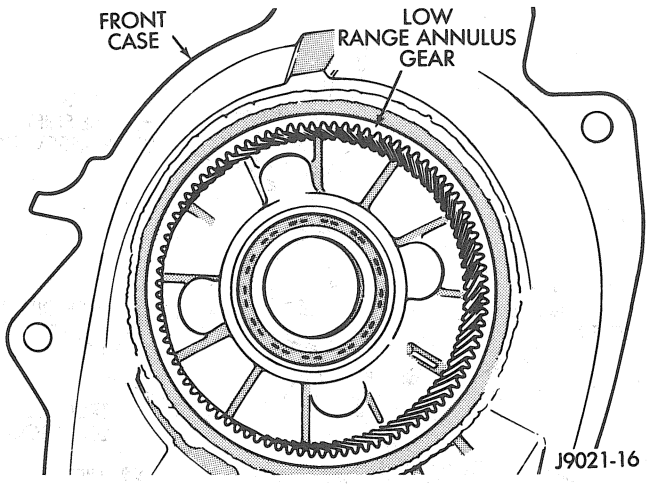


Fig. 78 Low Range Annulus Gear

3M all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT

(1) Shift transfer case into 4L position.
(2) Raise vehicle.
(3) Loosen lock bolt on adjusting trunnion (Fig. 79).
(4) Be sure linkage rod slides freely in trunnion. Clean rod and apply spray lube if necessary.
(5) Verify that transfer case range lever is fully engaged in 4L position.
(6) Tighten adjusting trunnion lock bolt.
(7) Lower vehicle.

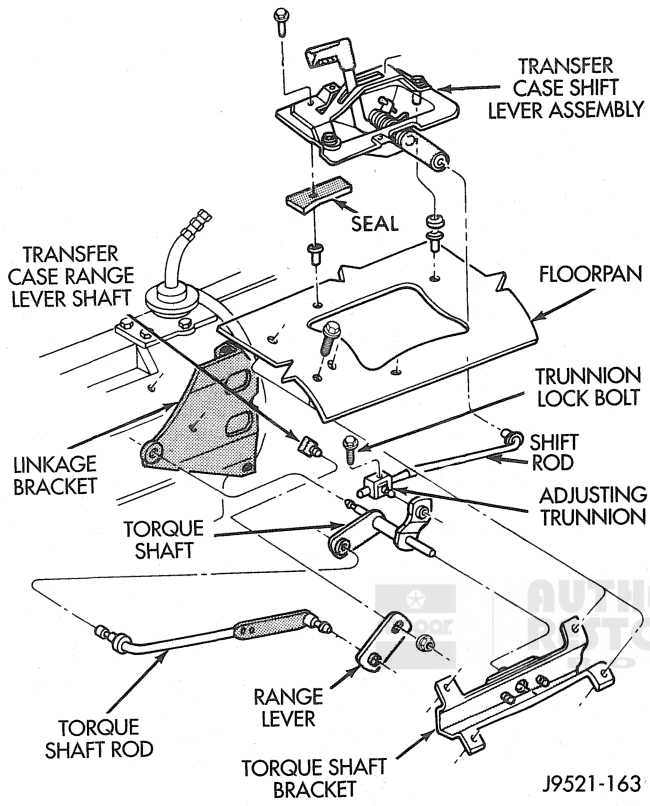


Fig. 79 Shift Linkage

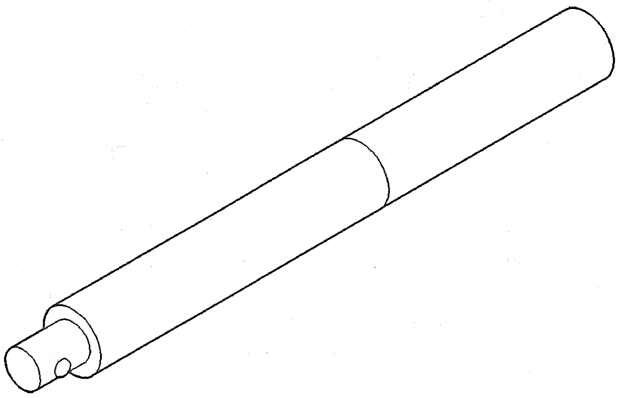
SPECIFICATIONS

TORQUE

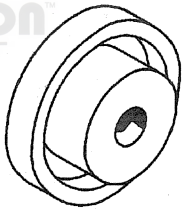
DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Bolt, Diff. Case	17–27 N·m (15–24 ft. lbs.)
Plug, Drain/Fill	40–45 N·m (30–40 ft. lbs.)
Bolt, Extension Housing	35–46 N·m (26–34 ft. lbs.)
Bolt, Front Brg. Retainer	16–27 N·m (12–20 ft. lbs.)
Bolt, Case Half	35–46 N·m (26–34 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Screw, Oil Pump	1.2–1.8 N·m (12–15 in. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35–47 N·m (26–35 ft. lbs.)
Bolts, U-Joint	19 N·m (17 ft. lbs.)
Vacuum Switch	20–34 N·m (15–25 ft. lbs.)

SPECIAL TOOLS

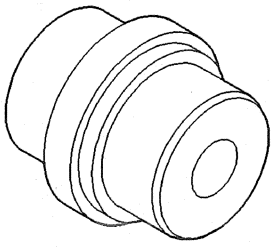
NV231



C-4171 Handle Universal (Non Threaded)

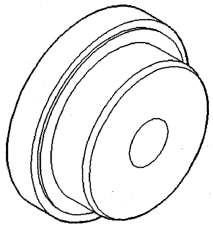


C-4210 Installer, Seal

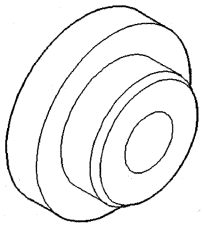


5061 Installer, Bearing

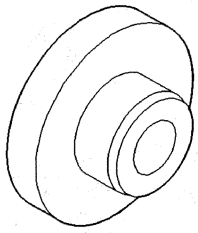
SPECIAL TOOLS (Continued)



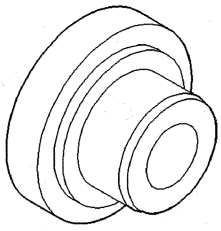
5062 Installer, Bearing



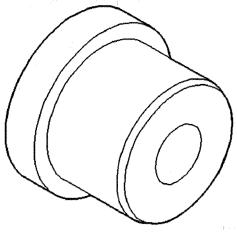
5063 Installer, Bearing



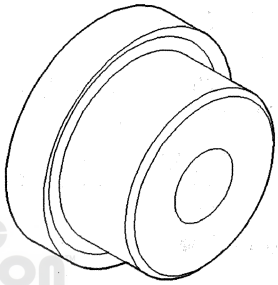
5064 Installer, Bearing



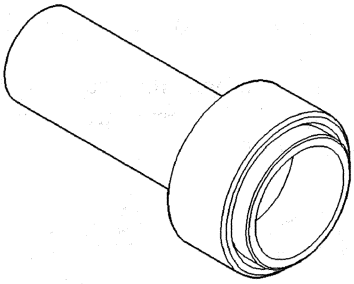
5065 Installer, Bearing



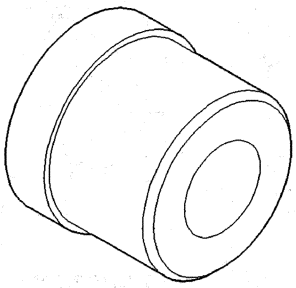
5066 Installer, Bushing



7828-A Installer, Input Gear Bearing



7888 Installer, Pump Housing Seal



7889-A Remover, Rear Output Shaft Bushing

NV242 TRANSFER CASE

INDEX

	page
GENERAL INFORMATION	
TRANSFER CASE IDENTIFICATION	312
DESCRIPTION AND OPERATION	
GENERAL INFORMATION	312
DIAGNOSIS AND TESTING	
NV242 TRANSFER CASE DIAGNOSIS	313
SERVICE PROCEDURES	
RECOMMENDED LUBRICANT AND FILL LEVEL	314
REMOVAL AND INSTALLATION	
NV231 TRANSFER CASE	314
SHIFT LEVER	314
DISASSEMBLY AND ASSEMBLY	
NV242 TRANSFER CASE	315
CLEANING AND INSPECTION	
NV242 TRANSFER CASE	336
ADJUSTMENTS	
SHIFT LINKAGE ADJUSTMENT	337
SPECIFICATIONS	
TORQUE	337
SPECIAL TOOLS	
NV242	338

GENERAL INFORMATION

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 1). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build. For example, a serial number of 7-10-95 would represent July 10, 1995.

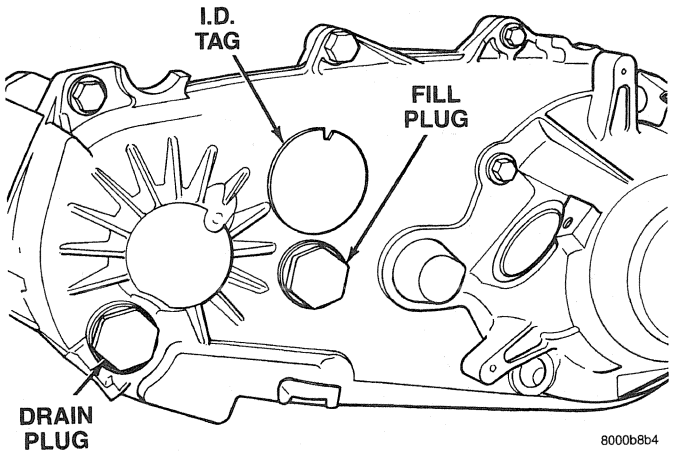


Fig. 1 Fill/Drain Plug And I.D. Tag Locations

DESCRIPTION AND OPERATION

GENERAL INFORMATION

The NP242 is a full and part-time transfer case (Fig. 2). It provides full time 2-wheel, or 4-wheel drive operation. The NP242 is used in XJ models.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

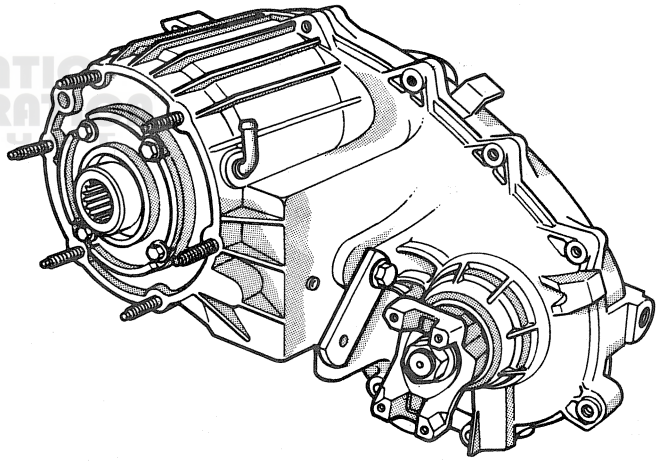


Fig. 2 NP242 Transfer Case

OPERATING RANGES

NP242 operating ranges are 2WD (2-wheel drive), 4x4 part-time, 4x4 full time, and 4 Lo.

The 2WD and 4x4 full time ranges can be used at any time and on any road surface.

The 4x4 part-time and 4 Lo ranges are for off road use only. The only time these ranges can be used on hard surface roads, is when the surface is covered with snow and ice.

SHIFT MECHANISM

Transfer case operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. Range positions are marked on the shift knob or shifter bezel plate.

DIAGNOSIS AND TESTING

NV242 TRANSFER CASE DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Transfer case external shift linkage binding.	(1) Lubricate, repair or replace linkage, or tighten loose components as necessary.
	(2) Insufficient or incorrect lubricant.	(2) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid.
	(3) Internal components binding, worn or damaged.	(3) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE POSITIONS	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. Check for leaks and repair if necessary **Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.**
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clear or replace vent if necessary.
	(3) Output shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.
TRANSFER CASE WILL NOT SHIFT THROUGH 4 X 4 PART-TIME RANGE (Light Remains On).	(1) Incomplete shift due to drivetrain torque load.	(1) Driver must momentarily release the accelerator pedal to complete the shift.
	(2) Incorrect tire pressure(s).	(2) Inflate all tires equally to correct pressure.
	(3) Excessive tire wear.	(3) Switch tires — Install the two tires with the most wear (one on the front axle and one on the rear axle).
	(4) Excessive vehicle loading.	(4) Check vehicle loading — **Do not exceed the vehicle's GVW.**

Mopar AUTHENTIC RESTORATION PRODUCT

SERVICE PROCEDURES

RECOMMENDED LUBRICANT AND FILL LEVEL

Recommended lubricant for the NV 231 transfer case is Mopar Dexron II, or ATF Plus. Approximate lubricant fill capacity is 1.18 liters (2.2 pints).

The fill and drain plugs are both in the rear case (Fig. 1). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

REMOVAL AND INSTALLATION

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.
(2) Raise vehicle.
(3) Loosen adjusting trunnion locknut and slide shift rod out of trunnion (Fig. 3). If rod lacks enough travel to come out of trunnion, push trunnion out of torque shaft.
(4) Lower vehicle.
(5) Remove console. Refer to park brake section in Group 5 for procedures.
(6) Remove screws attaching lever assembly to floorpan and remove assembly and shift rod (if left attached).

INSTALLATION

(1) If shift rod was not removed from lever assembly, work rod down through floorpan opening. Then position lever assembly on floorpan and install assembly attaching screws.
(2) Install console.
(3) Raise vehicle.
(4) Connect trunnion to torque shaft arm. Or, slide shift rod into trunnion on range lever. Be sure shift rod slides freely in trunnion.
(5) Verify that range lever is in 4L position. Then tighten trunnion lock bolt.
(6) Lower vehicle and check transfer case shift operation.

NV231 TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.
(2) Raise vehicle.
(3) Drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember, or skid plate.
(7) Disconnect front/rear propeller shafts at transfer case.

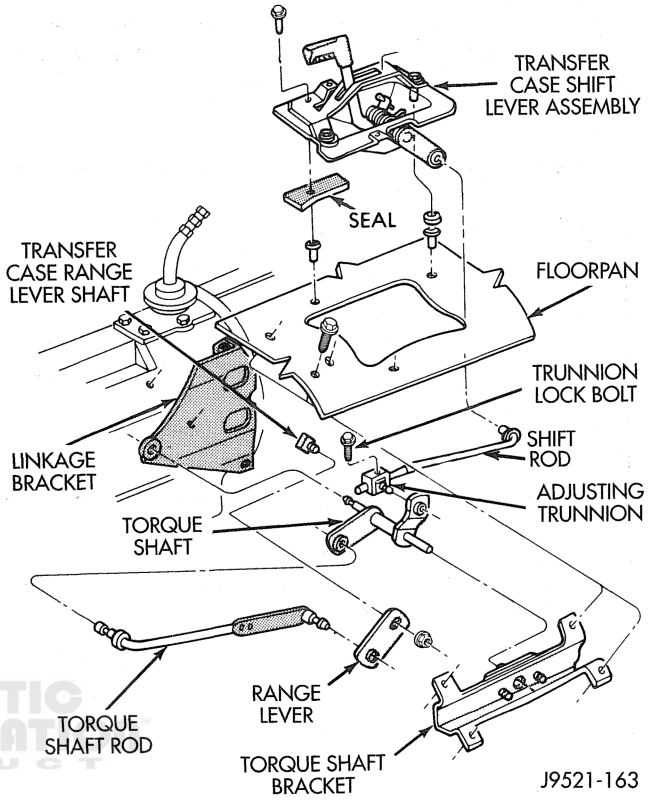


Fig. 3 Shift Linkage

(8) Disconnect vehicle speed sensor wires.
(9) Disconnect transfer case linkage rod from range lever.
(10) Disconnect transfer case vent hose, and indicator or vacuum switch harness.
(11) Support transfer case with transmission jack.
(12) Remove nuts attaching transfer case to transmission.
(13) Secure transfer case to jack with chains.
(14) Pull transfer case and jack rearward to disengage transfer case.
(15) Remove transfer case from under vehicle.
(16) If transfer case was removed for overhaul, remove damper from rear retainer.

TRANSFER CASE INSTALLATION

(1) Mount transfer case on a transmission jack. Secure transfer case to jack with chains.
(2) Position transfer case under vehicle.
(3) Align transfer case and transmission shafts and install transfer case on transmission.
(4) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.
(5) Install damper on rear retainer (Fig. 4). Tighten damper attaching nuts to 54 N·m (40 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

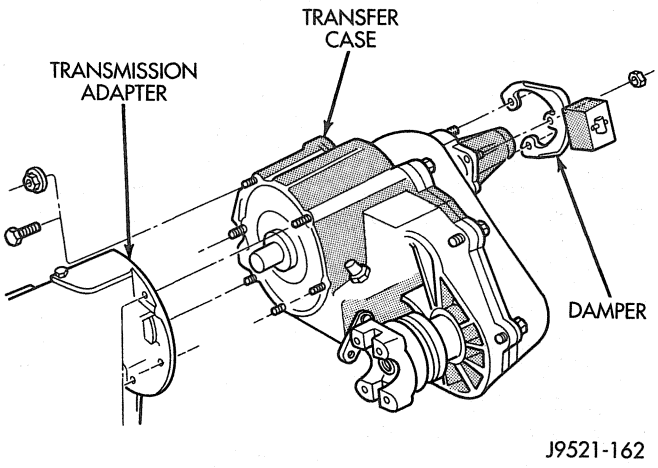


Fig. 4 Transfer Case Mounting

(6) Connect vehicle speed sensor wires, and vent hose.

(7) Connect indicator or vacuum switch harness to transfer case switch. Secure wire harnesses to clips on transfer case.

(8) Align and connect propeller shafts. Tighten shaft attaching bolts to 19 N·m (170 in. lbs.) torque.

(9) Fill transfer case with Mopar Dexron II fluid.

(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(11) Remove transmission jack and support stand.

(12) Connect shift rod to transfer case range lever.

(13) Adjust transfer case shift linkage.

(14) Lower vehicle and verify transfer case shift operation.

DISASSEMBLY AND ASSEMBLY

NV242 TRANSFER CASE

DISASSEMBLE

(1) Remove fill and drain plugs.

(2) Remove front yoke. Discard yoke seal washer and nut.

(3) Place transfer case range lever in 4L position.

(4) Remove extension housing attaching bolts.

(5) Tap extension housing in a clockwise direction to break sealer bead and remove housing (Fig. 5).

CAUTION: To avoid damaging the sealing surfaces of the extension housing and rear retainer, do not attempt to pry or wedge the housing off the retainer.

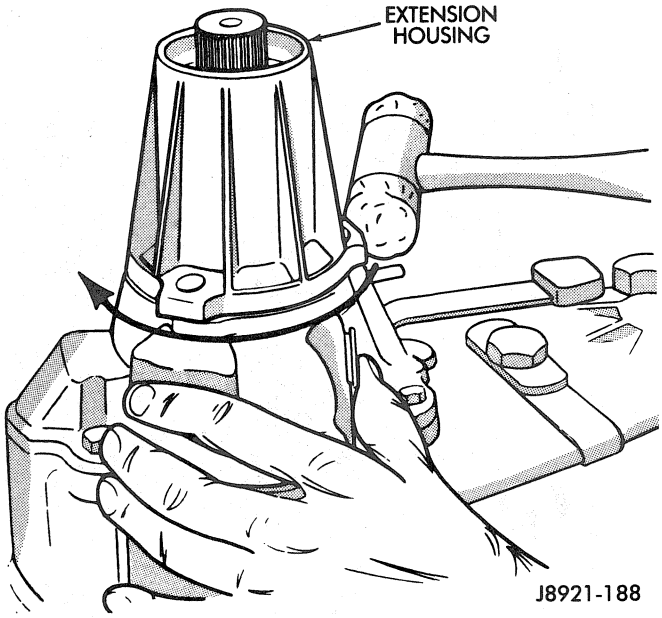


Fig. 5 Extension Housing Removal

(6) Remove rear bearing snap ring from mainshaft (Fig. 6). Discard snap ring.

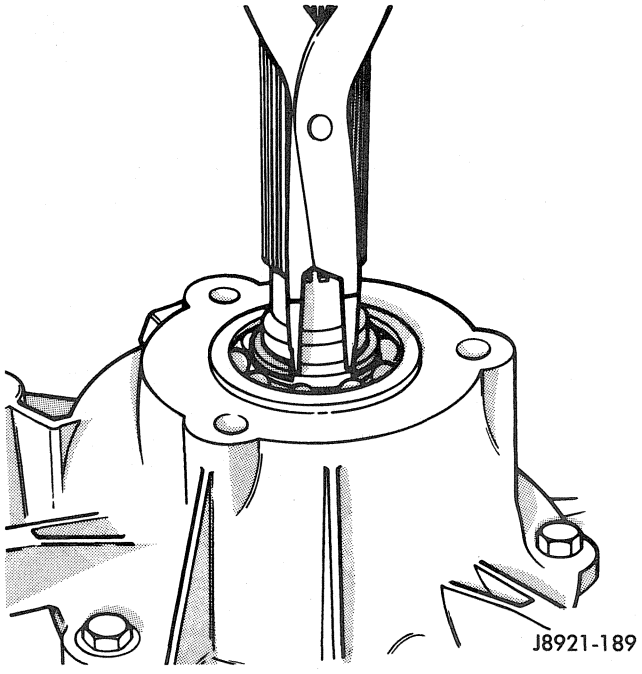


Fig. 6 Removing Rear Bearing Snap Ring

(7) Remove rear retainer attaching bolts.

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Loosen rear retainer (Fig. 7). Position long screwdriver under each tab at ends of retainer housing and pry retainer upward.

CAUTION: Do not pry against the sealing surfaces of the retainer or rear case. The surfaces could be damaged.

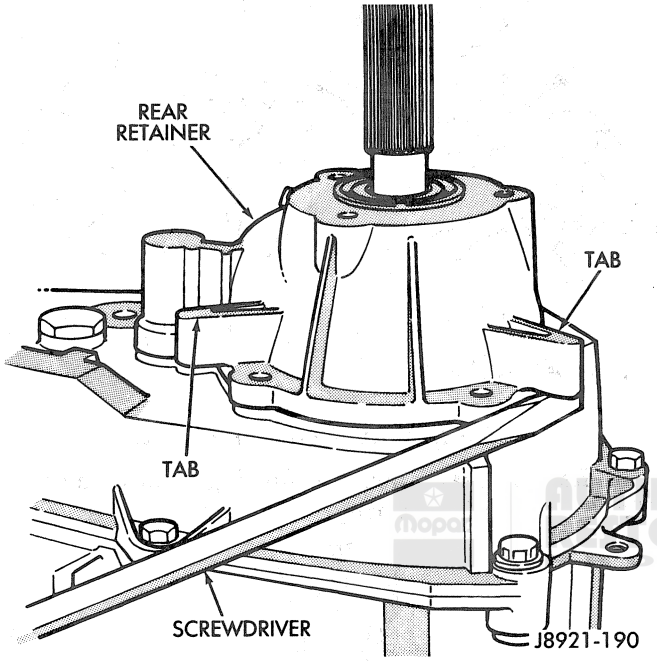


Fig. 7 Loosening Rear Retainer

(9) Lift rear retainer up and off case and mainshaft (Fig. 8).

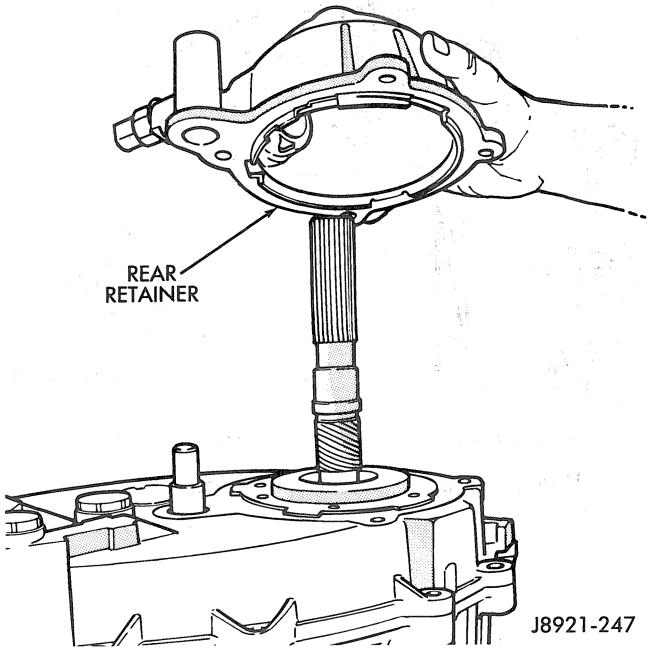


Fig. 8 Rear Retainer Removal

(10) Remove bolts attaching rear case to front case. Retain bolts and the washers.

(11) Loosen rear case with two screwdrivers (Fig. 9). Insert screwdrivers into slots cast in case ends. Then gently pry upward to break sealer bead.

CAUTION: Do not pry against the sealing surfaces of the front case or rear case. The surfaces could be damaged.

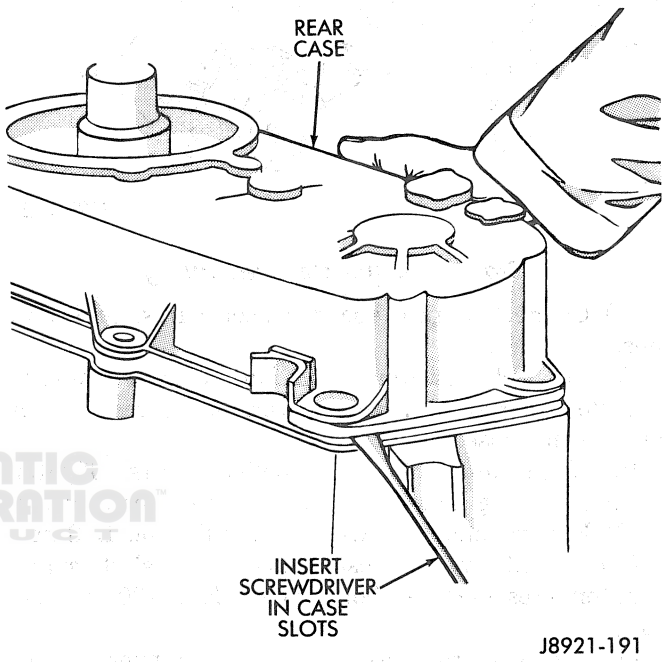


Fig. 9 Loosening Rear Case

(12) Remove rear case and oil pump as assembly (Fig. 10).

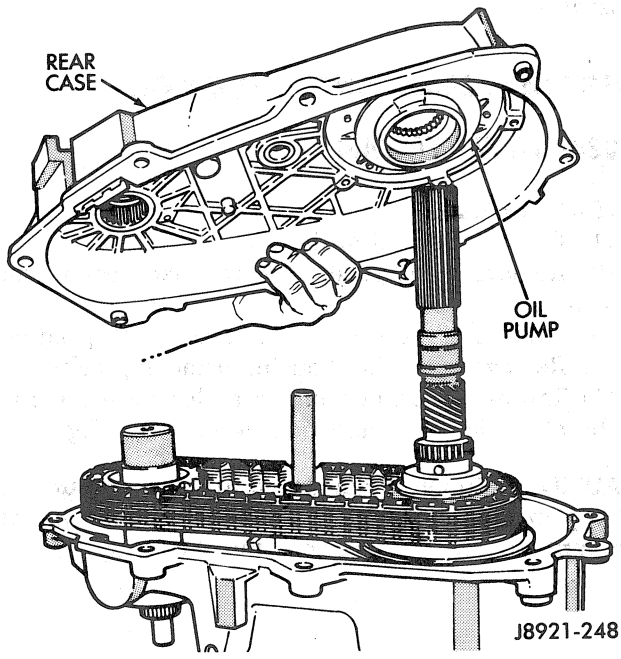


Fig. 10 Rear Case And Oil Pump Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Slide oil screen (Fig. 11) out of case pocket.
(14) Remove oil pump, pickup tube and oil screen from rear case (Fig. 12).

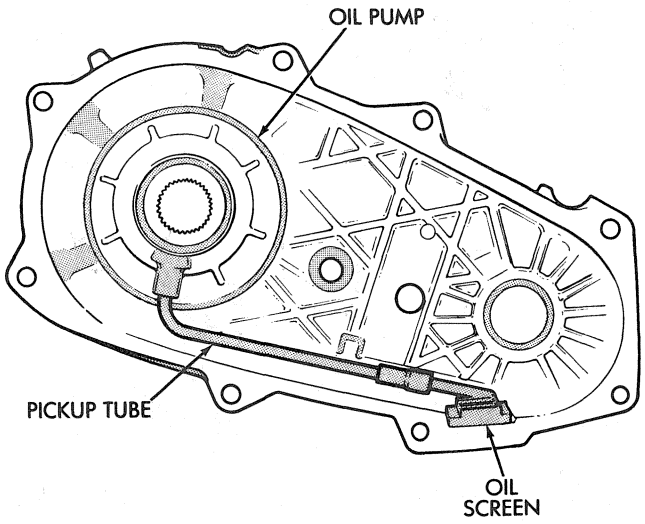


Fig. 11 Unseating Oil Screen

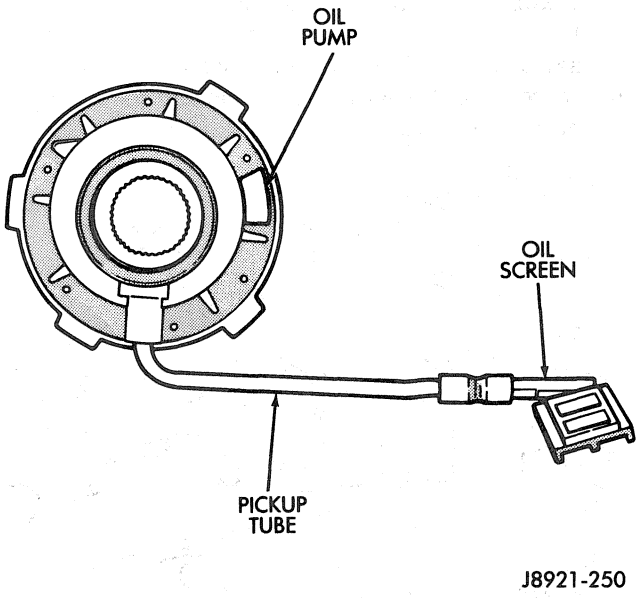


Fig. 12 Oil Pump/Pickup Tube/Screen Removal

(15) Remove pickup tube and screen from pump. **Do not disassemble oil pump; it is not repairable. Pumps are serviced only as an assembly.**
(16) Remove pickup tube O-ring from oil pump (Fig. 13).
(17) Remove and discard oil pump seal.
(18) Remove magnet from front case.
(19) Remove drive sprocket snap ring (Fig. 14).

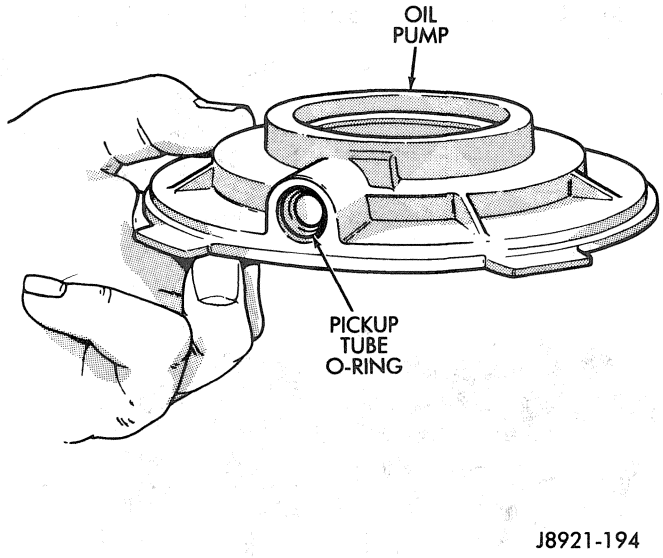


Fig. 13 Pickup Tube O-Ring Removal

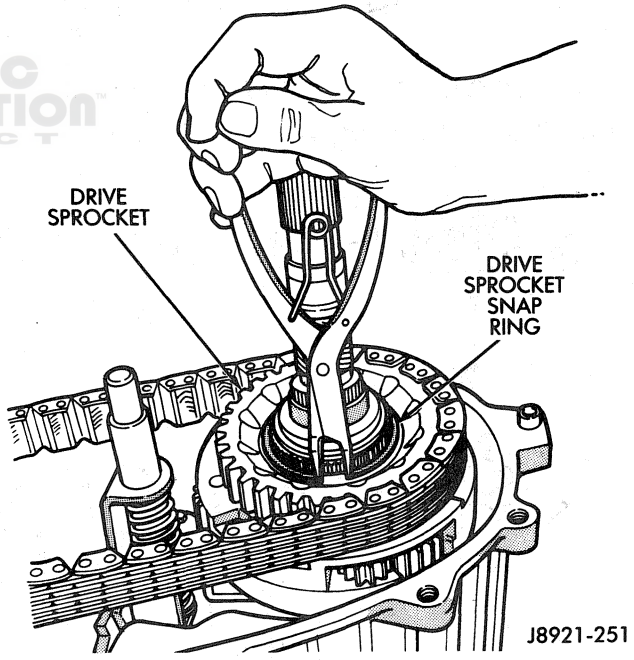


Fig. 14 Drive Sprocket Snap Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(20) Remove drive sprocket and chain (Fig. 15).

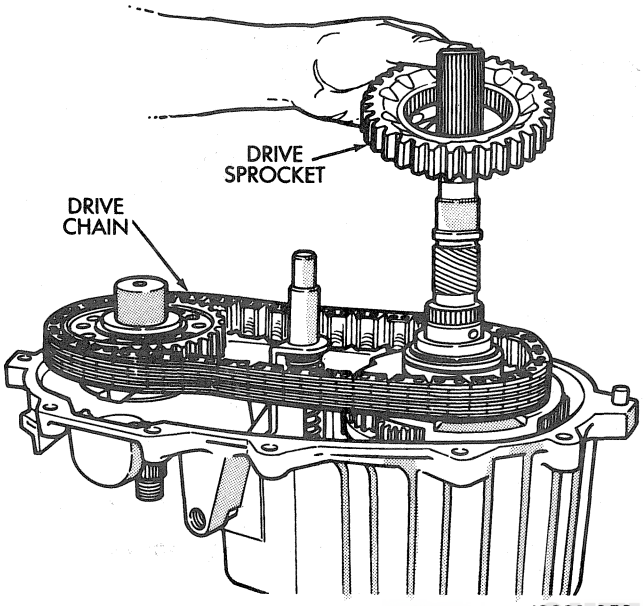


Fig. 15 Drive Sprocket And Chain Removal

(21) Remove front output shaft (Fig. 16).

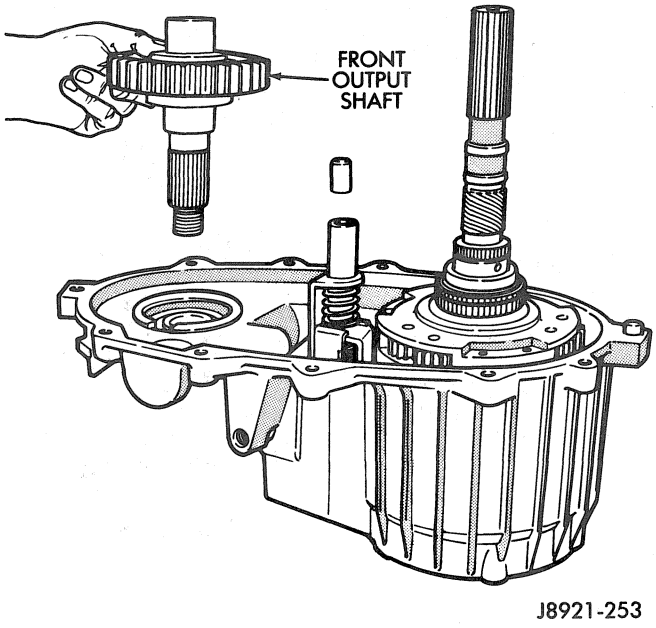


Fig. 16 Removing Front Output Shaft

(22) Remove transfer case shift lever nut and lever.

(23) Remove shift detent plug, spring and pin (Fig. 17).

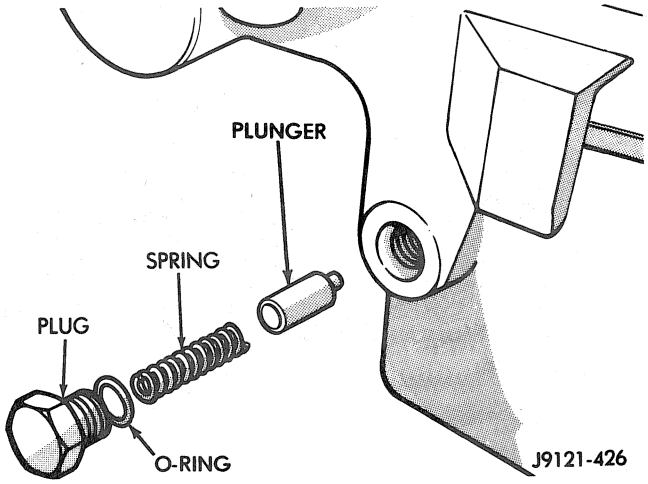


Fig. 17 Detent Component Removal

(24) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole (Fig. 18).

(25) Remove range fork lockpin with size number one easy-out tool. Grip easy-out tool with locking pliers and remove pin with counterclockwise, twist and pull motion (Fig. 18).

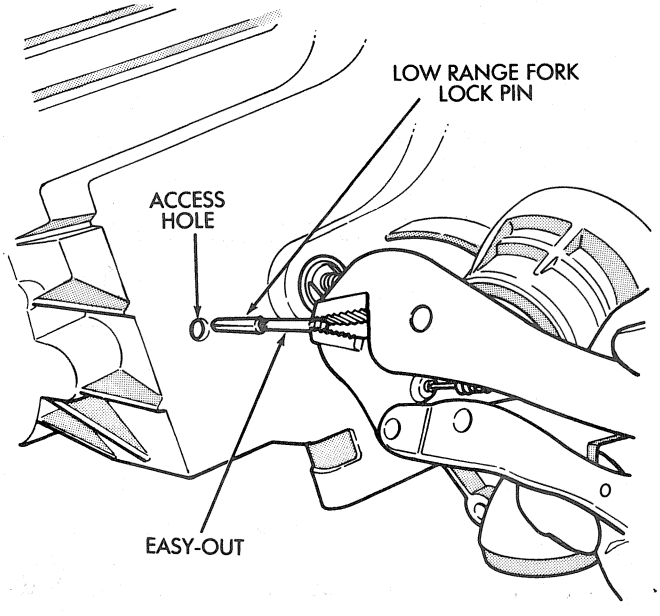


Fig. 18 Low Range Fork Lockpin Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(26) Remove shift rail by pulling it straight up and out of fork (Fig. 19).

(27) Remove mode fork and mainshaft as assembly (Fig. 20).

(28) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 21). Note position of mode sleeve in fork and remove sleeve.

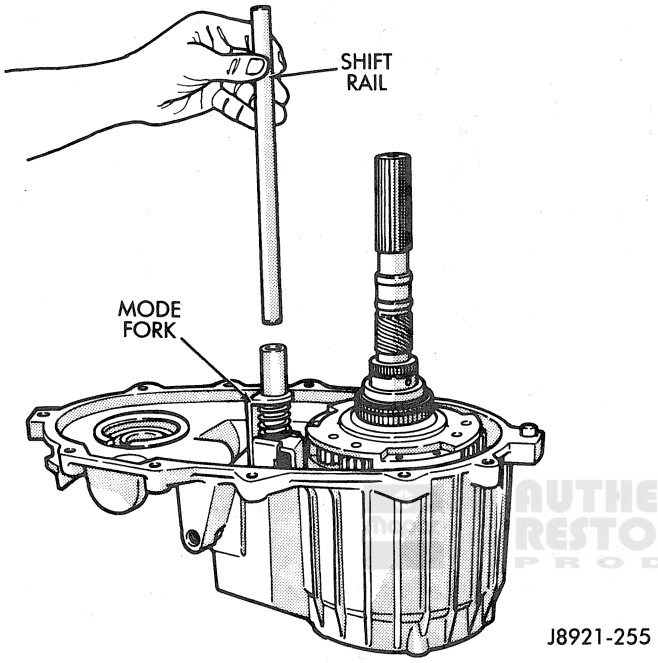


Fig. 19 Shift Rail Removal

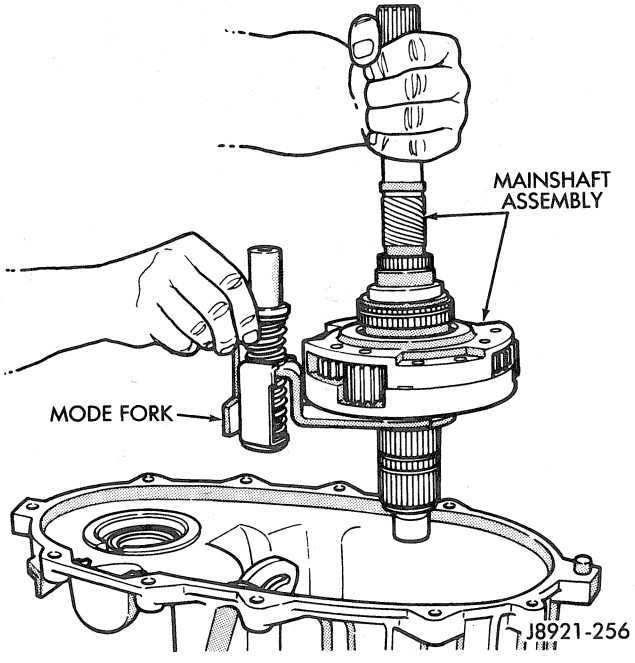


Fig. 20 Mode Fork And Mainshaft Removal

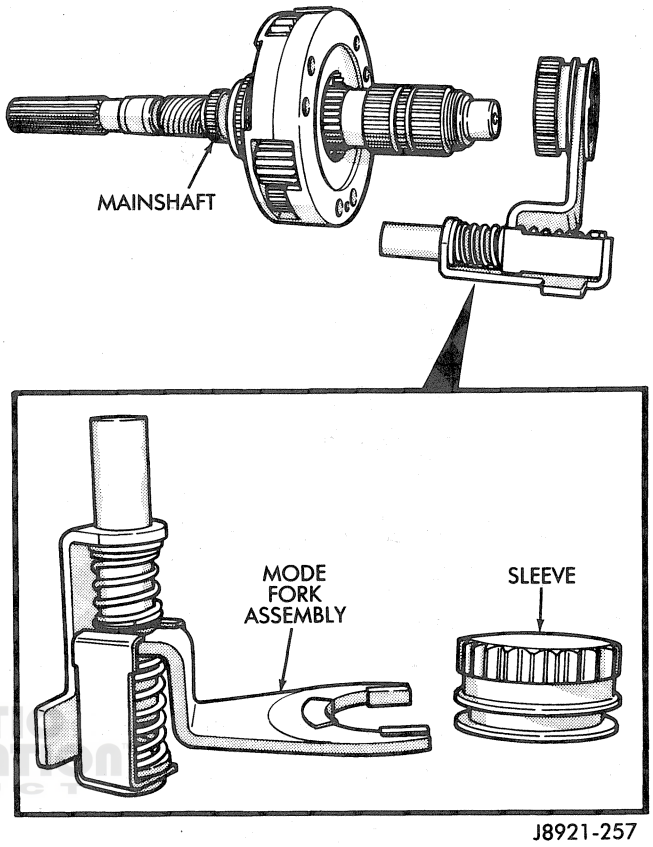


Fig. 21 Mode Fork And Sleeve Removal

(29) Remove intermediate clutch shaft snap ring (Fig. 22).

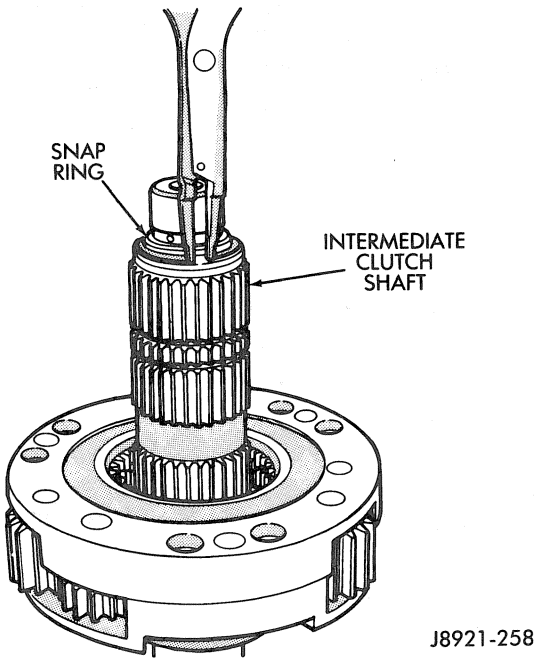


Fig. 22 Intermediate Clutch Shaft Snap Ring Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(30) Remove clutch shaft thrust ring (Fig. 23).

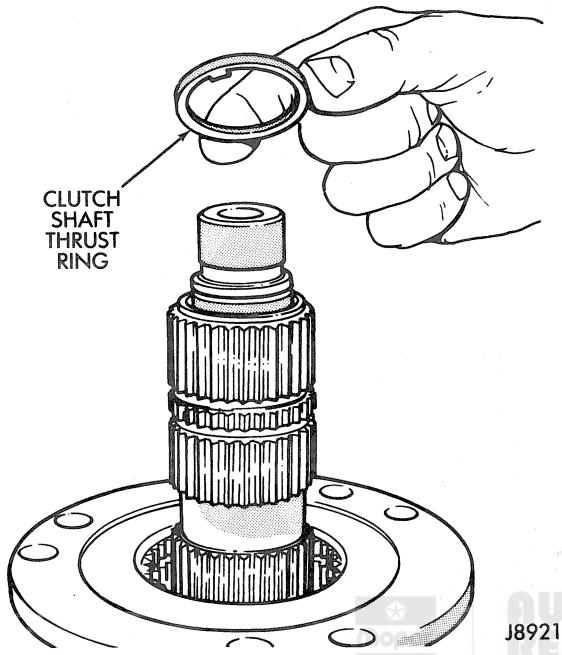


Fig. 23 Clutch Shaft Thrust Ring Removal

(31) Remove intermediate clutch shaft (Fig. 24).

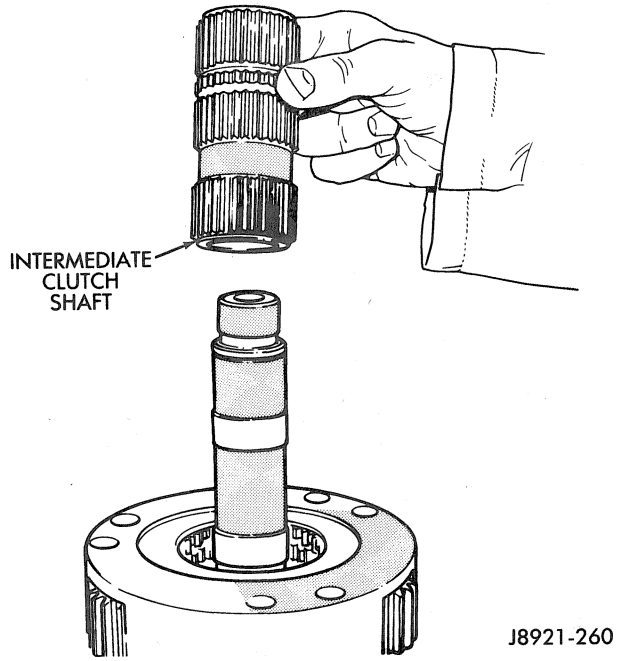


Fig. 24 Intermediate Clutch Shaft Removal

(32) Remove differential snap ring (Fig. 25).

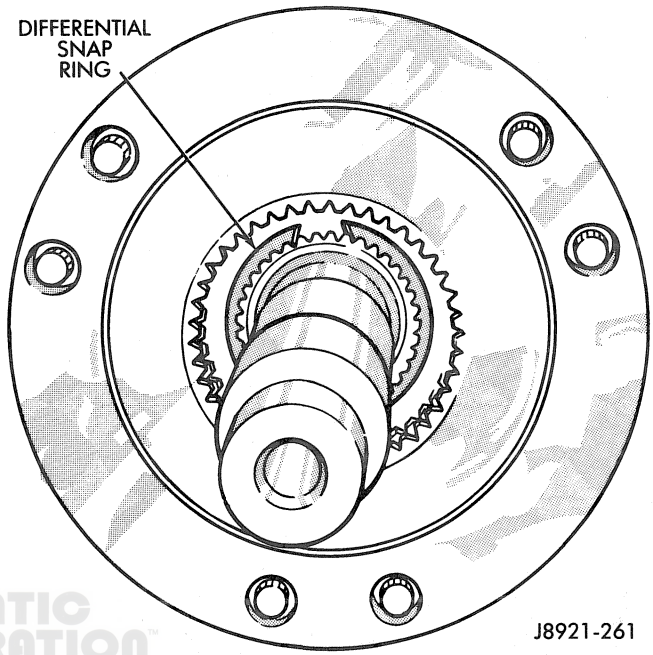


Fig. 25 Differential Snap Ring Removal

(33) Remove differential (Fig. 26).

(34) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

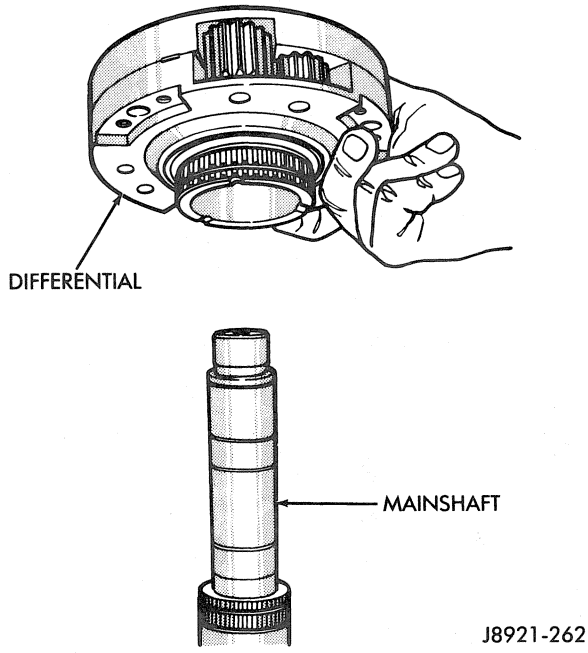


Fig. 26 Differential Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(35) Slide low range fork pin out of shift sector slot (Fig. 27).

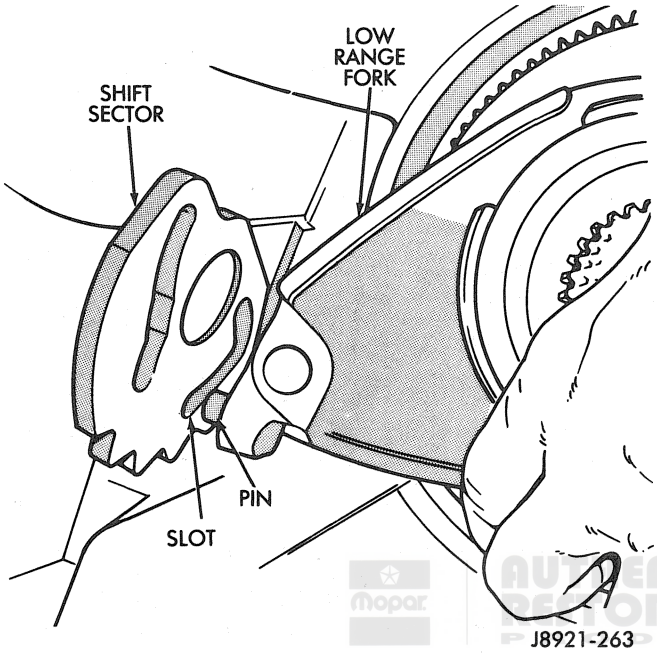


Fig. 27 Disengaging Low Range Fork

(36) Remove low range fork and hub (Fig. 28).

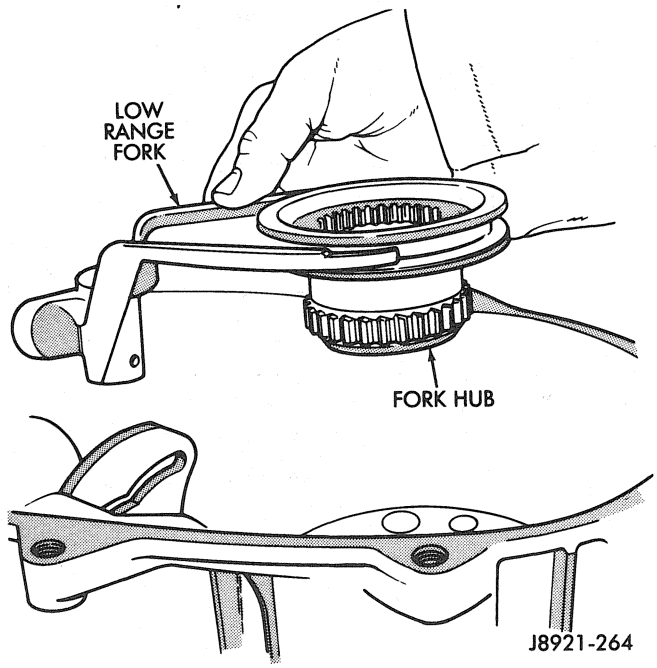


Fig. 28 Low Range Fork And Hub Removal

(37) Remove shift sector (Fig. 29).

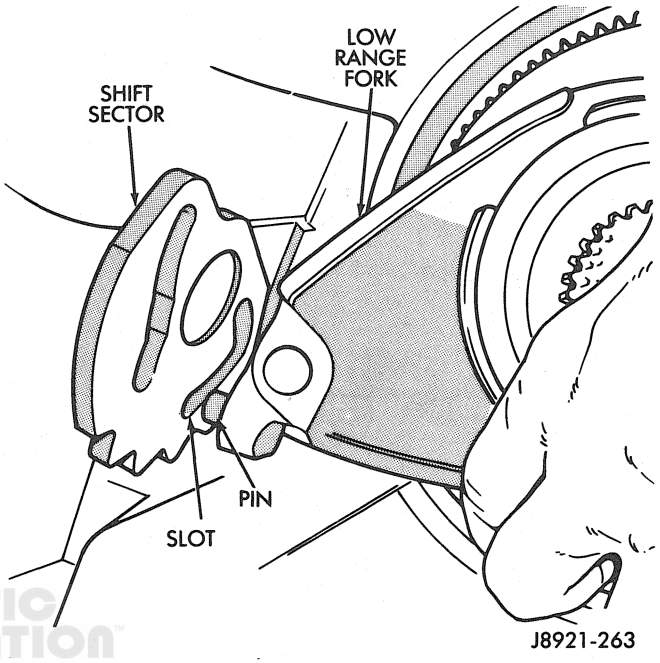


Fig. 29 Shift Sector Position

(38) Remove shift sector bushing and O-ring (Fig. 30).

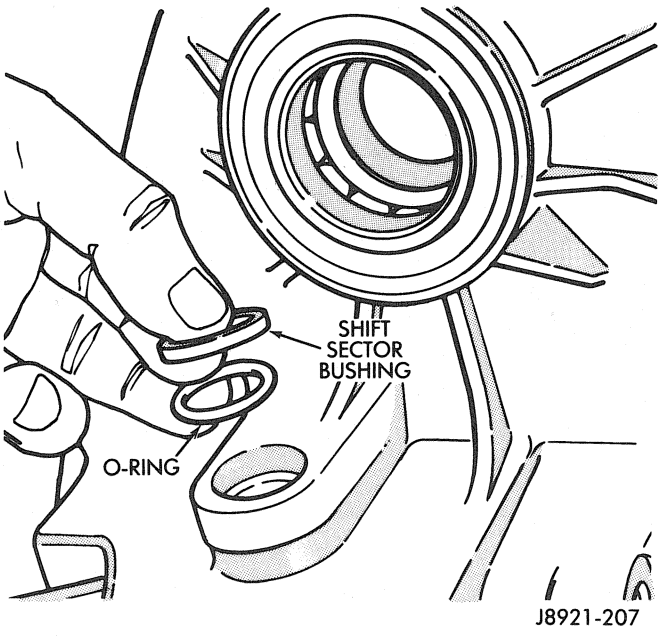


Fig. 30 Sector Bushing And O-Ring Removal

(39) Remove front bearing retainer bolts.

DISASSEMBLY AND ASSEMBLY (Continued)

(40) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 31). Position screwdriver in slots cast into retainer.

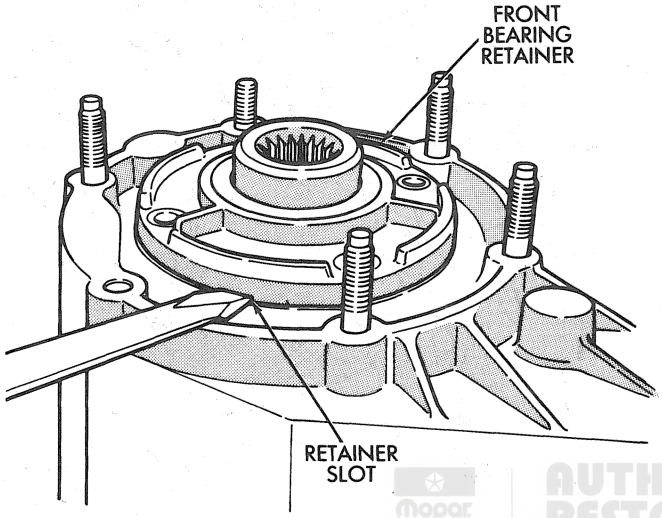


Fig. 31 Front Bearing Retainer Removal

(41) Remove input gear snap ring (Fig. 32).

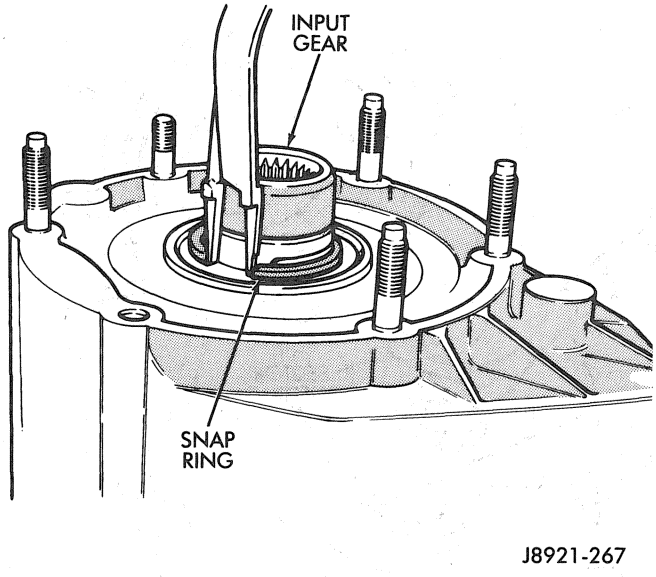


Fig. 32 Input Gear Snap Ring Removal

(42) Remove input/low range gear assembly from bearing with Tool Handle C-4171 and Tool 7829A (Fig. 33).

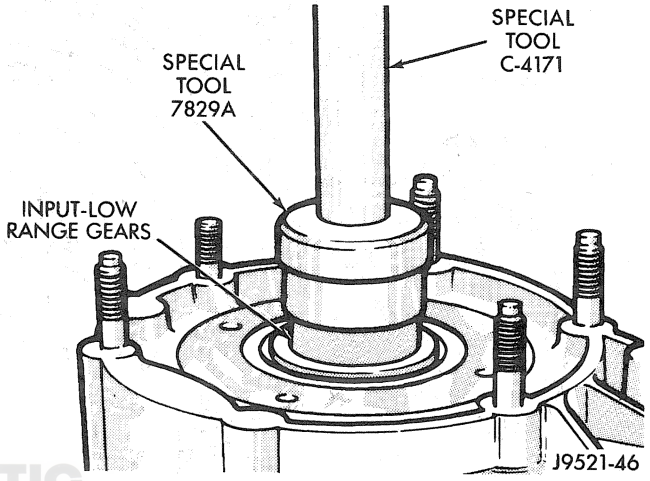


Fig. 33 Input And Low Range Gear Assembly Removal

(43) Remove low range gear snap ring (Fig. 34).

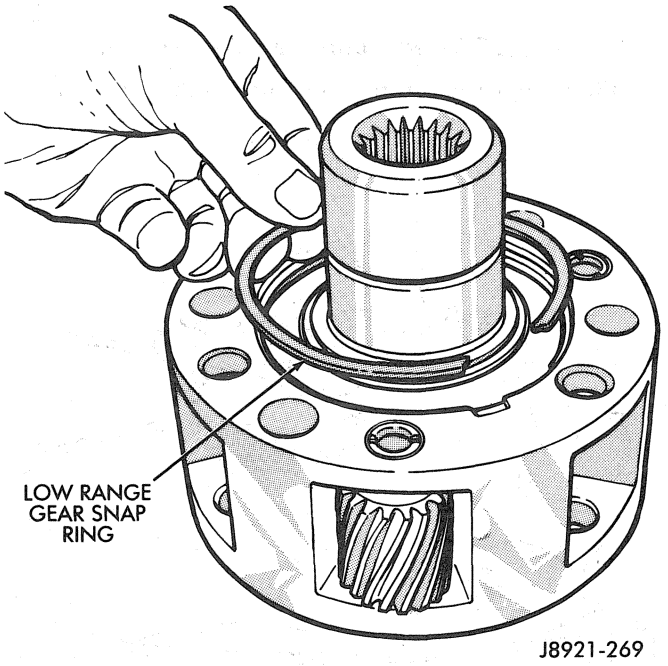


Fig. 34 Low Range Gear Snap Ring Removal/ Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(44) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 35).

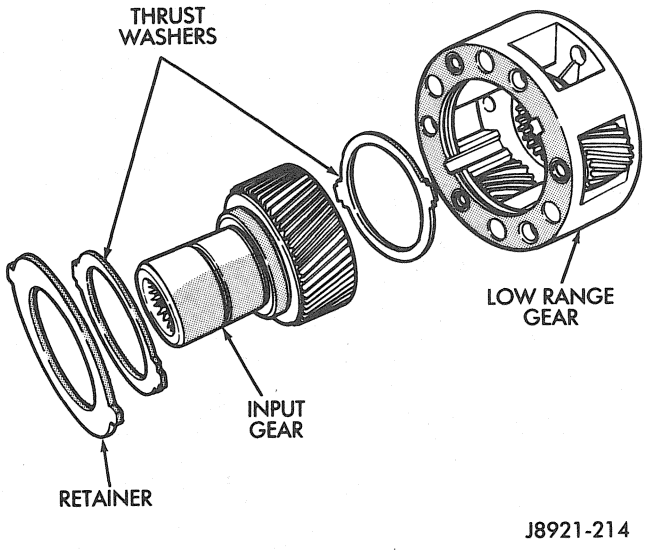


Fig. 35 Low Range Gear Disassembly

(45) Inspect low range annulus gear (Fig. 36). **Gear is not a serviceable component. If damaged, replace gear and front case as assembly.**

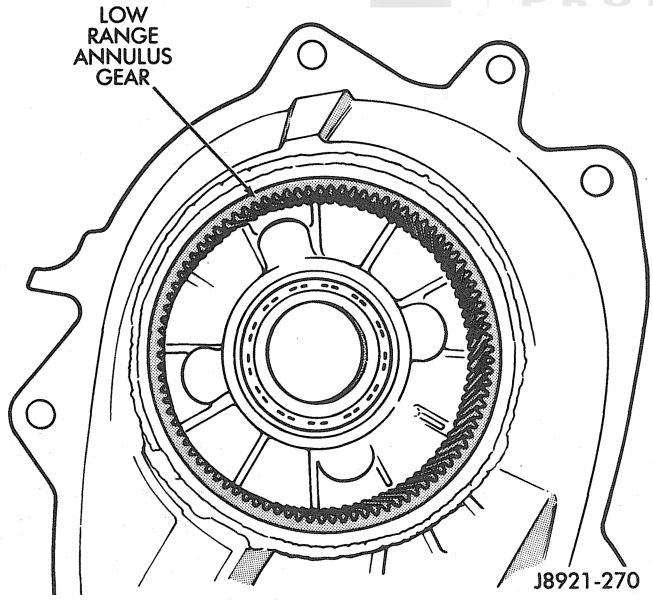


Fig. 36 Inspecting Low Range Annulus Gear

(46) Remove oil seals from following components:
- rear retainer
- extension housing
- oil pump
- case halves

(47) Mark differential case halves for reference.

(48) Remove differential case bolts and separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 37).

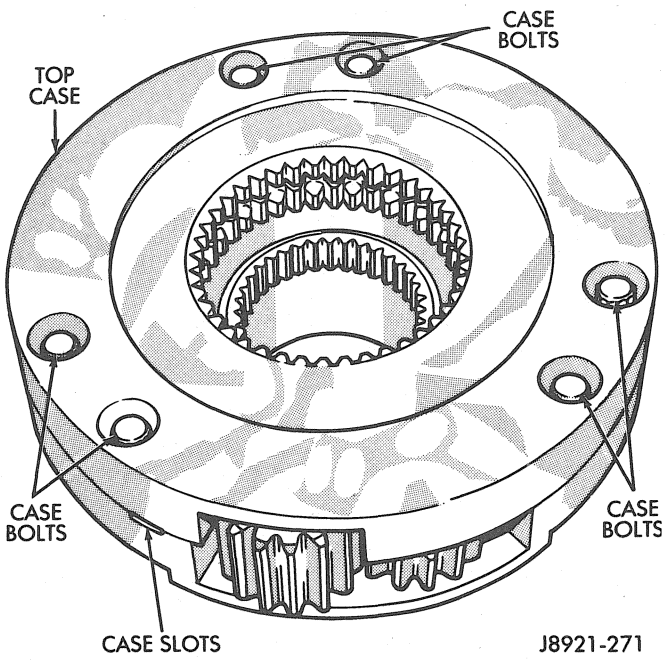


Fig. 37 Separating Differential Case Halves

(49) Remove thrust washers and planet gears from case pins (Fig. 38).

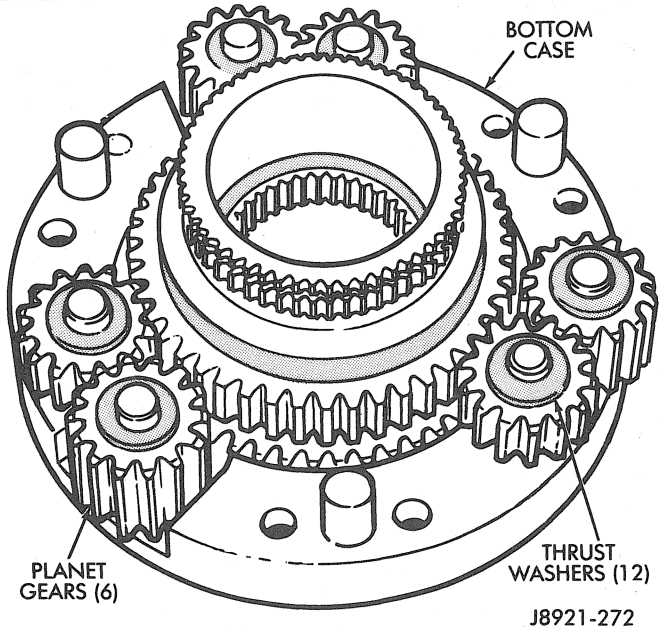


Fig. 38 Planet Gears And Thrust Washer Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(50) Remove mainshaft and sprocket gears from bottom case (Fig. 39). Note gear position for reference before separating them.

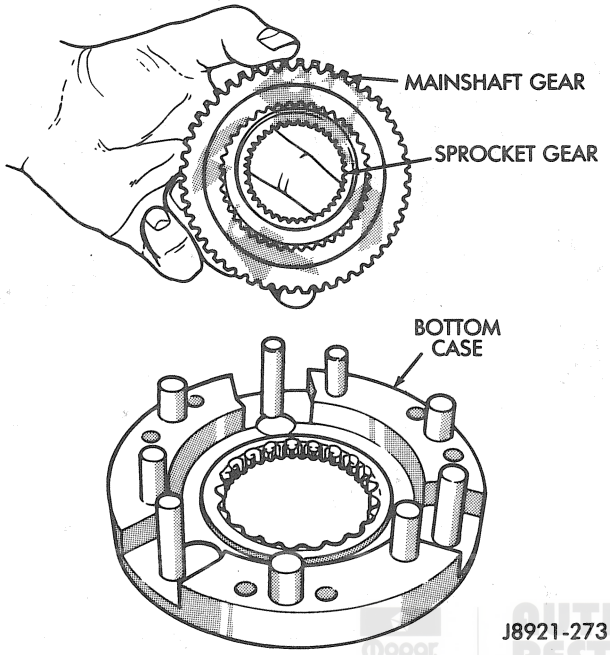


Fig. 39 Mainshaft And Sprocket Gear Removal

NV242 TRANSFER CASE ASSEMBLE

(1) Lubricate transfer case components with automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Be sure replacement bearings do not block these feed holes.

(2) Remove snap ring that retains front output shaft front bearing in case (Fig. 40). Then remove bearing. Use hammer handle, or hammer and brass punch to tap bearing out of case.

(3) Install new front output shaft bearing with Tool Handle C-4171 and Installer 8033A (Fig. 41).

(4) Install front bearing snap ring (Fig. 40).

(5) Install new front output shaft oil seal as follows:

(a) Tap seal into bore until flush with upper edge of case bore. Use suitable size installer tool to start seal into place (Fig. 42).

(b) Seat seal 2.03 to 2.5 mm (0.080 to 0.100 in.) **below** top edge of seal bore in front case (Fig. 43). This is correct final seal position. Use suitable size installer tool or blunt punch to final-seat seal. Check seal depth with a dial caliper or depth micrometer.

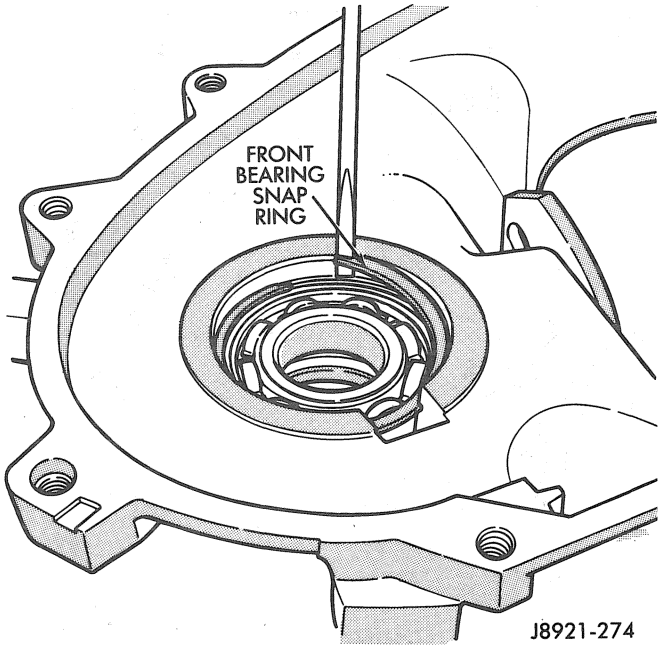


Fig. 40 Front Output Shaft Front Bearing Snap Ring Removal

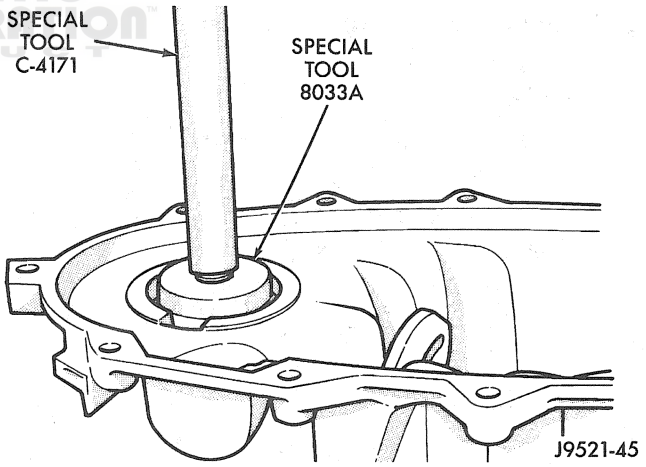


Fig. 41 Front Output Shaft Front Bearing Installation

CAUTION: Be sure the front output seal is seated below the top edge of the case bore as shown (Fig. 43). The seal could work loose if not seated to the recommended depth.

(6) Remove input gear bearing with Tool Handle C-4171 and Remover C-4210 (Fig. 44).

(7) Install snap ring on new input gear bearing.

(8) Install new input gear bearing with shop press and wood block. Install bearing far enough to seat snap ring against case (Fig. 45).

(9) Remove input gear pilot bearing with slide hammer and internal puller (Fig. 46).

(10) Install new pilot bearing with Tool Handle C-4171 and Installer 5065 (Fig. 47).

DISASSEMBLY AND ASSEMBLY (Continued)

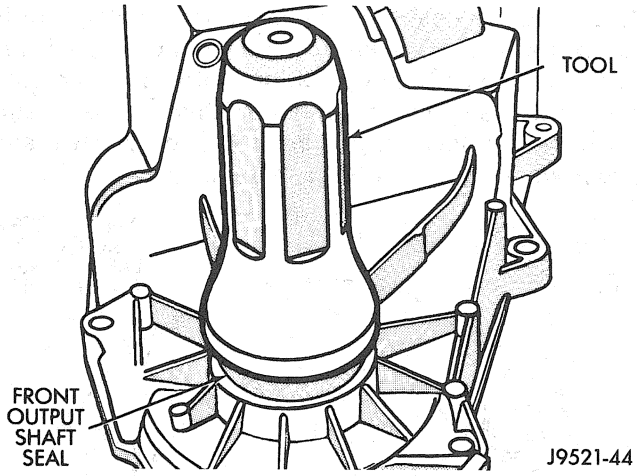


Fig. 42 Starting Front Output Shaft Seal Into Case Bore

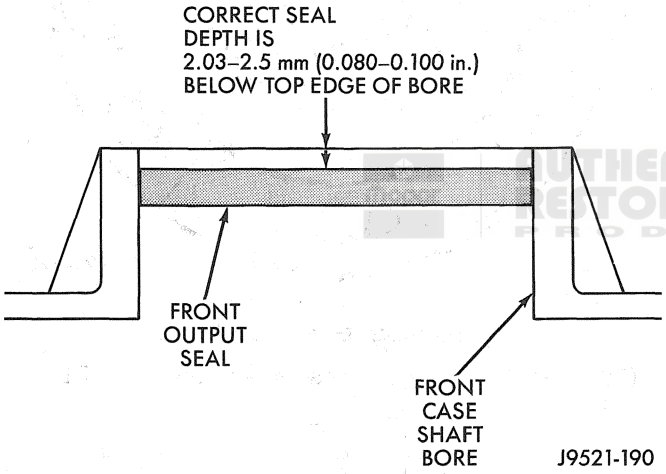


Fig. 43 Front Output Seal Installation Depth

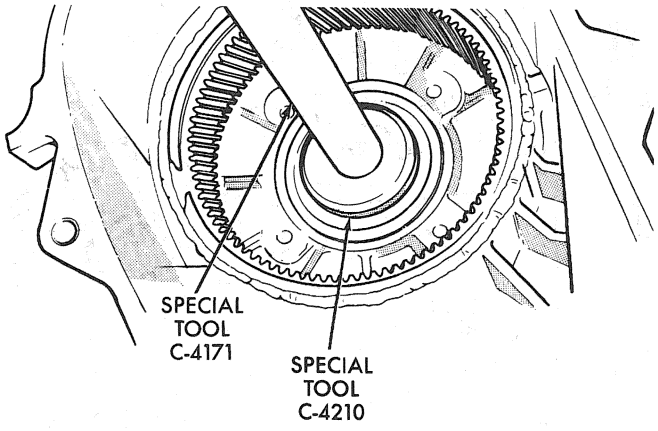


Fig. 44 Input Gear Bearing Removal

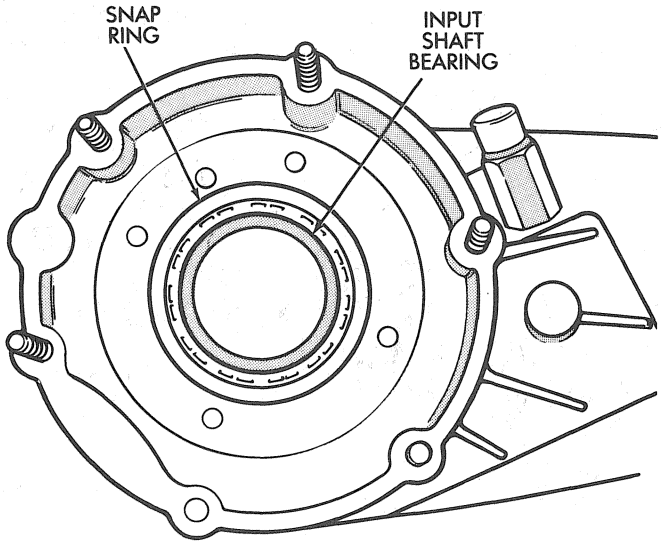


Fig. 45 Seating Input Gear Bearing

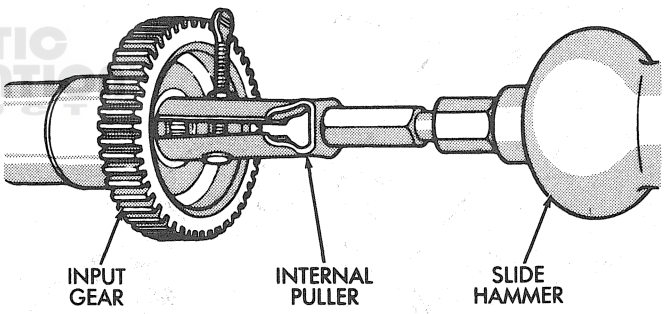


Fig. 46 Input Gear Pilot Bearing Removal

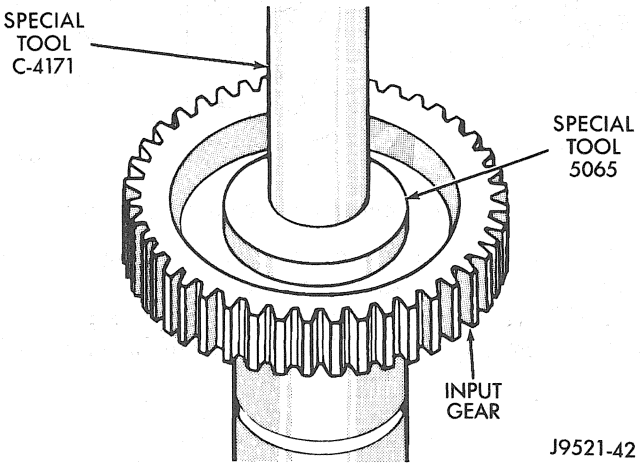


Fig. 47 Input Gear Pilot Bearing Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(11) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 48).

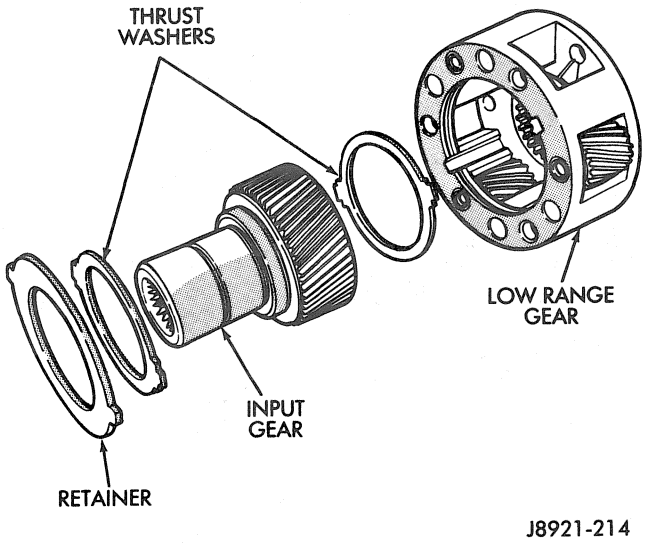


Fig. 48 Low Range And Input Gear Assembly

(12) Install low range gear snap ring (Fig. 49).

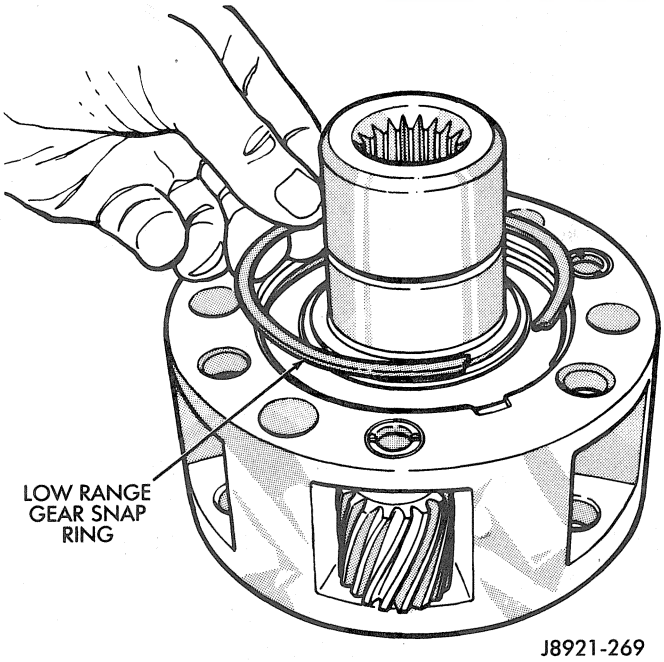


Fig. 49 Install Low Range Gear Snap Ring

(13) Lubricate input gear and low range gears with automatic transmission fluid.

(14) Start input gear shaft into front case bearing.

(15) Press input gear shaft into front bearing.

CAUTION: Be sure the input gear installer tool is the proper size. The wrong size tool could push the input gear pilot bearing too far into the gear bore (Fig. 50). Also, do not press against the end surfaces of the low range gear. The gear case and thrust washers could be damaged.

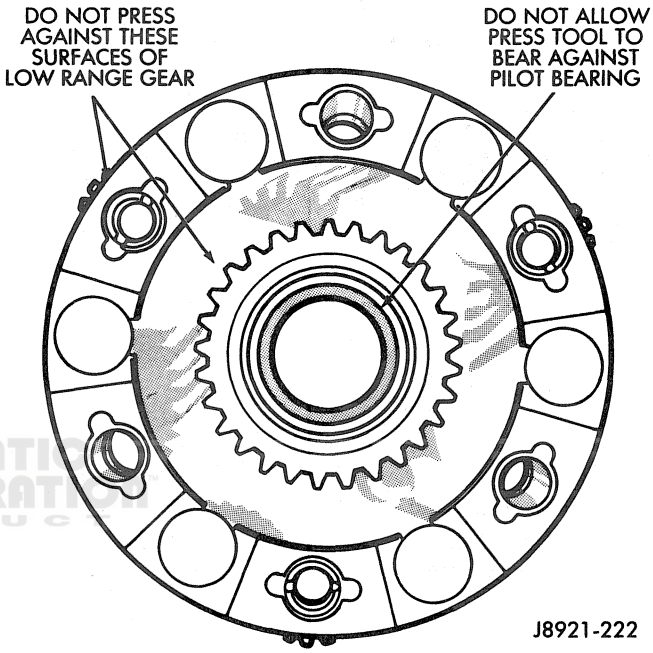


Fig. 50 Input Gear Installation

(16) Install new input gear snap ring (Fig. 51).

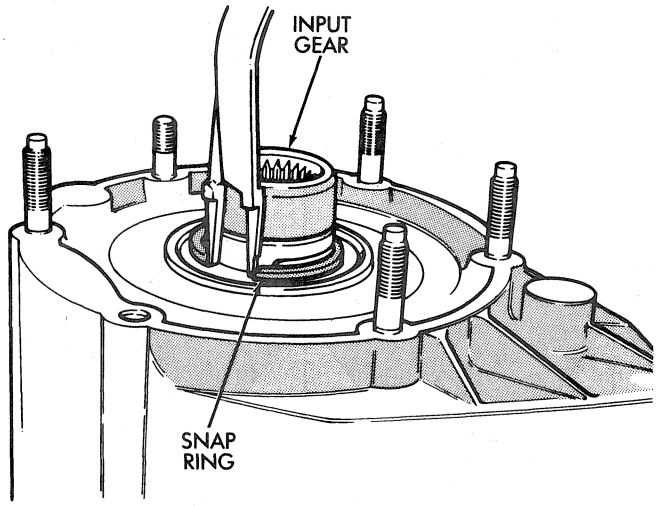


Fig. 51 Input Gear Snap Ring Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(17) Install new seal in front bearing retainer with Tool Handle C-4171 and Installer 7884 (Fig. 52).

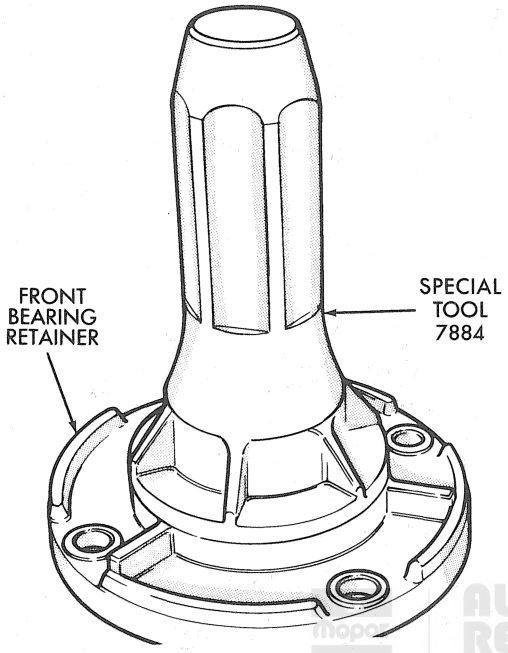


Fig. 52 Front Bearing Retainer Seal Installation

(18) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker. silicone adhesive sealer, or Loctite 518 to seal surface of front bearing retainer.

(19) Install front bearing retainer (Fig. 53). Tighten retainer bolts to 16 ft. lbs. (21 N·m) torque.

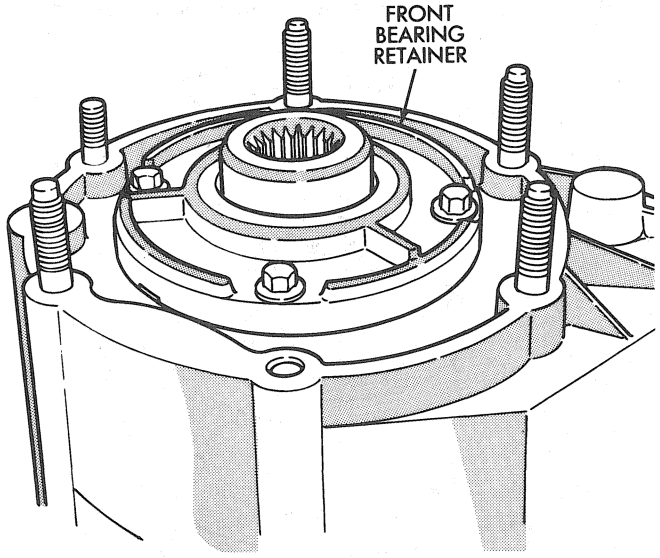


Fig. 53 Installing Front Bearing Retainer

(20) Install new sector shaft O-ring and bushing (Fig. 54).

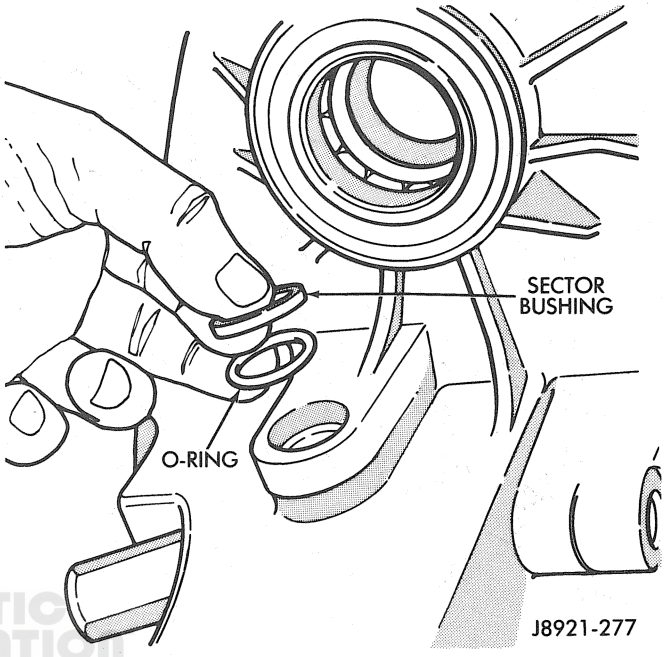


Fig. 54 Sector O-Ring And Bushing Installation

(21) Install shift sector.

(22) Install new pads in low range fork (Fig. 55).

(23) Assemble low range fork and hub (Fig. 55).

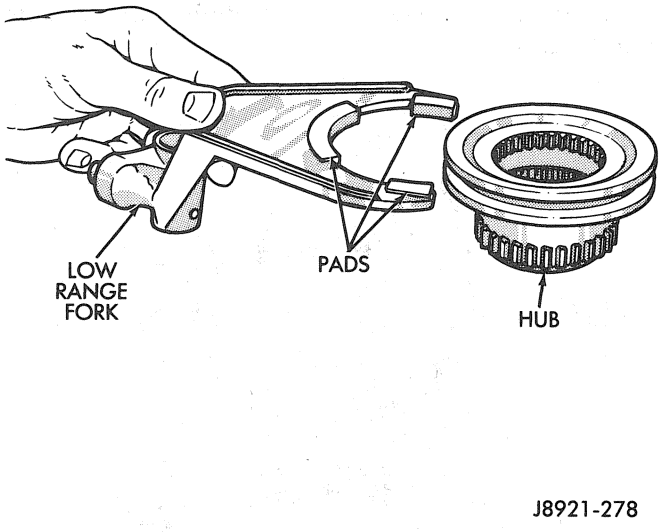


Fig. 55 Assembling Low Range Fork And Hub

DISASSEMBLY AND ASSEMBLY (Continued)

(24) Position low range fork and hub in case. Be sure low range fork pin is engaged in shift sector slot (Fig. 56).

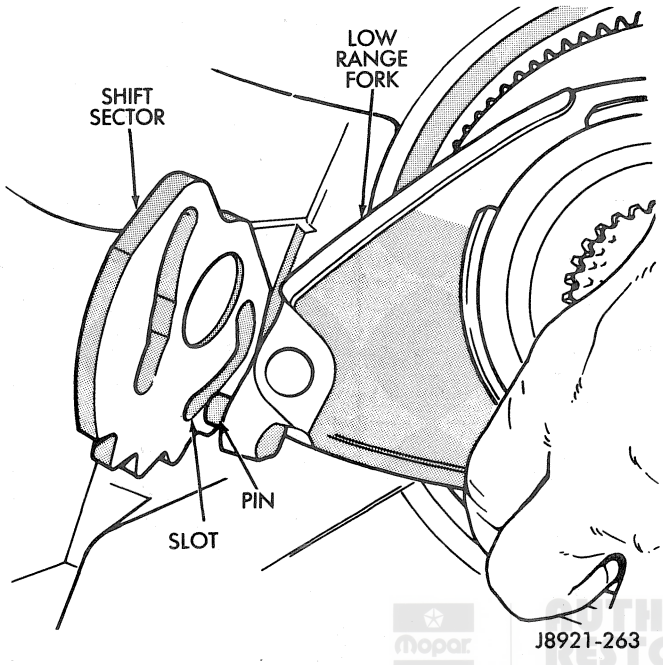


Fig. 56 Positioning Low Range Fork

(25) Lubricate differential components with automatic transmission fluid.

(26) Install sprocket gear in differential bottom case (Fig. 57).

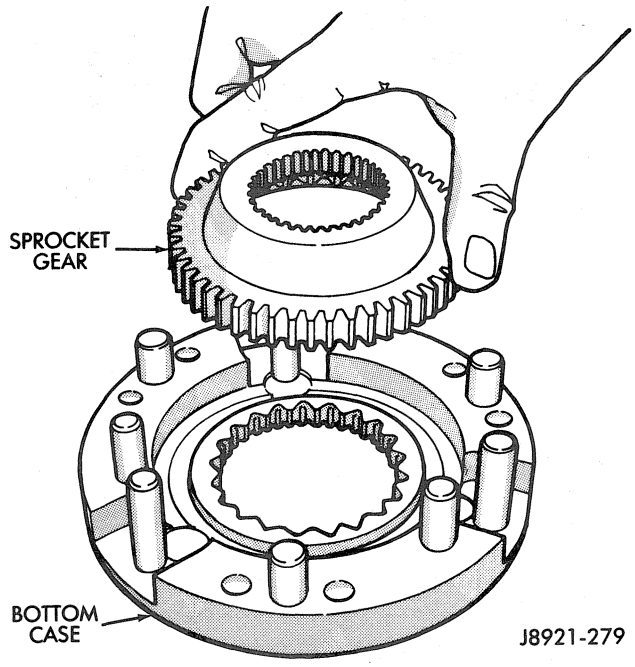


Fig. 57 Installing Differential Sprocket Gear

(27) Install differential planet gears and new thrust washers (Fig. 58). **Be sure thrust washers are installed at top and bottom of each planet gear.**

(28) Install differential mainshaft gear (Fig. 58).

(29) Align and position differential top case on bottom case (Fig. 59). Align using scribe marks made at disassembly.

(30) Install and tighten differential case bolts to specified torque.

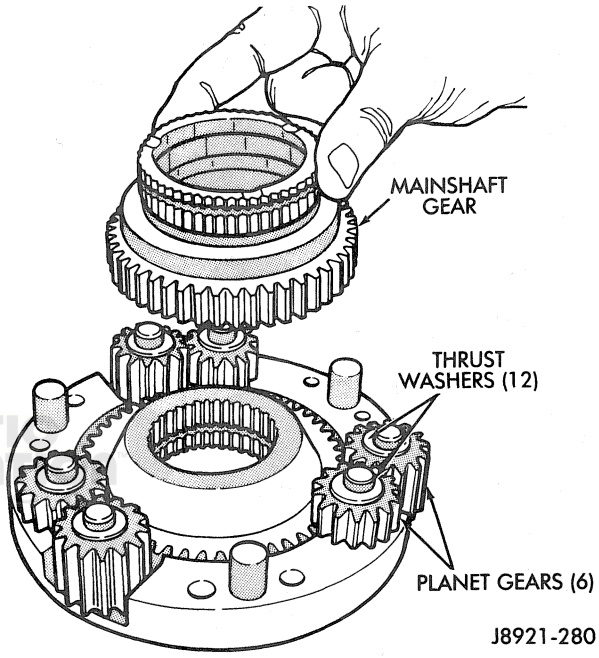


Fig. 58 Installing Mainshaft And Planet Gears

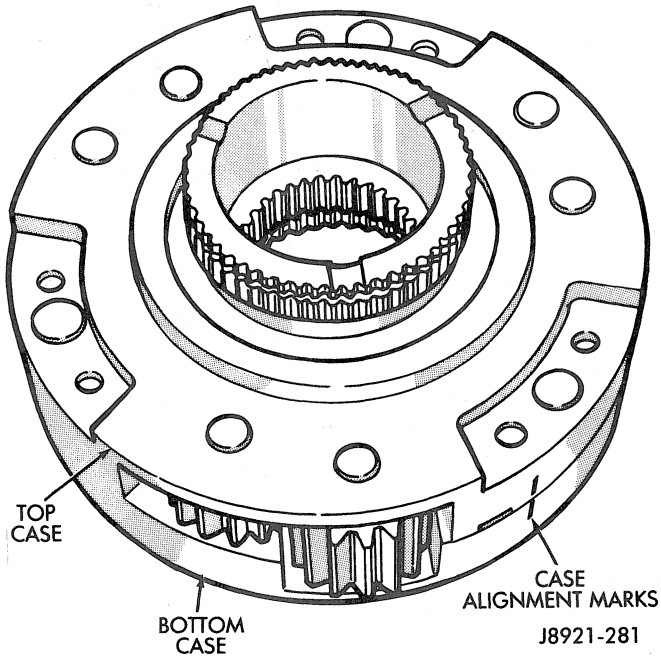


Fig. 59 Differential Case Assembly

DISASSEMBLY AND ASSEMBLY (Continued)

(31) Install first mainshaft bearing spacer on mainshaft (Fig. 60).

(32) Install bearing rollers on mainshaft (Fig. 60). **Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.**

(33) Install remaining bearing spacer on mainshaft (Fig. 60). Do not displace any bearings while installing spacer.

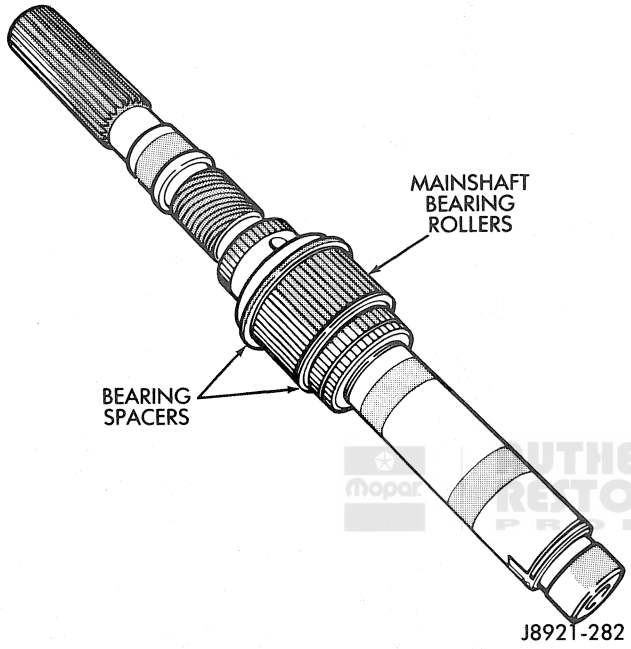
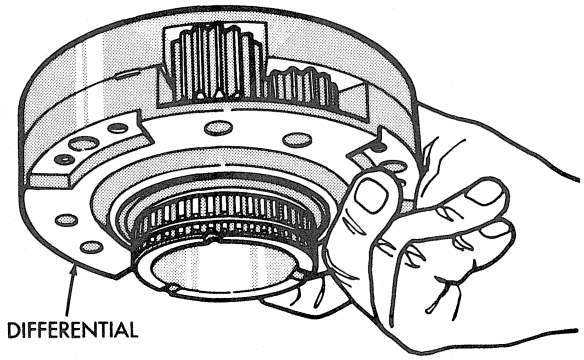


Fig. 60 Installing Mainshaft Bearing Rollers and Spacers

(34) Install differential (Fig. 61). **Do not displace mainshaft bearings when installing differential.**



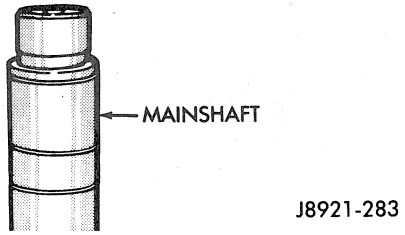


Fig. 61 Differential Installation

(35) Install differential snap ring (Fig. 62).

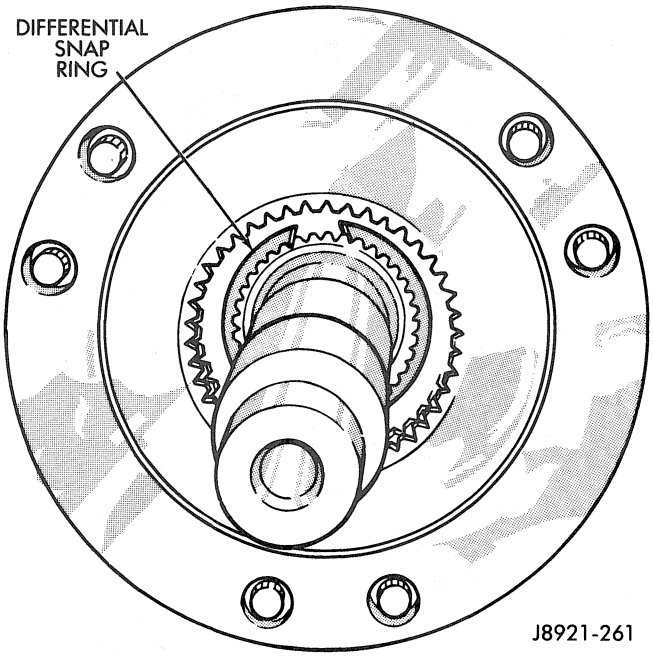


Fig. 62 Installing Differential Snap Ring

(36) Install intermediate clutch shaft (Fig. 63).

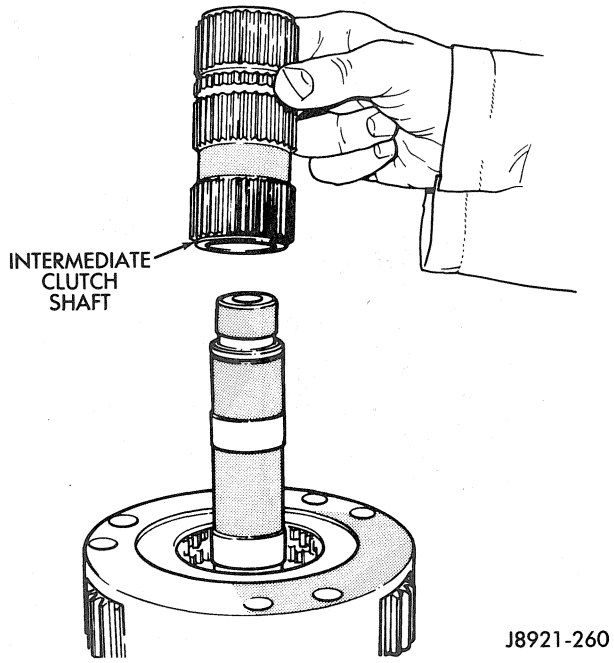


Fig. 63 Installing Intermediate Clutch Shaft

DISASSEMBLY AND ASSEMBLY (Continued)

(37) Install clutch shaft thrust washer (Fig. 64).

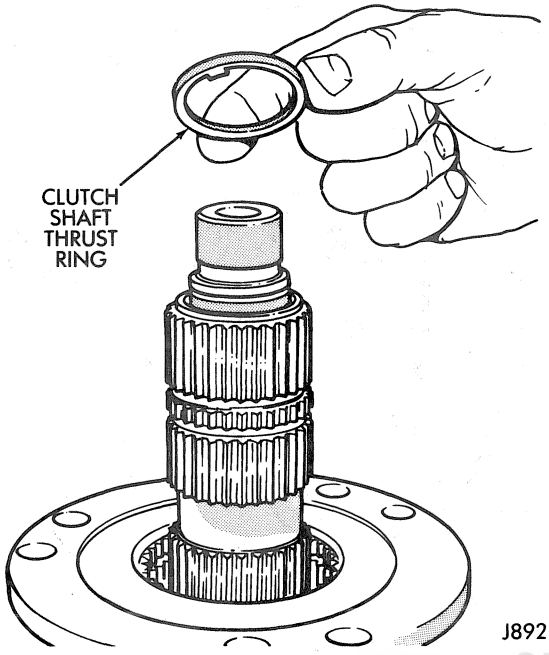


Fig. 64 Installing Clutch Shaft Thrust Washer

(38) Install clutch shaft snap ring (Fig. 65).

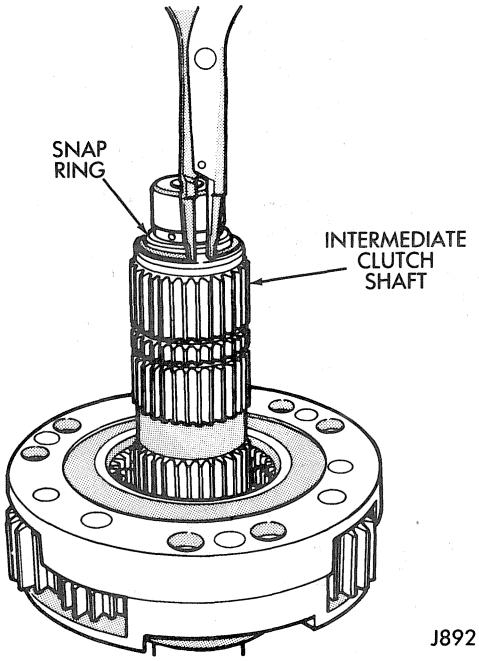


Fig. 65 Installing Clutch Shaft Snap Ring

(39) Inspect mode fork assembly (Fig. 66). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 66). Replace worn, damaged components.

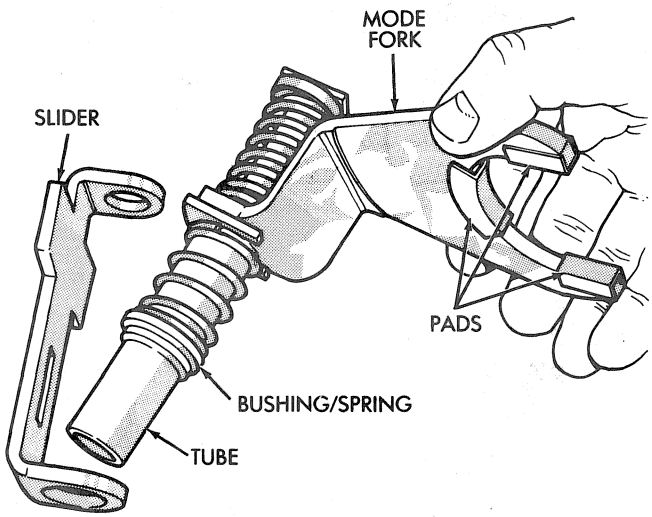


Fig. 66 Mode Fork Assembly Inspection

(40) Install mode sleeve in mode fork (Fig. 67). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.

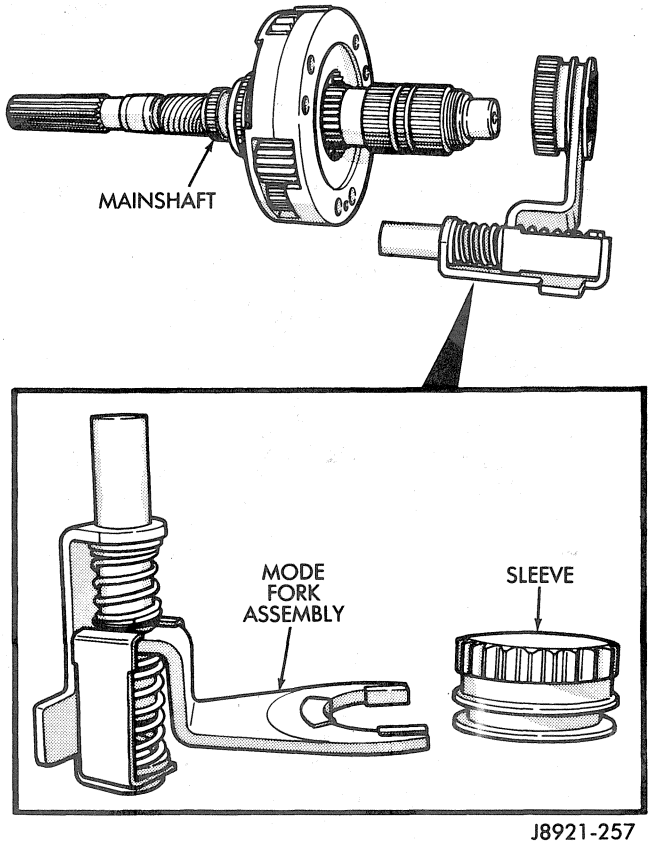


Fig. 67 Installing Mode Fork And Sleeve

DISASSEMBLY AND ASSEMBLY (Continued)

(41) Install mode fork and mainshaft assembly in case (Fig. 68). Rotate mainshaft slightly to engage shaft with low range gears.

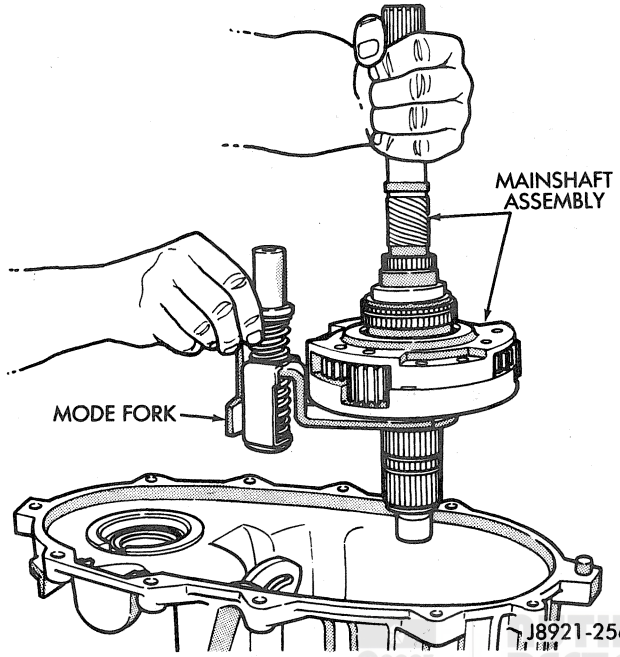


Fig. 68 Assembled Mainshaft And Mode Fork Installation

(42) Rotate mode fork pin into shift sector slot.

(43) Install shift rail (Fig. 69). **Be sure rail is seated in both shift forks.**

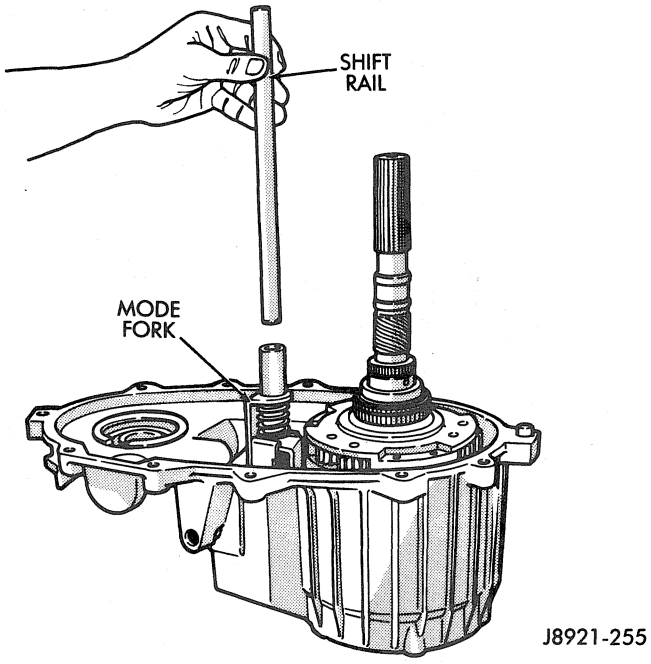


Fig. 69 Shift Rail Installation

(44) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(45) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 70). **Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.**

(46) Insert lockpin through access hole and into shift fork (Fig. 70). Then remove easy-out and seat the pin with pin punch.

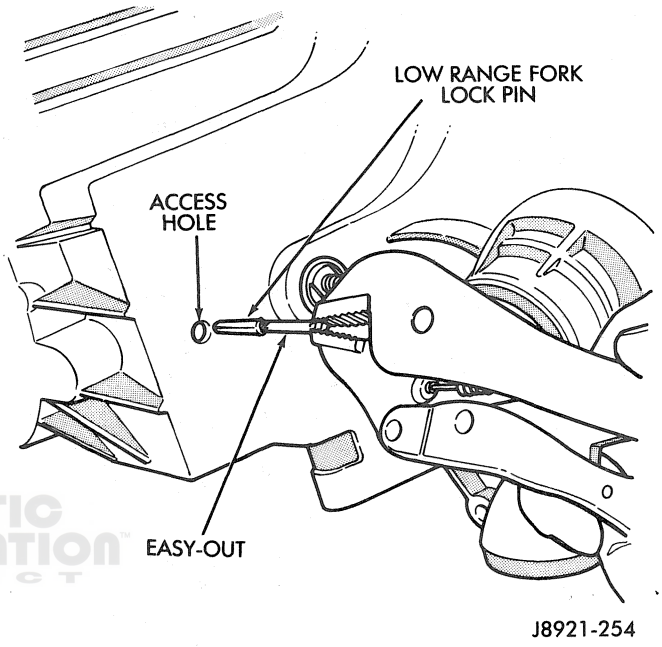


Fig. 70 Installing Low Range Fork Lockpin

(47) Install plug in lockpin access hole.

(48) Install transfer case shift lever and attaching nut. Tighten nut to 30 N·m (22 ft. lbs.) torque.

(49) Install detent plunger, detent spring and detent plug in case (Fig. 71).

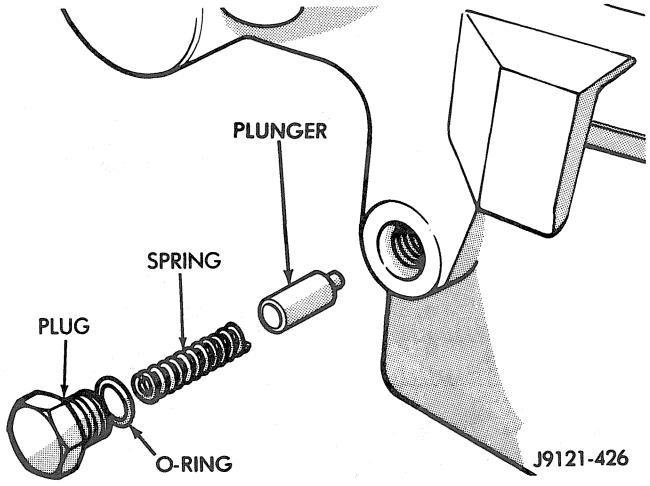


Fig. 71 Detent Pin, Spring And Plug Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(50) Install front output shaft (Fig. 72).

(51) Install drive chain (Fig. 72). Engage chain with front output shaft sprocket teeth.

(52) Install drive sprocket (Fig. 72).

(53) Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.

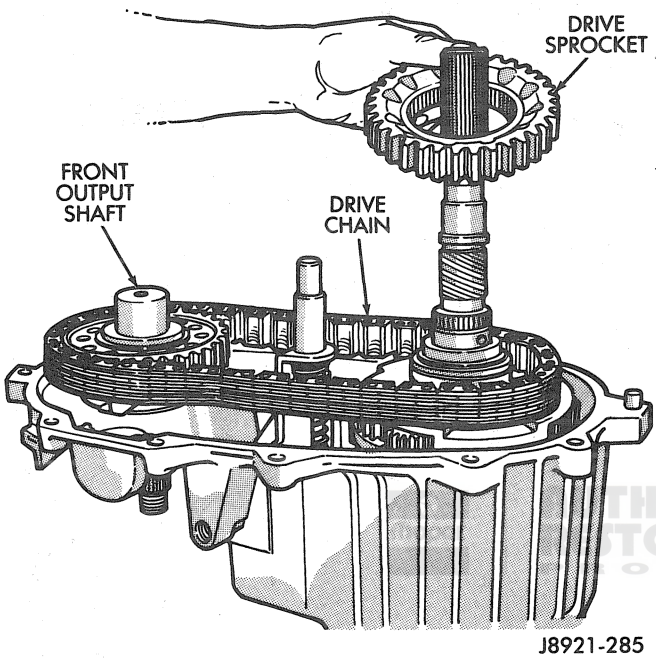


Fig. 72 Drive Chain And Sprocket Installation

(54) Install drive sprocket snap ring (Fig. 73).

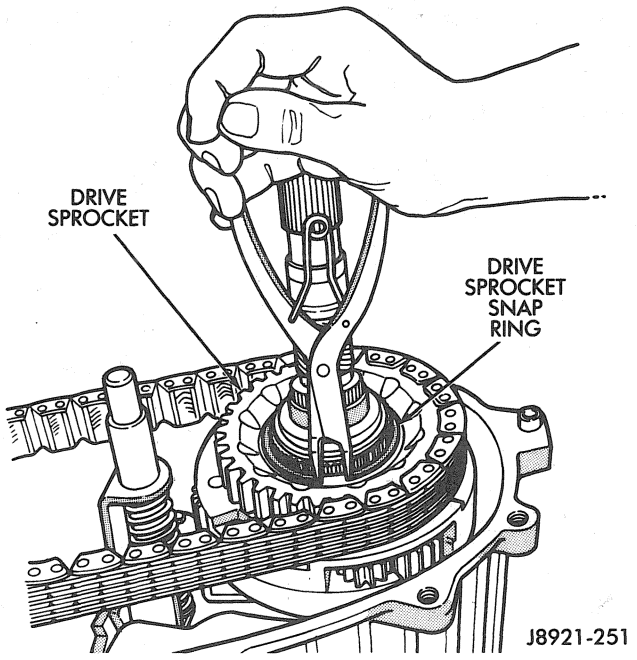


Fig. 73 Drive Sprocket Snap Ring Installation

(55) Replace front output shaft rear bearing (Fig. 74). Remove bearing with internal puller and slide hammer. Install new bearing with Tool Handle C-4171 and Installer 5066. Lubricate bearing after installation.

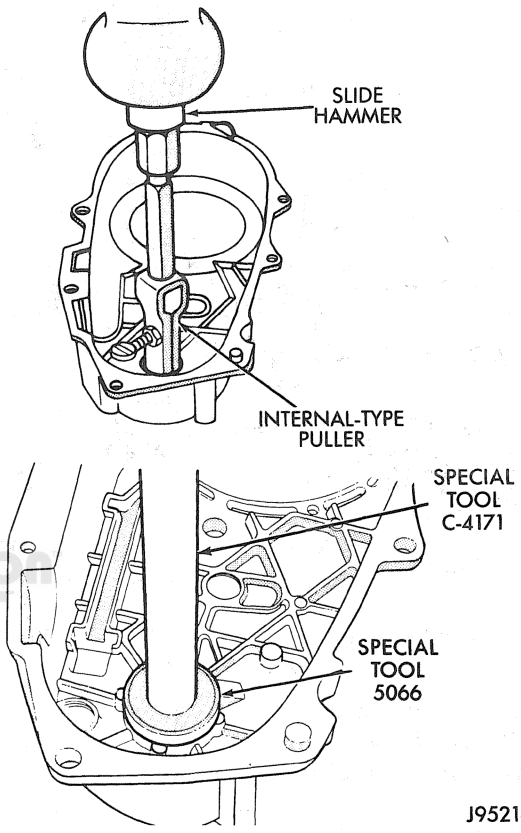


Fig. 74 Front Output Shaft Rear Bearing Installation

(56) Install new seal in oil pump feed housing with Special Tool 7888 (Fig. 75).

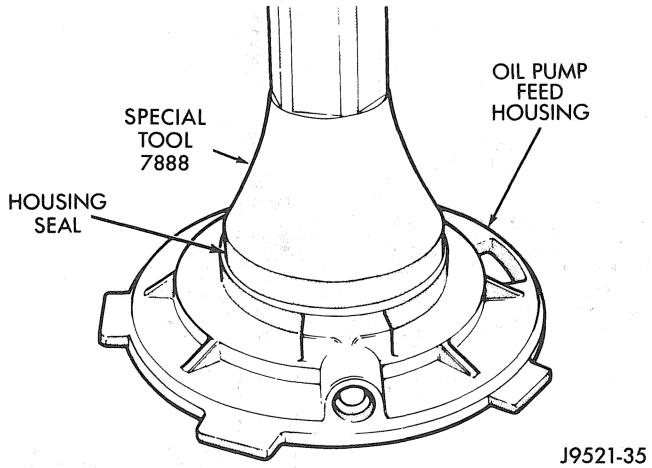


Fig. 75 Oil Pump Seal Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(57) Install new pickup tube O-ring in oil pump (Fig. 76).

(58) Insert oil pickup tube in oil pump and attach oil screen and connector hose to pickup tube. Then install assembled pump, tube and screen in rear case (Fig. 77). Be sure screen is seated in case slot as shown.

(59) Install magnet in front case pocket (Fig. 78).

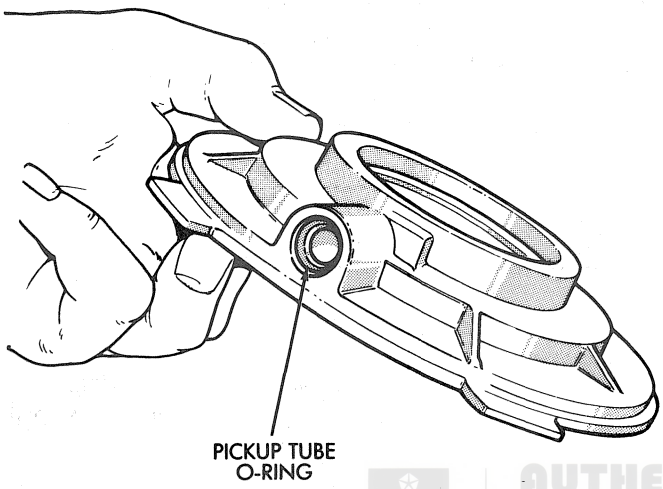


Fig. 76 Pickup Tube O-Ring Installation

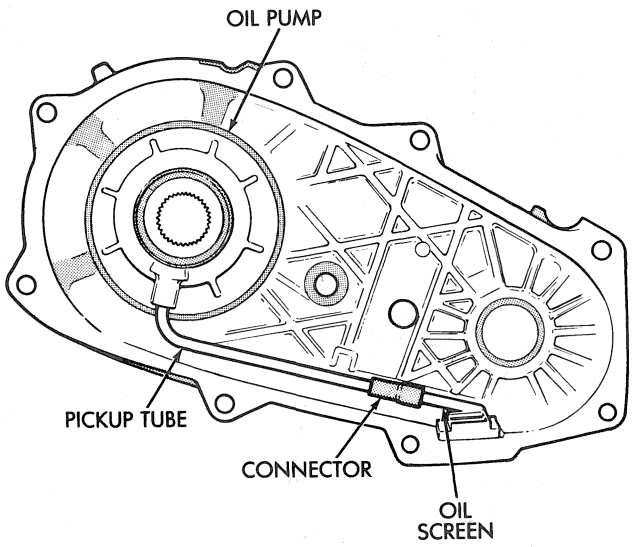


Fig. 77 Oil Screen And Pickup Tube Installation

(60) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of front case.

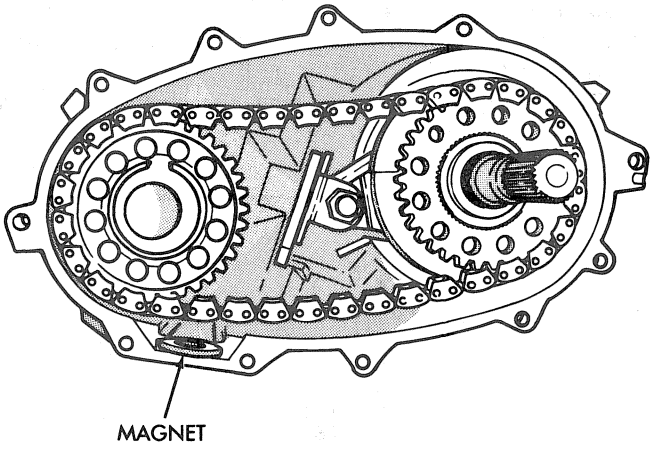


Fig. 78 Installing Case Magnet

(61) Align and install rear case on front case. Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

(62) Install and tighten front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each bolt used at case dowel locations.**

(63) Tap rear retainer bearing out of retainer with hammer and brass drift.

(64) Install bearing in rear retainer with Driver Handle C-4171 and Installer 5064 (Fig. 79).

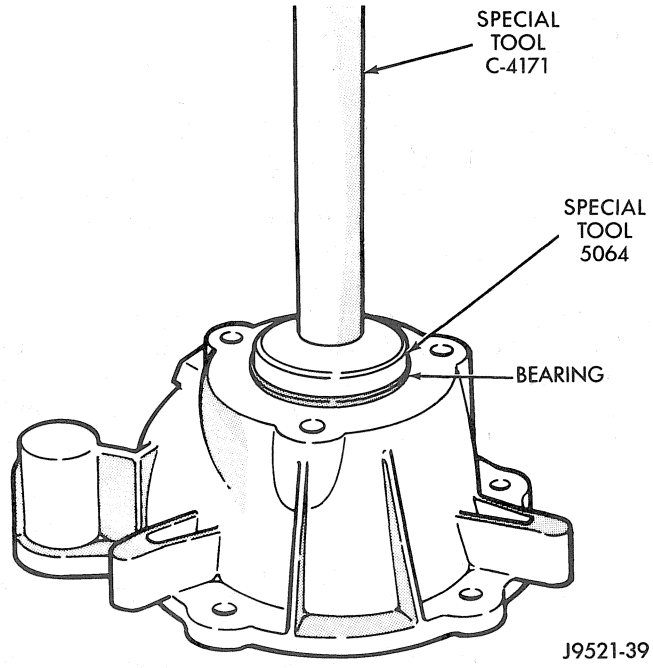


Fig. 79 Installing Rear Bearing In Retainer

(65) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of rear retainer.

DISASSEMBLY AND ASSEMBLY (Continued)

(66) Install locating dowel in rear retainer (if removed) and install retainer on the case. Tighten retainer bolts to 41 N·m (30 ft. lbs.) torque.

(67) Install new rear bearing snap ring (Fig. 80). Lift mainshaft slightly to seat snap ring if necessary.

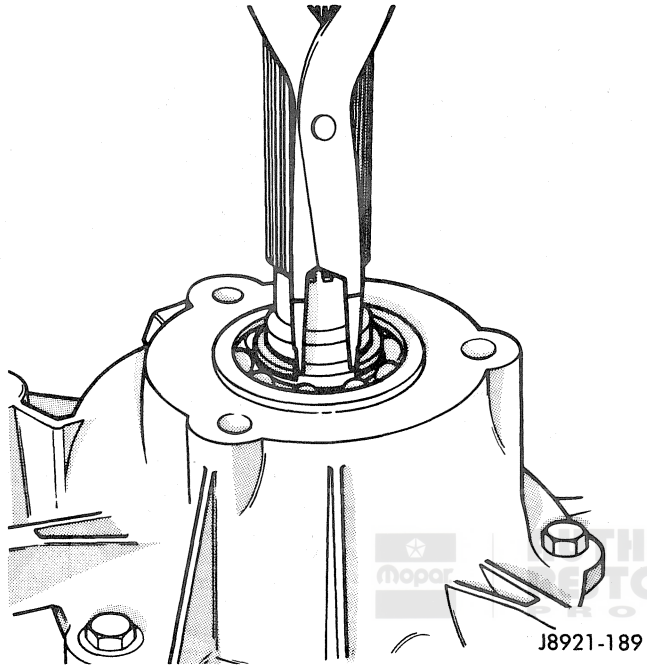


Fig. 80 Rear Bearing Snap Ring Installation

(68) Remove extension housing seal if not removed previously.

(69) Replace extension housing bushing (Fig. 81).

- Use Tools C-4171 and 7889-A to remove bushing
- Use Tools C-4171 and 5066 to install bushing

(70) Install new extension housing oil seal with Special Tool 7891 (Fig. 82).

(71) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of extension housing.

(72) Install extension housing on case. Tighten housing bolts to 41 N·m (30 ft. lbs.) torque.

(73) Lubricate seal surface of front yoke with transmission fluid. Then install front yoke and secure it with new seal washer and nut. Tighten nut to 149 N·m (110 ft. lbs.) torque.

(74) Install new gasket on vacuum switch and install switch in case. Tighten switch to 27 N·m (20 ft. lbs.) torque.

(75) Install speedometer components.

(76) Install and tighten drain plug to 47 N·m (35 ft. lbs.) torque.

(77) After installing transfer case, refill with recommended lubricant.

(78) Tighten fill plug to 47 N·m (35 ft. lbs.) torque.

(79) Adjust transfer case shift linkage.

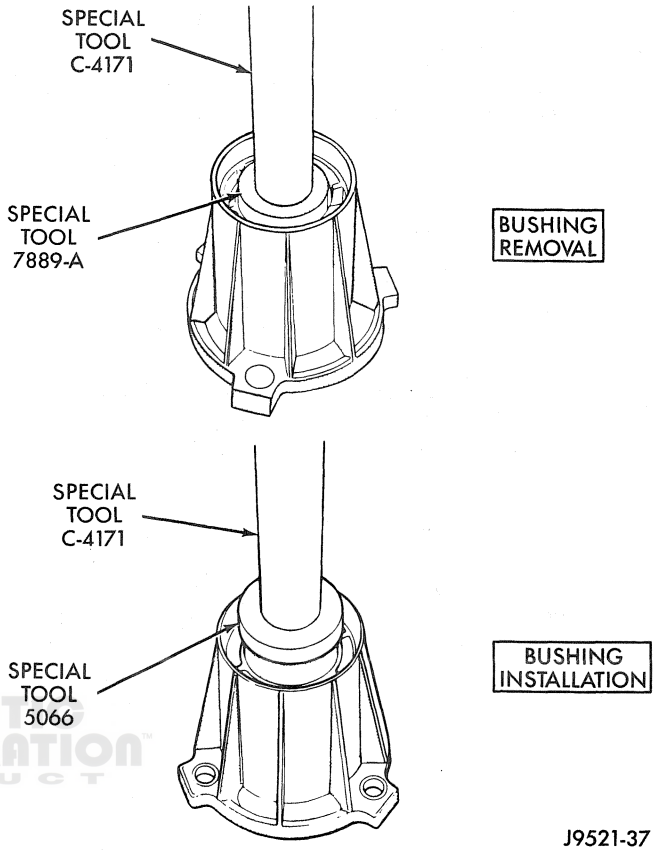


Fig. 81 Extension Housing Bushing Replacement

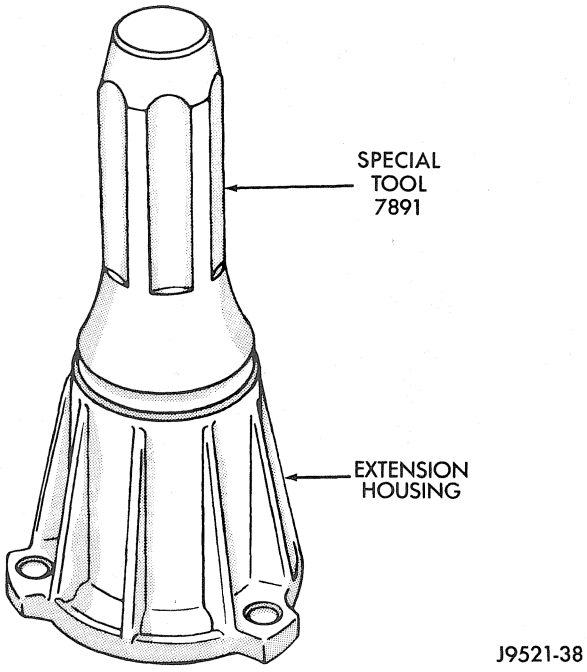
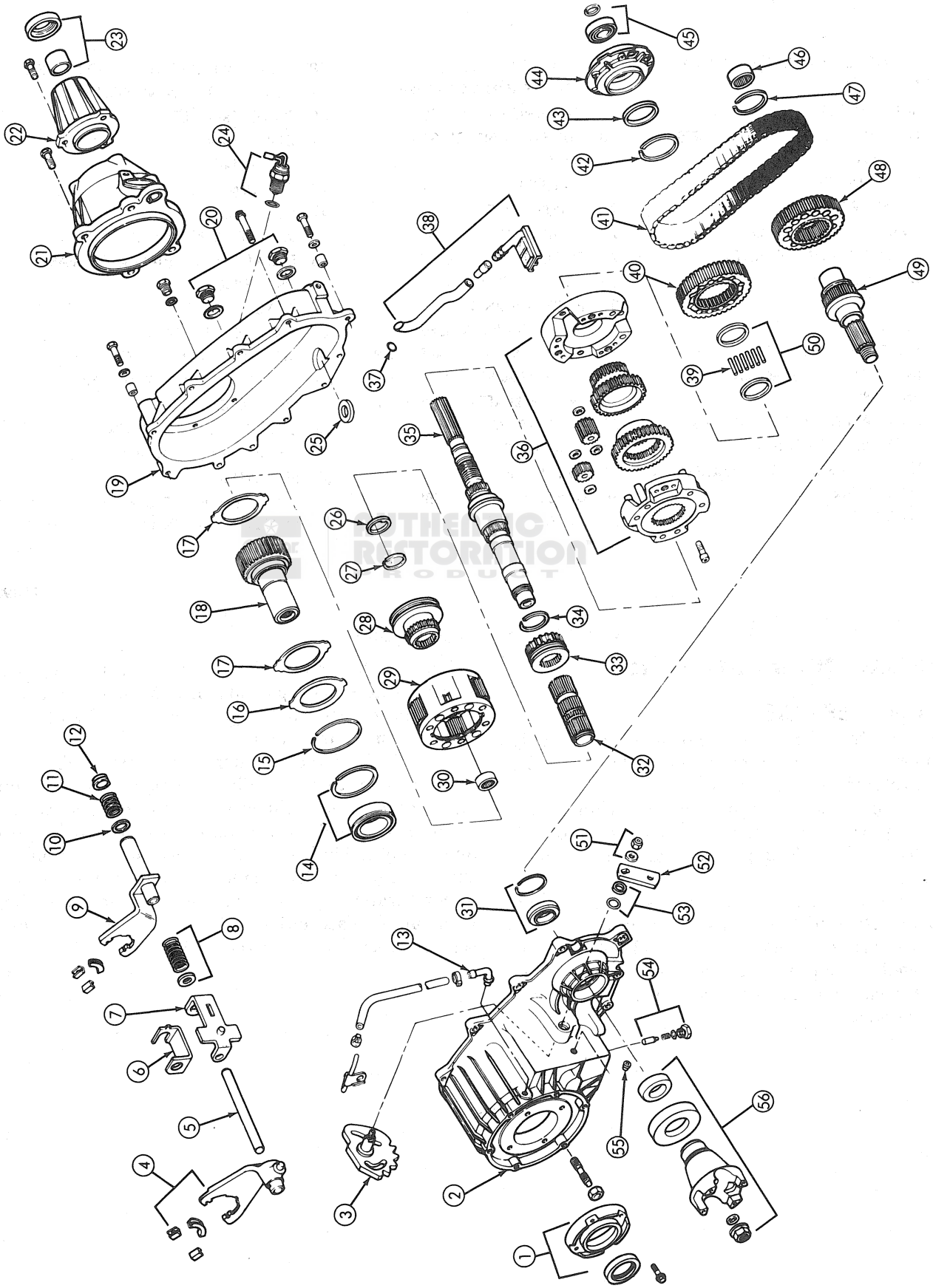


Fig. 82 Seating Extension Housing Seal

DISASSEMBLY AND ASSEMBLY (Continued)



1 FRONT BEARING RETAINER AND SEAL
2 FRONT CASE
3 SHIFT SECTOR
4 LOW RANGE FORK AND INSERTS
5 SHIFT RAIL
6 SHIFT BRACKET
7 SLIDER BRACKET
8 BUSHING AND SPRING
9 MODE FORK AND INSERTS
10 BUSHING
11 FORK SPRING
12 BUSHING
13 VENT TUBE ASSEMBLY
14 INPUT GEAR BEARING AND SNAP RING
15 LOW RANGE GEAR SNAP RING
16 RETAINER, LOW RANGE GEAR
17 THRUST WASHER, LOW RANGE GEAR
18 INPUT GEAR
19 REAR CASE
20 DRAIN/FILL PLUGS
21 REAR BEARING RETAINER
22 EXTENSION HOUSING
23 BUSHING AND OIL SEAL
24 SWITCH
25 MAGNET
26 THRUST RING
27 SNAP RING
28 SHIFT SLEEVE
29 LOW RANGE GEAR
30 PILOT BUSHING (INPUT GEAR/MAINSHAFT)
31 FRONT OUTPUT SHAFT FRONT BEARING AND SNAP RING
32 INTERMEDIATE CLUTCH SHAFT
33 SHIFT SLEEVE
34 SNAP RING
35 MAINSHAFT
36 DIFFERENTIAL ASSEMBLY
37 OIL PUMP TUBE O-RING
38 OIL PUMP PICKUP TUBE AND SCREEN
39 MAINSHAFT BEARING ROLLERS
40 DRIVE SPROCKET
41 DRIVE CHAIN
42 SNAP RING
43 OIL PUMP SEAL
44 OIL PUMP
45 REAR BEARING AND SNAP RING
46 FRONT OUTPUT SHAFT REAR BEARING
47 SNAP RING
48 DRIVEN SPROCKET
49 FRONT OUTPUT SHAFT
50 MAINSHAFT BEARING SPACERS
51 SHIFT LEVER WASHER AND NUT
52 SHIFT LEVER
53 SECTOR O-RING AND SEAL
54 DETENT PIN, SPRING AND PLUG
55 SEAL PLUG
56 FRONT YOKE NUT, SEAL WASHER, YOKE, SLINGER AND FRONT OUTPUT SEAL

J9521-192

NV242 Transfer Case Legend

CLEANING AND INSPECTION

NV242 TRANSFER CASE

Clean the transfer case components thoroughly with solvent. Remove all traces of sealer from the case and retainer seal surfaces.

Clean the oil pickup screen with solvent and allow it to air dry. Use compressed air to remove solvent residue from all oil feed passages and channels in case halves.

Inspect the differential gears, thrust washers and case halves. Replace the mainshaft gear if the gear teeth or the brass ring on the underside of the gear are damaged. Replace the differential as an assembly if the gears, case halves, or the pins in the lower case half are damaged.

Inspect the case halves, extension housing and retainers for cracks, porosity, or damaged sealing surfaces. Inspect the shafts, gears, chain and shift components for wear or damage.

Inspect all of the transfer case bearings for wear, roughness, pitting, or galling. Replace worn or damaged bearings as outlined in the assembly section.

Check the seal contact surfaces of the front yoke and propeller shaft slip yoke. These surfaces must be smooth and corrosion free for proper seal life. Smooth minor scratches, nicks with 280 grit emery soaked with oil. Replace either yoke if the seal surface is severely corroded, or scored.

ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT

(1) Shift transfer case into 4L position.
(2) Raise vehicle.
(3) Loosen lock bolt on adjusting trunnion (Fig. 83).
(4) Be sure linkage rod slides freely in trunnion. Clean rod and apply spray lube if necessary.
(5) Verify that transfer case range lever is fully engaged in 4L position.
(6) Tighten adjusting trunnion lock bolt.
(7) Lower vehicle.

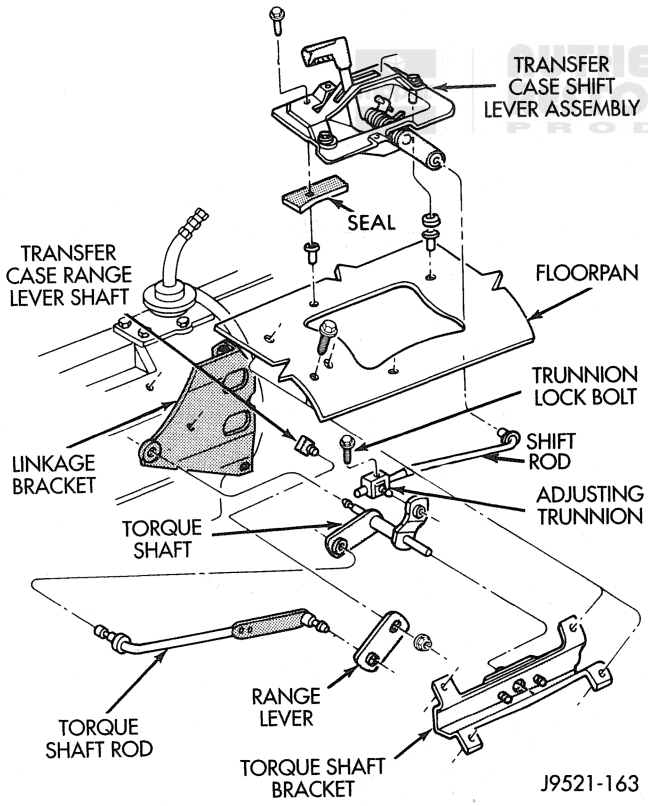


Fig. 83 Shift Linkage

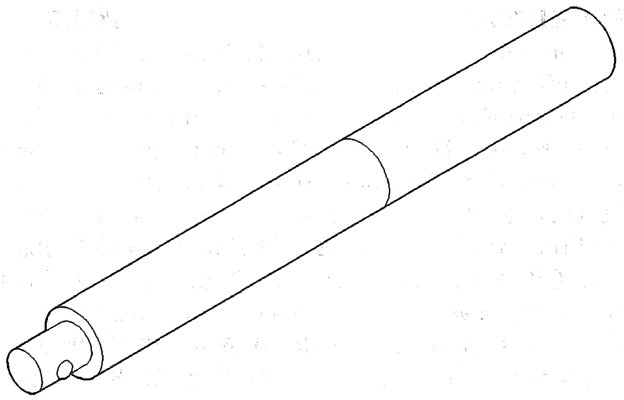
SPECIFICATIONS

TORQUE

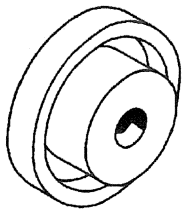
DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Bolt, Diff. Case	17–27 N·m (15–24 ft. lbs.)
Plug, Drain/Fill	40–45 N·m (30–40 ft. lbs.)
Bolt, Extension Housing	35–46 N·m (26–34 ft. lbs.)
Bolt, Front Brg. Retainer	16–27 N·m (12–20 ft. lbs.)
Bolt, Case Half	35–46 N·m (26–34 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Screw, Oil Pump	1.2–1.8 N·m (12–15 in. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35–47 N·m (26–35 ft. lbs.)
Bolts, U-Joint	19 N·m (17 ft. lbs.)
Vacuum Switch	20–34 N·m (15–25 ft. lbs.)

SPECIAL TOOLS

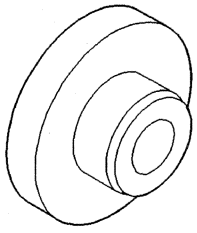
NV242



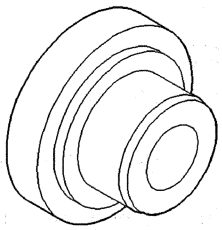
C-4171 Handle Universal (Non Threaded)



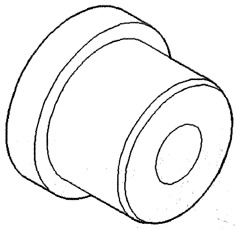
C-4210 Installer, Seal



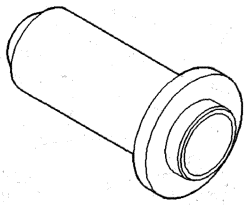
5064 Installer, Bearing



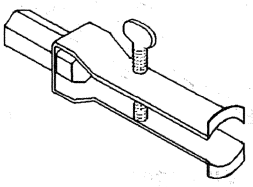
5065 Installer, Bearing



5066 Installer, Bushing

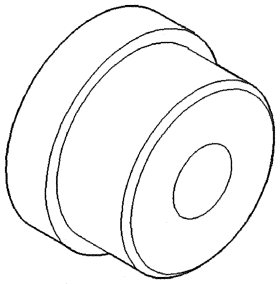


6272 Installer, Seal

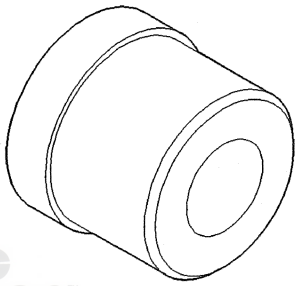


7794-A Puller, Bearing & Seal

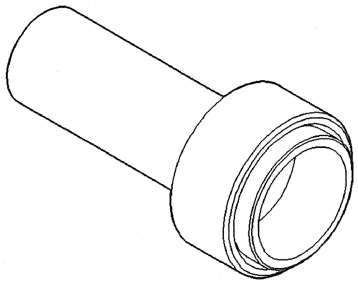
SPECIAL TOOLS (Continued)



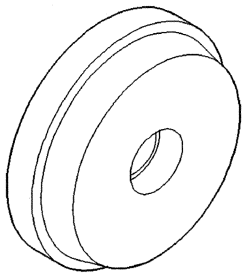
7829A Remover, Input Gear Bearing



7889-A Remover, Rear Output Shaft Bushing



7888 Installer, Pump Housing Seal



8033-A Installer, Bearing

TIRES AND WHEELS

CONTENTS

	page		page
TIRES	1	WHEELS	8

TIRES

INDEX

page

DESCRIPTION AND OPERATION
- RADIAL-PLY TIRES . . . 2
- REPLACEMENT TIRES . . . 3
- SPARE TIRE (TEMPORARY) . . . 2
- TIRE INFLATION PRESSURES . . . 2
- TIRE INFORMATION . . . 1
- TIRE PRESSURE FOR HIGH—SPEED OPERATION . . . 3

DIAGNOSIS AND TESTING
- LEAD CORRECTION CHART . . . 4
- PRESSURE GAUGES . . . 3
- TIRE NOISE OR VIBRATION . . . 4
- TIRE WEAR PATTERNS . . . 3
- TREAD WEAR INDICATORS . . . 3

SERVICE PROCEDURES
- MATCH MOUNTING . . . 6
- REPAIRING LEAKS . . . 7
- ROTATION . . . 6

CLEANING AND INSPECTION
- CLEANING OF TIRES . . . 7

DESCRIPTION AND OPERATION

TIRE INFORMATION

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles

Radial ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval shown in the section on Tire Rotation. This will help to achieve a greater tread-life potential.

TIRE IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code (Fig. 1).

Performance tires will have a speed rating letter after the aspect ratio number. The speed rating is not always printed on the tire sidewall. The letter **S** indicates that the tire is speed rated up to 112 mph.

- **Q** up to 100 mph
- **T** up to 118 mph
- **U** up to 124 mph
- **H** up to 130 mph
- **V** up to 149 mph
- **Z** more than 149 mph (consult the tire manufacturer for the specific speed rating)

An All Season type tire will have either **M + S, M & S or M—S** (indicating mud and snow traction) imprinted on the side wall.

TIRE CHAINS

Tire snow chains may be used on **certain** models. Refer to Owner's Manual for more information.

DESCRIPTION AND OPERATION (Continued)

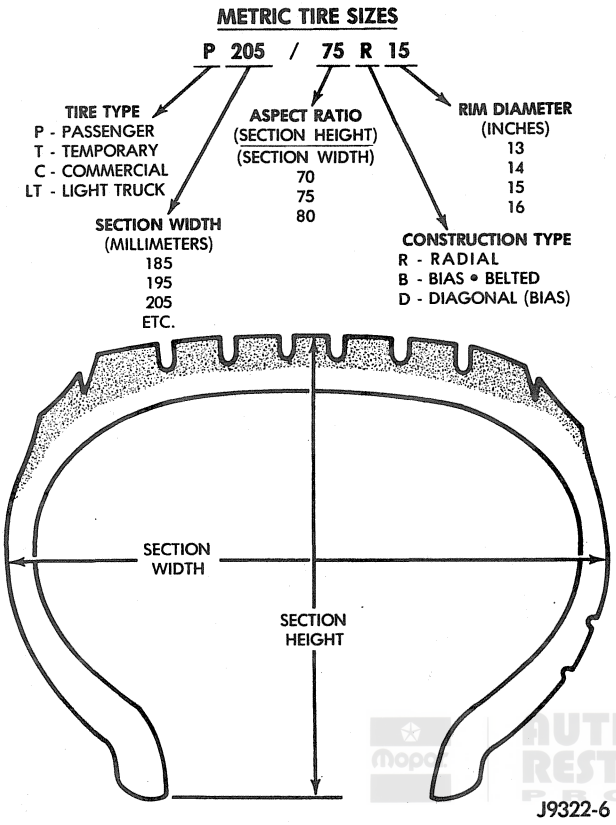


Fig. 1 Tire Identification

RADIAL-PLY TIRES

Radial-ply tires improve handling, tread life, ride quality and decrease rolling resistance.

Radial-ply tires must always be used in sets of four and under no circumstances should they be used on the front only. They may be mixed with temporary spare tires when necessary. A maximum speed of 50 MPH is recommended while a temporary spare is in use.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They also use the same recommended inflation pressures.

The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

It is recommended that tires from different manufactures NOT be mixed. The proper tire pressure should be maintained on all four tires. For proper tire pressure refer to the Tire Inflation Pressure Chart provided with the vehicle.

SPARE TIRE (TEMPORARY)

The temporary spare tire is designed for emergency use only. The original tire should be repaired and reinstalled at the first opportunity, or a new tire purchased. Do not exceed speeds of 50 MPH. Refer to Owner's Manual for complete details.

TIRE INFLATION PRESSURES

Under inflation causes rapid shoulder wear, tire flexing, and can result in tire failure (Fig. 2).

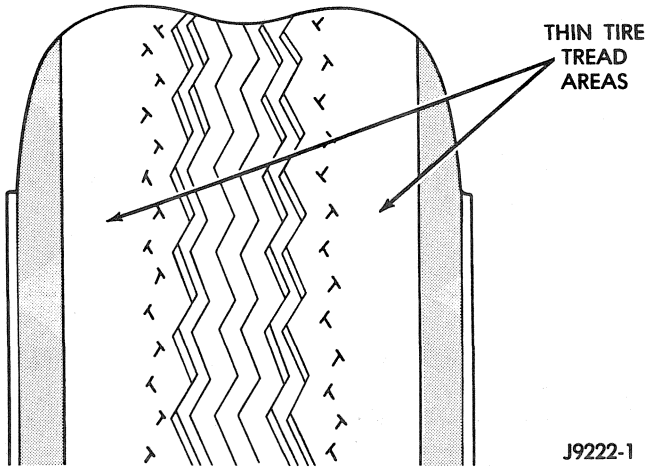


Fig. 2 Under Inflation Wear

Over inflation causes rapid center wear and loss of the tire's ability to cushion shocks (Fig. 3).

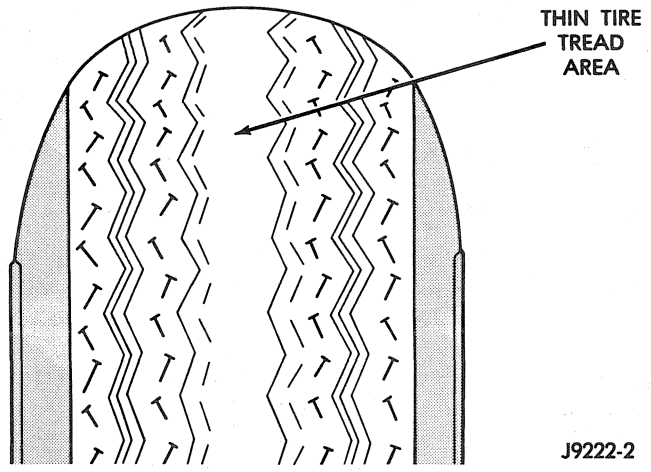


Fig. 3 Over Inflation Wear

Improper inflation can cause:

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- The vehicle to drift.

For proper tire pressure specification refer to the Tire Inflation Pressure Chart provided with the vehicle.

Tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. Tire pressure should be checked cold once per month. Check tire pressure more frequently when the

DESCRIPTION AND OPERATION (Continued)

weather temperature varies widely. Tire pressure will decreases when the outdoor temperature drops.

Inflation pressures specified on the placards are always cold inflation pressure. Cold inflation pressure is obtained after the vehicle has not been operated for at least 3 hours. Or the vehicle is driven less than one mile after being inoperative for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation. Do not reduce this normal pressure build-up.

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING. THE TIRE CAN FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

TIRE PRESSURE FOR HIGH—SPEED OPERATION

Chrysler Corporation advocates driving at safe speeds within posted speed limits. Where speed limits allow the vehicle to be driven at high speeds, correct tire inflation pressure is very important. For speeds up to and including 75 mph (120 km/h), tires must be inflated to the pressures shown on the tire placard. For speeds in excess of 75 mph (120 km/h), tires must be inflated to the maximum pressure specified on the tire sidewall.

Vehicles loaded to the maximum capacity should not be driven at continuous speeds above 75 mph (120 km/h).

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING. THE TIRE CAN FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

For emergency vehicles that are driven at speeds over 90 mph (144 km/h), special high-speed tires must be used. Consult tire manufacturer for correct inflation pressure recommendations.

REPLACEMENT TIRES

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

It is recommend that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires not listed in the specification charts may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

DIAGNOSIS AND TESTING

PRESSURE GAUGES

A high-quality air-pressure gauge is recommended to check tire pressure. After checking with the gauge, replace valve caps and finger tighten.

TREAD WEAR INDICATORS

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band.

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs (Fig. 4).

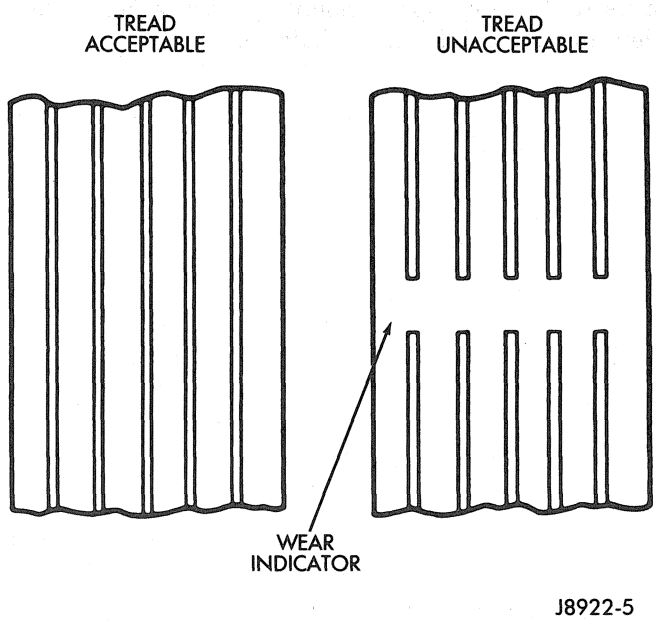
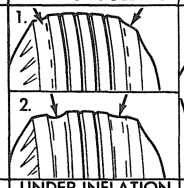
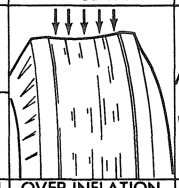
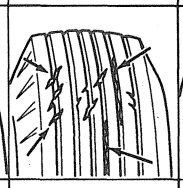
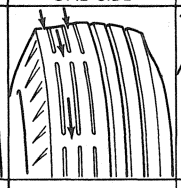
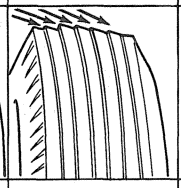
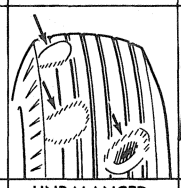
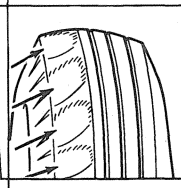
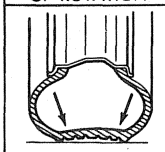
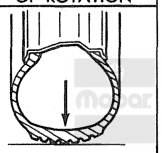
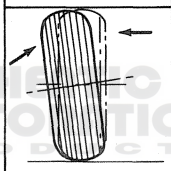
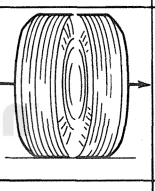
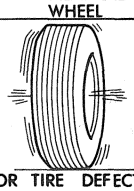


Fig. 4 Tread Wear Indicators

TIRE WEAR PATTERNS

Under inflation results in faster wear on shoulders of tire. Over inflation causes faster wear at center of tread.

DIAGNOSIS AND TESTING (Continued)

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT							
CAUSE	UNDER-INFLATION OR LACK OF ROTATION 	OVER-INFLATION OR LACK OF ROTATION 	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER 	INCORRECT TOE 	UNBALANCED WHEEL  OR TIRE DEFECT *	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION.
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION SEE GROUP 2

*HAVE TIRE INSPECTED FOR FURTHER USE.

RN797

Fig. 5 Tire Wear Patterns

Excessive camber causes the tire to run at an angle to the road. One side of tread is worn more than the other.

Excessive toe-in or toe-out causes wear on the tread edges of the tire, from dragging of tire. There is a feathered effect across the tread (Fig. 5).

TIRE NOISE OR VIBRATION

Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

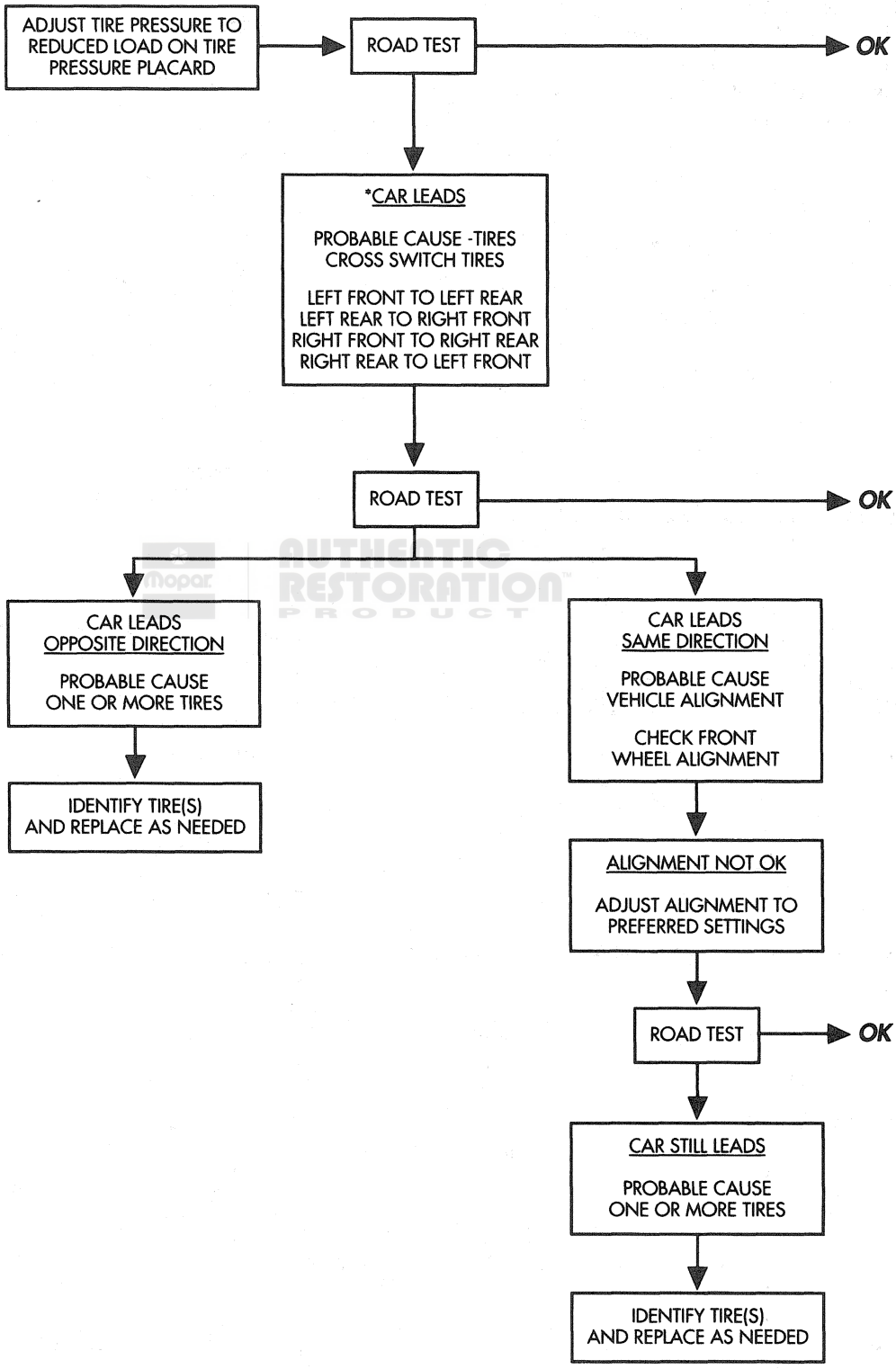
To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying speeds. Note the effect of acceleration and deceleration on noise level. Differential and exhaust noises will change in intensity as speed varies, while tire noise will usually remain constant.

LEAD CORRECTION CHART

Use the following chart to correct vehicle leading or drifting problems.

DIAGNOSIS AND TESTING (Continued)

LEAD CORRECTION CHART



*NOTE: VERIFY THAT LEAD IS NOT RELATED TO STEERING WHEEL NOT CENTERED

SERVICE PROCEDURES

ROTATION

Tires on the front and rear axles operate at different loads and perform different steering, driving, and braking functions. For these reasons;

- They wear at unequal rates
- Tend to develop irregular wear patterns

These effects can be reduced by timely rotation of tires. The benefits of rotation are especially worthwhile. Rotation will:

- Increase tread life
- Help to maintain mud, snow, and wet traction levels
- Contribute to a smooth, quiet ride

The suggested method of tire rotation is (Fig. 6). Other rotation methods can be used, but they will not provide all the tire longevity benefits.

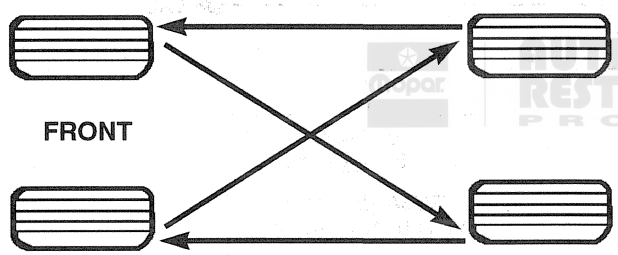


Fig. 6 Tire Rotation Pattern

MATCH MOUNTING

NOTE: XJ tires and wheels are not currently match mounted at the factory.

Match mounting is a technique used to reduce runout in the wheel/tire assembly. This means that the high spot of the tire is aligned with the low spot on the wheel rim. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the rim is identified with a label on the outside of the rim and a dot on the inside of the rim. If the outside label has been removed the tire will have to be removed to locate the dot on the inside of the rim.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve stem location. This reference will ensure that it is remounted in the original position on the wheel.

(1) Measure the total indicator runout on the center of the tire tread rib. Record the indicator reading. Mark the tire to indicate the high spot. Place a mark on the tire at the valve stem location (Fig. 7).

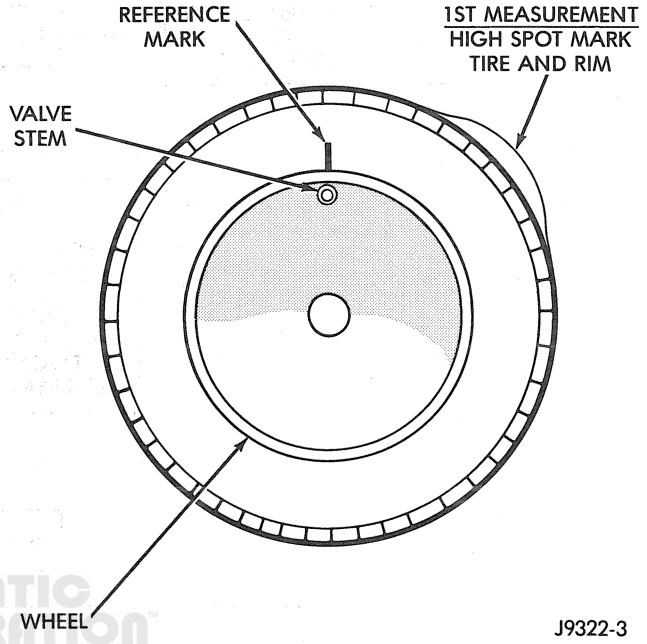


Fig. 7 First Measurement On Tire

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 8).

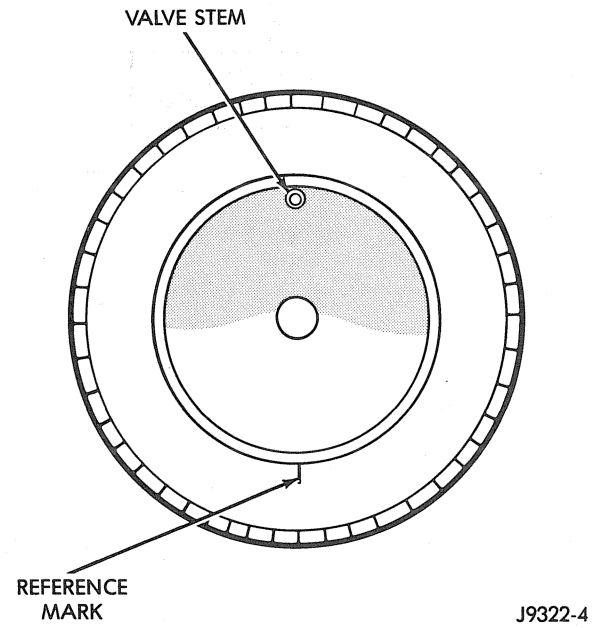


Fig. 8 Remount Tire 180 Degrees

(3) Measure the total indicator runout again. Mark the tire to indicate the high spot.

(4) If runout is still excessive, the following procedures must be done.

SERVICE PROCEDURES (Continued)

• If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.
• If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications. Refer to Wheel and Tire Runout.
• If the high spot is NOT within 101.6 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot to first. Break down the tire and remount it 90 degrees on rim in that direction (Fig. 9). This procedure will normally reduce the runout to an acceptable amount.

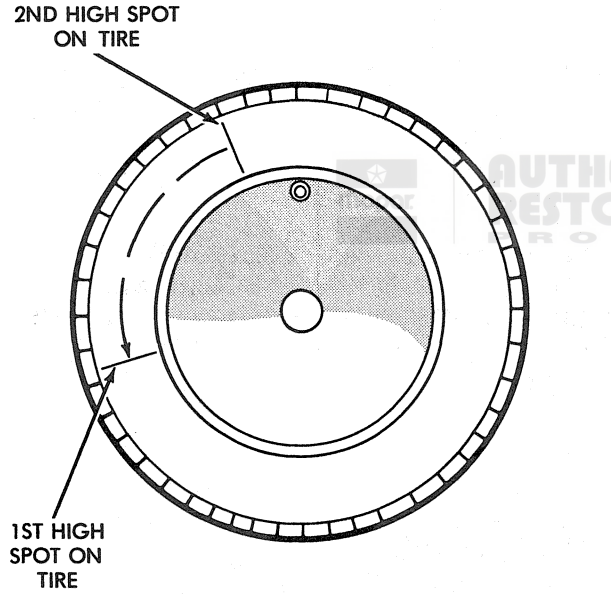


Fig. 9 Remount Tire 90 Degrees In Direction of Arrow

REPAIRING LEAKS

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (Fig. 10). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before dismounting tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and tighten to proper torque specification.

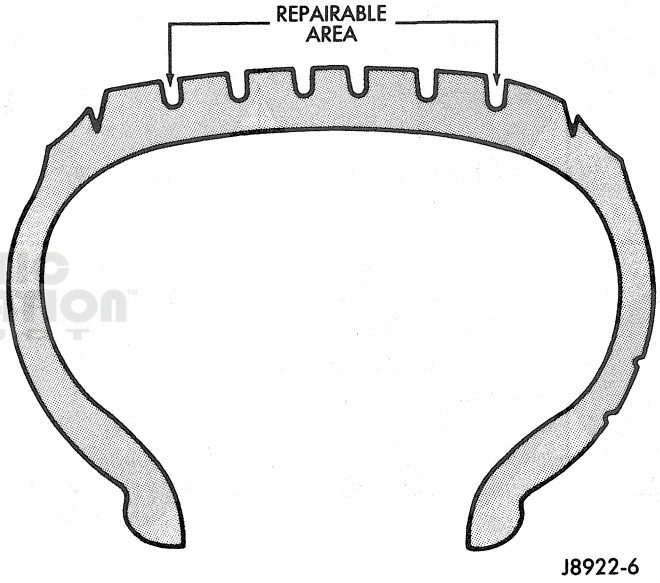


Fig. 10 Tire Repair Area

CLEANING AND INSPECTION

CLEANING OF TIRES

Remove protective coating on tires before delivery of vehicle. The coating could cause deterioration of tires.

Remove protective coating by:
• Applying warm water
• Letting it soak one minute
• Scrubbing the coating away with a soft bristle brush.
• Steam cleaning may also be used for cleaning.
• DO NOT use gasoline or wire brush for cleaning.
• DO NOT use mineral oil or an oil-based solvent.

WHEELS

INDEX

page

DESCRIPTION AND OPERATION
WHEEL 8
DIAGNOSIS AND TESTING
TIRE AND WHEEL RUNOUT 8
WHEEL INSPECTION 8
SERVICE PROCEDURES
TIRE AND WHEEL BALANCE 10
WHEEL INSTALLATION 9
SPECIFICATIONS
WHEEL LUG NUT 11

DESCRIPTION AND OPERATION

WHEEL

Available rim sizes are on the safety certification label located on the drivers door shut face.

Rim size is determined by the drivetrain package.

Original equipment wheels are designed for operation up to the specified maximum vehicle capacity.

All models use steel or cast aluminum wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 1).

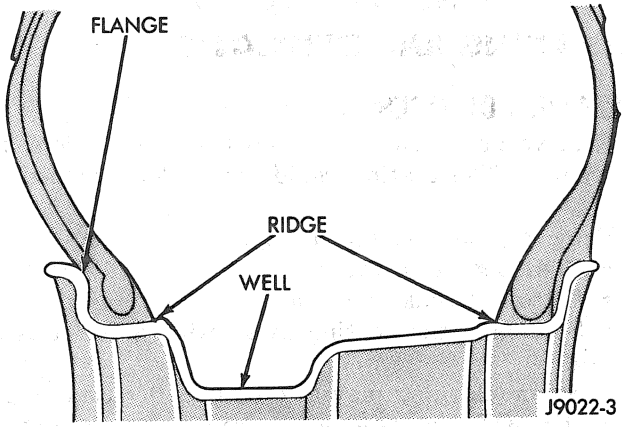


Fig. 1 Safety Rim

Initial inflation of the tire forces the bead over these raised sections. In case of tire failure, the raised sections help hold the tire in position on the wheel.

Cast aluminum wheels require coated balance weights and special alignment equipment.

The wheel studs and nuts are designed for specific applications and must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels.

Before installing the wheel, remove any build up of corrosion on the wheel mounting surfaces.

WARNING: INSTALLING WHEELS WITHOUT GOOD METAL-TO-METAL CONTACT COULD CAUSE LOOSENING OF WHEEL NUTS. THIS COULD ADVERSELY AFFECT THE SAFETY AND HANDLING OF YOUR VEHICLE.

Mopar AUTHENTIC RESTORATION PRODUCT

DIAGNOSIS AND TESTING

WHEEL INSPECTION

Wheels must be replaced if they:

- Have excessive run out
- Are bent or dented
- Leak air
- Have damaged bolt holes

Wheel repairs employing hammering, heating, welding or repairing leaks are not allowed.

Original equipment replacement wheels should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The physical dimensions (diameter, width, offset, and bolt circle) of the wheel should be the same as the original wheel.

WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE. REPLACEMENT WITH USED WHEELS IS NOT RECOMMENDED. THE SERVICE HISTORY OF THE RIM MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel (Fig. 2).

Lateral runout is the **wobble** of the tire or wheel.

DIAGNOSIS AND TESTING (Continued)

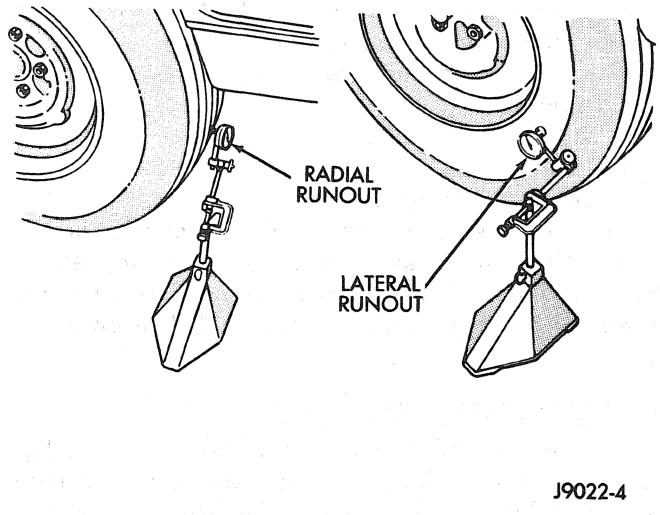


Fig. 2 Checking Tire Runout

Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

METHOD 1 (RELOCATE WHEEL ON HUB)

Check accuracy of the wheel mounting surface; adjust wheel bearings.

Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

Make sure all wheel nuts are properly torqued.

Relocate wheel on the mounting, two studs over from the original position.

Re-tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

METHOD 2 (RELOCATE TIRE ON WHEEL)

Rotating tire on wheel is particularly effective when there is runout in both tire and wheel.

Remove tire from wheel and re-mount wheel on hub in former position.

Check wheel radial runout (Fig. 3).

NOTE: If the vehicle is equipped with aluminum or full faced wheels the tire must be remove to check radial runout.

- STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in.
- ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in.

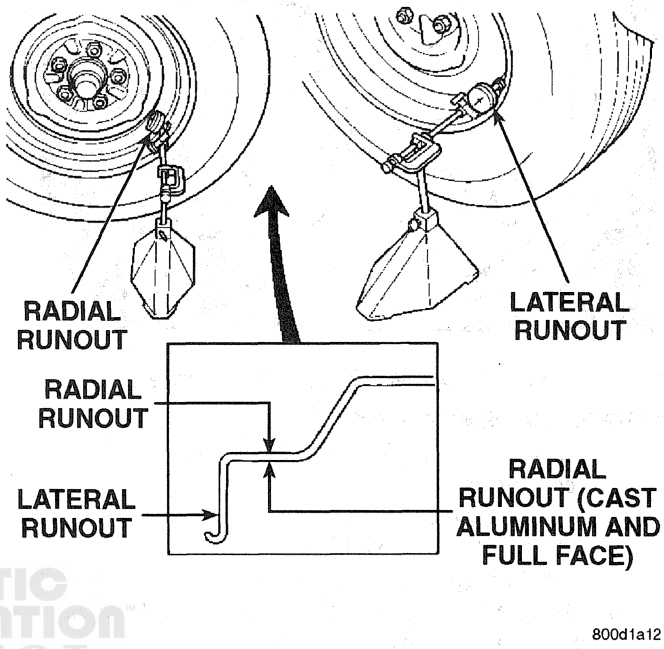


Fig. 3 Checking Wheel Runout

If point of greatest runout is near original chalk mark, remount tire 180 degrees. Recheck runout.

SERVICE PROCEDURES

WHEEL INSTALLATION

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

NOTE: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the proper torque specification (Fig. 4). **Never use oil or grease on studs or nuts.**

SERVICE PROCEDURES (Continued)

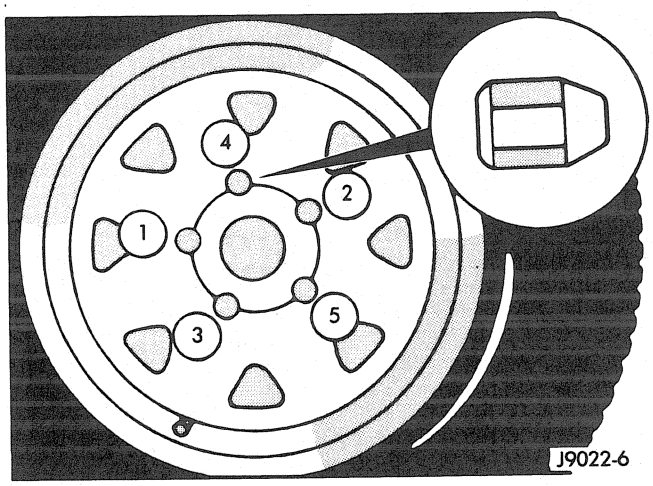


Fig. 4 Lug Nut Tightening Pattern

WHEEL REPLACEMENT

Wheels must be replaced if they have:

- Excessive runout
- Bent or dented
- Leak air through welds
- Have damaged bolt holes

Wheel repairs employing hammering, heating, or welding are not allowed.

Original equipment wheels are available through your dealer. Replacement wheels from any other source should be equivalent in:

- Load carrying capacity
- Diameter
- Width
- Offset
- Mounting configuration

Failure to use equivalent replacement wheels may affect the safety and handling of your vehicle. Replacement with **used** wheels is not recommended. Their service history may have included severe treatment.

TIRE AND WHEEL BALANCE

It is recommended that a two plane dynamic balancer be used when a wheel and tire assembly require balancing. Static should be used only when a two plane balancer is not available.

For static imbalance, find location of heavy spot causing imbalance. Counter balance wheel directly opposite the heavy spot. Determine weight required to counterbalance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (Fig. 5) and (Fig. 6). Off-vehicle balancing is necessary.

Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, remove the opposite wheel/tire.

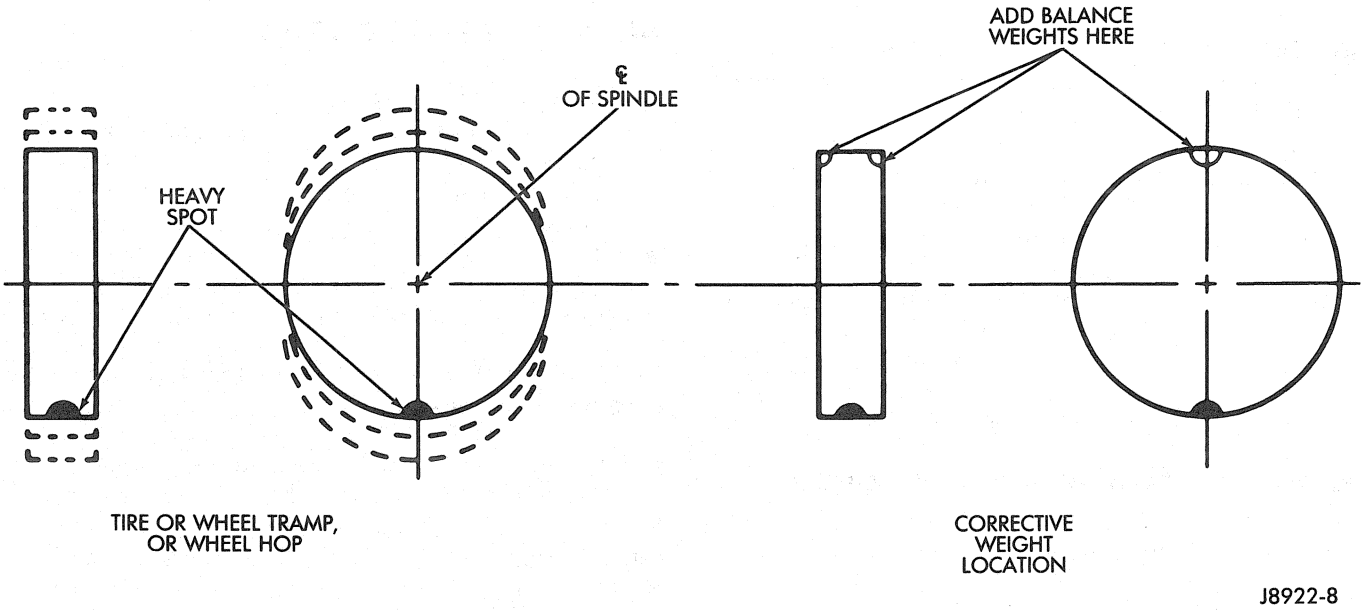


Fig. 5 Static Unbalance & Balance

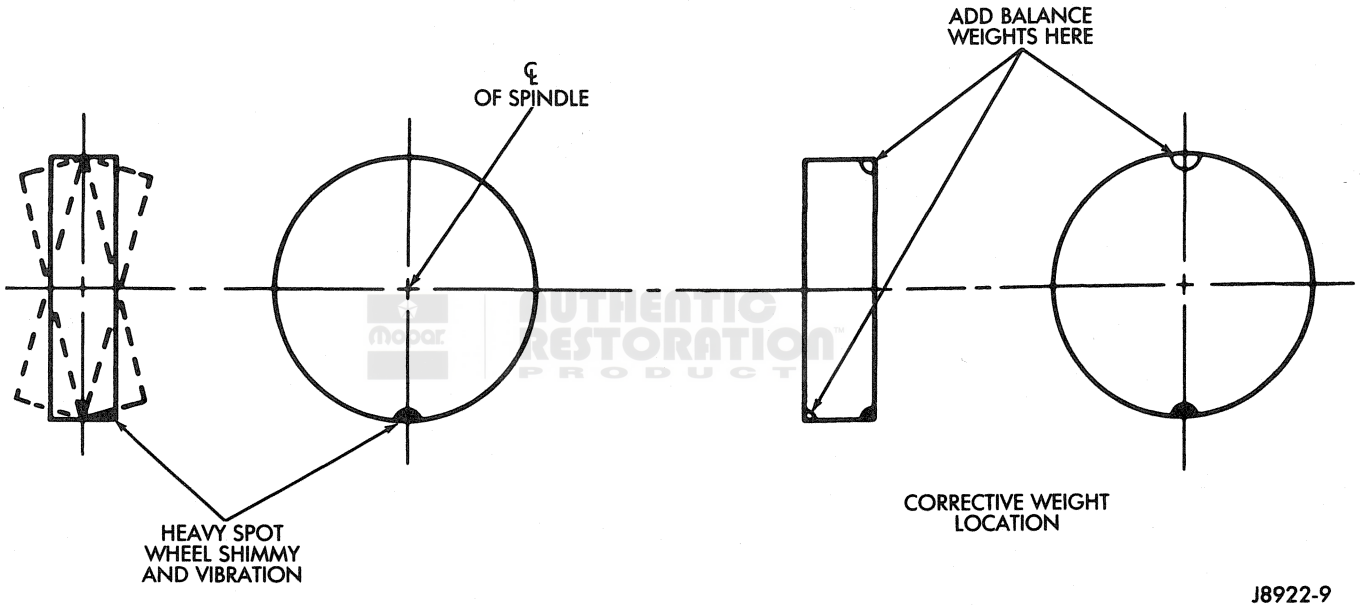


Fig. 6 Dynamic Unbalance & Balance

SPECIFICATIONS

WHEEL LUG NUT

DESCRIPTION	TORQUE
1/2 X 20 with 60° Cone	109 to 150 N·m (80 to 110 ft. lbs.)

BODY

CONTENTS

	page		page
BODY COMPONENT SERVICE	16	SEATS	12
GENERAL SERVICE INFORMATION	1	STATIONARY GLASS	4
PAINT	2		

GENERAL SERVICE INFORMATION

GENERAL INFORMATION

SAFETY PRECAUTIONS AND WARNINGS

WARNING: EYE PROTECTION SHOULD BE USED WHEN SERVICING GLASS COMPONENTS. PERSONAL INJURY CAN RESULT.

USE A BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

DO NOT GO UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.

CAUTION: When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.

Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous condition can result.

Always have a fire extinguisher ready for use when welding.

Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is OFF. Damage to electrical system can result.

Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.

Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.

Do not hammer or pound on plastic trim panel when servicing interior trim, plastic panel can break.

Chrysler Corporation uses many different types of push-in fasteners to secure the interior and exterior trim to the body. Most of these fasteners can be reused to assemble the trim during various repair procedures. At times a push-in fastener cannot be removed without damaging the fastener or the component it is holding. If it is not possible to remove a fastener without damaging a component or body, cut or brake the fastener and use a new one when installing the component. Never pry or pound on a plastic or press-board trim component. Using a suitable fork-type prying device, pry the fastener from the retaining hole behind the component being removed. When installing, verify fastener alignment with the retaining hole, by hand, push directly on or over the fastener until it seats. Apply a low force pull to the panel to verify that it is secure.

When it is necessary to remove components to service another, it should not be necessary to apply excessive force or bend a component to remove it. Before damaging a trim component, verify hidden fasteners or captured edges holding the component in place.

PAINT

INDEX

page

GENERAL INFORMATION
BASE COAT/CLEAR COAT FINISH 2
PAINT CODE 2
PAINTED SURFACE TOUCH-UP 2
WET SANDING, BUFFING AND POLISHING 2
SPECIFICATIONS
AFTERMARKET PAINT REPAIR PRODUCTS 3

GENERAL INFORMATION

PAINT CODE

Exterior vehicle body colors are identified on the Body Code plate. The plate is located on the left side of the dash panel in the engine compartment. Refer to the Introduction section at the front of this manual for body code plate description. The paint code is also identified on the Vehicle Saftey Certification Label which is located on the drivers door shut face. The color names provided in the Paint and Trim Code Description chart are the color names used on most repair product containers.

BASE COAT/CLEAR COAT FINISH

On most vehicles a two part paint application (base coat/clear coat) is used. Color paint that is applied to primer is called base coat. The clear coat protects the base coat from ultra violet light and provides a durable high gloss finish.

WET SANDING, BUFFING AND POLISHING

Minor acid etching, orange peel or smudging in clear coat or single stage finishes can be reduced with light wet sanding, hand buffing and polishing. **If the finish has been wet sanded in the past, it can not be repeated. Wet sanding operation should be performed by a trained automotive paint technician.** .

CAUTION: Do not remove clear coat finish, if equipped. Base coat paint must retain clear coat for durability.

PAINTED SURFACE TOUCH-UP

When a painted metal surface has been scratched or chipped, it should be touched-up as soon as possible to avoid corrosion. For best results, use Mopar® Scratch Filler/Primer, Touch-Up Paints and Clear Top Coat. Refer to Introduction group of this manual for Body Code Plate information.

TOUCH-UP PROCEDURE

(1) Scrape loose paint and corrosion from inside scratch or chip.

(2) Clean affected area with Mopar® Tar/Road Oil Remover and allow to dry.

(3) Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle fill the defect without running. Do not stroke brush applicator on body surface. Allow the filler/ primer to dry hard.

(4) Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.

(5) On vehicles without clear coat, the touch-up color can be lightly (600 grit) wet sanded and polished with rubbing compound.

(6) On vehicles with clear coat, Apply clear top coat to touch- up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

SPECIFICATIONS

AFTERMARKET PAINT REPAIR PRODUCTS

1996 EXTERIOR COLOR

EXTERIOR COLOR	CHRY CODE	PPG	BASF	DuPONT	S-W ACME M-S	AKZO/NOBEL SIKKENS
Flame Red Clear Coat	PR4	4679	23043	B9326	46916	CHA93:PR4
Magenta Clear Coat	SH1	74171	26079	B9615	51522	CHA96:SH1
Citron Pearl Coat	SJV	47694	26081	B9672	51524	CHA96:SJV
Light Pearlstone Pearl Coat	HV1	4189	22125	B8952	41824	CHA89:HV1
Moss Green Pearl Coat	RJN	47383	25036	B9533	50277	CHA95:RJN
Bright Jade Satin Glow	SQP	47586	26088	B9636	51533	CHA96:SQP
Lapis Blue Clear Coat	RC4	4935	24098	B9531	50218	CHA95:RC4
Dark Blue Pearl Coat	PCJ	4783	24072	B9453	48543	CHA94:PCJ
Black Clear Coat	DX8	9700	15214	99	34858 90-5950	CHA85:DX8
Dark Silver Metallic Clear Coat	KS7	4274	21077	B9137	44046	CHA91:KS7
Stone White Clear Coat	SW5	91231	26091	B9634	51540	CHA96:SW5

1996 CLADDING COLOR

CLADDING COLOR	CHRY CODE	PPG	BASF	DuPONT	S-W ACME M-S	AKZO/NOBEL SIKKENS
Light Pearlstone	HV1	4189	22125	B8952	41824	CHAHV1M
Dark Silver	KS7	4274	21077	B9137	44046	CHAKS7M

1996 INTERIOR COLOR

INTERIOR COLOR	CHRY CODE	PPG	BASF	DuPONT	S-W ACME M-S
Charcoal HS1/HA8	SA	34427/2-1312 34466/2-1312	18825 18826	C8826 C8824	38500 38501
Dark Sand	Y6	26375/2-1358	19139	C8914	40079

STATIONARY GLASS

INDEX

	page
DESCRIPTION AND OPERATION	
SAFETY PRECAUTIONS	4
REMOVAL AND INSTALLATION	
LIFTGATE WINDOW GLASS	9
REAR DOOR STATIONARY WINDOW GLASS	8
REAR QUARTER WINDOW GLASS	8
WINDSHIELD	4
SPECIAL TOOLS	
SPECIAL TOOLS STATIONARY GLASS	11

DESCRIPTION AND OPERATION

SAFETY PRECAUTIONS

WARNING: DO NOT OPERATE THE VEHICLE WITHIN 24 HOURS OF WINDSHIELD INSTALLATION. IT TAKES AT LEAST 24 HOURS FOR URETHANE ADHESIVE TO CURE. IF IT IS NOT CURED, THE WINDSHIELD MAY NOT PERFORM PROPERLY IN AN ACCIDENT.

URETHANE ADHESIVES ARE APPLIED AS A SYSTEM. USE GLASS CLEANER, GLASS PREP SOLVENT, GLASS PRIMER, AND PINCHWELD (FENCE) PRIMER PROVIDED BY THE ADHESIVE MANUFACTURER. IF NOT, STRUCTURAL INTEGRITY COULD BE COMPROMISED.

BE SURE TO REFER TO THE URETHANE MANUFACTURER'S DIRECTIONS FOR CURING TIME SPECIFICATIONS, AND DO NOT USE ADHESIVE AFTER ITS EXPIRATION DATE.

VAPORS THAT ARE EMITTED FROM THE URETHANE ADHESIVE OR PRIMER COULD CAUSE PERSONAL INJURY, USE THEM IN A WELL VENTILATED AREA.

SKIN CONTACT WITH URETHANE ADHESIVE SHOULD BE AVOIDED, OR PERSONAL INJURY MAY RESULT.

ALWAYS WEAR EYE AND HAND PROTECTION WHEN WORKING WITH GLASS.

CAUTION: Protect all painted or trimmed surfaces from coming in contact with urethane or primers.

Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

It is difficult to salvage a windshield during the removal operation. The windshield is part of the structural support for the roof. The urethane bonding used to secure the windshield to the fence is difficult to cut or clean from any surface. If the moldings are set in urethane, it would also be unlikely they could be salvaged. Before removing the windshield, check the availability of the windshield and moldings from the parts supplier.

REMOVAL AND INSTALLATION

WINDSHIELD

Windshield glass removal is accomplished by the use of a razor knife and an electric hot knife to cut through the urethane adhesive. This removal method applies in all instances.

Depending on the circumstances, either one of two windshield glass installation methods can be used:

- The short method.
- The extended method.

The short method is used when the windshield glass is removed intact, and the body opening and the pinchweld flanges do not require repair.

The extended method must be used when the body opening or a flange is damaged. The extended method must also be used when urethane no longer adheres to either the windshield glass or the pinchweld flanges.

REMOVAL

NOTE: When using the windshield glass short installation method, ensure that a bead of urethane remains on the pinchweld flange.

(1) Cover the interior and exterior body surface areas with a protective covering.

(2) With doors open, remove the windshield wiper arms, interior trim moldings and rearview mirror.

(3) Make a cut around the **perimeter** of the windshield glass along the glass edge with a razor knife.

(4) Clean the blade of the hot knife with solvent and a cloth. Sharpen the blade with a fine-tooth file.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When cutting through urethane with a hot knife, do not allow the knife blade to remain stationary at any location. Excessive heat will permanently soften urethane and cause complete replacement of the urethane.

(5) Start the hot knife blade (special tool C-4386) between the glass and the urethane. Next, cut the adhesive as close to the glass edge as possible (Fig. 1). Allow as much adhesive to remain on the pinchweld flange as possible. **For best cutting results, clean the knife blade frequently with steel wool while the blade is hot.**

(6) Remove the windshield glass from the body opening.

(7) After the hot knife blade has cooled, clean the blade with solvent and a clean cloth.

INSTALLATION—SHORT METHOD

Normally, after a replacement windshield glass is installed, the rearview mirror bracket also requires installation. **Do not install the bracket until after the windshield glass installation is completed.**

(1) Inspect the windshield opening pinchweld flanges. Prime any bare spots with urethane primer. Allow a minimum of 18 minutes for dry time.

(2) Inspect urethane bead for high spots. Level bead by shaving off high spots with a razor knife.

(3) Clean the outer edge of windshield glass with naphtha or a equivalent product.

(4) Prime outer perimeter of interior side of glass 16 mm (5/8 inch) from edge. Use a wipe-off type urethane primer and wipe glass dry after primer application.

NOTE: The reveal molding has an adhesive applied to the windshield contact surface to help secure the molding to the windshield during the installation procedure.

(5) Apply the molding to the windshield:

- With the molding at room temperature, press the molding onto the windshield corners.
- From corner to corner, work the molding to the center of each side. (Some strectching of the molding may be required during this procedure.)

(6) Place the glass on the pinchweld flanges and inspect for gaps in the urethane. Gaps in excess of 3 mm (1/8 inch) must be filled with urethane.

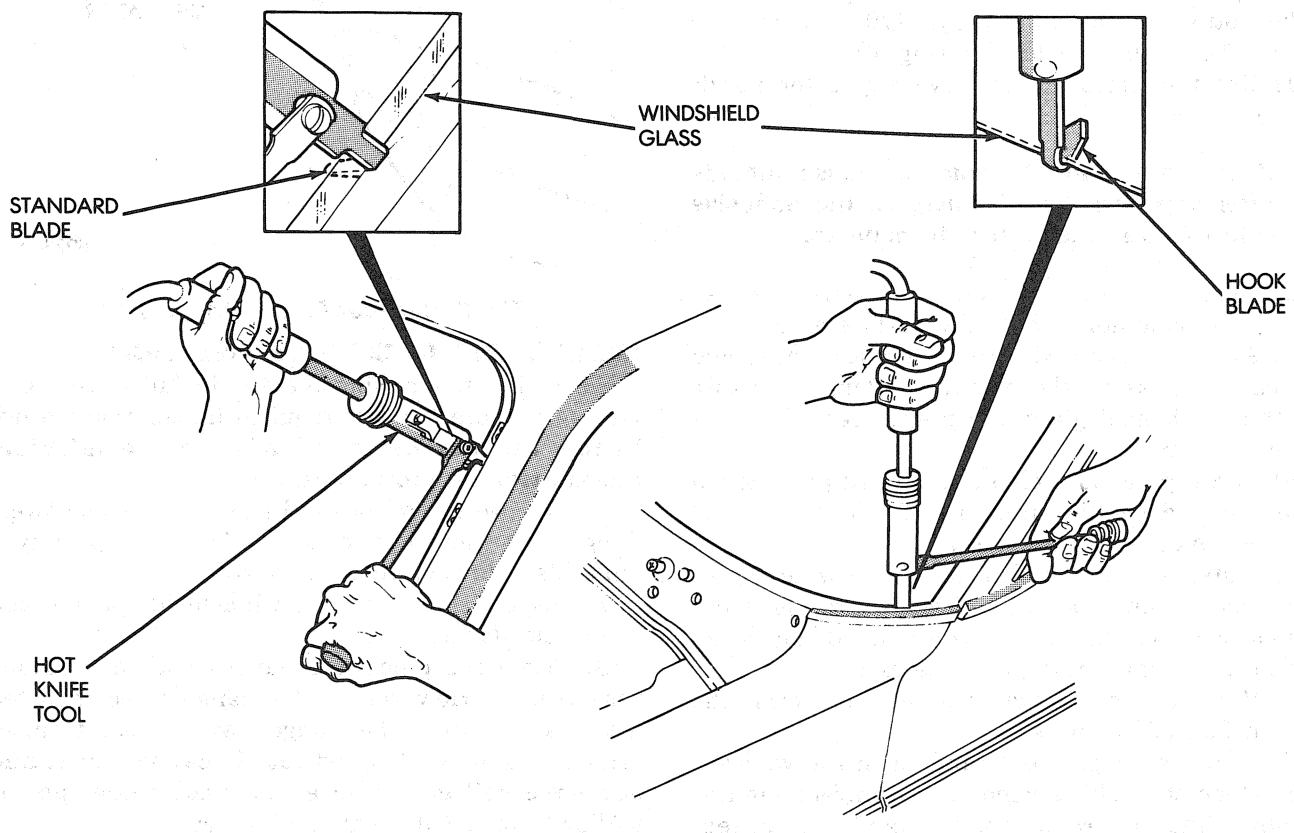


Fig. 1 Cutting Glass Urethane Adhesive With Hot Knife

REMOVAL AND INSTALLATION (Continued)

(7) Adjust windshield glass position until it is aligned with the flanges and adhesive. Next, make alignment marks on the glass and body.

(8) Remove the windshield glass and position it on a flat surface.

CAUTION: Avoid spilling or dripping primer on painted surfaces. Clean spills or drips immediately. The primer will damage the paint if it remains on the surface for any length of time.

(9) If the replacement windshield glass does not have blackout primer:

- Attach a 25 mm (1 in) wide masking tape band around the interior side of the glass 16 mm (5/8 in) from the edge of the glass (Fig. 2).
- Do not attach tape along the bottom of the glass and **attach it only to the inside of the glass.**
- Clean the 16-mm (5/8-in) wide surface area around the glass with isopropyl alcohol.
- Thoroughly mix and apply glass blackout primer to the 16 mm (5/8 in) surface area around the interior side of the glass (Fig. 3).
- Allow the primer to dry for at least 10-12 minutes.

(10) Apply a small amount of adhesive to the bottom support spacers and attach the support spacers to the bottom of the windshield, 170 mm. inboard from the outer windshield edge (Fig. 4).

(11) Cut the urethane adhesive applicator nozzle (Fig. 5).

CAUTION: Be prepared to install the glass immediately after applying the adhesive, as the adhesive will begin to cure in less than 10 minutes.

(12) Apply a continuous, 6-mm (1/4-in) diameter bead of urethane adhesive to the surface area.

(13) Align the glass with the reference marks and position the glass on the pinchweld flanges. Ensure that the windshield glass is correctly seated on the support spacers.

(14) Force the windshield glass inward just enough to wet-out and set the urethane. Use care to avoid excessive squeeze-out of adhesive.

(15) Water test the windshield with a water spray after installation. Do not direct high pressure streams of water directly at urethane. If any leaks are detected, apply urethane as necessary.

(16) If used, remove the masking tape from the inner surface of the glass.

(17) Install all components and clean the vehicle.

(18) Open the vehicle windows to prevent interior pressure while the urethane is curing.**If not vented, pressure in the interior of the vehicle may interfere with proper glass bonding.**

(19) Install the rearview mirror.

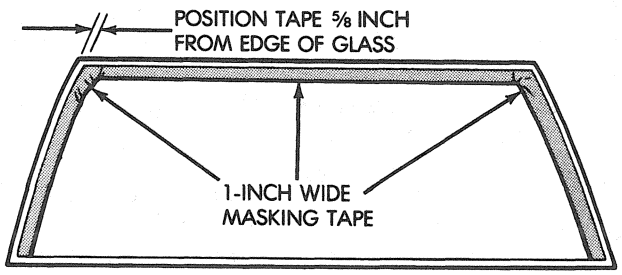


Fig. 2 Masking Tape Location For Blackout Primer

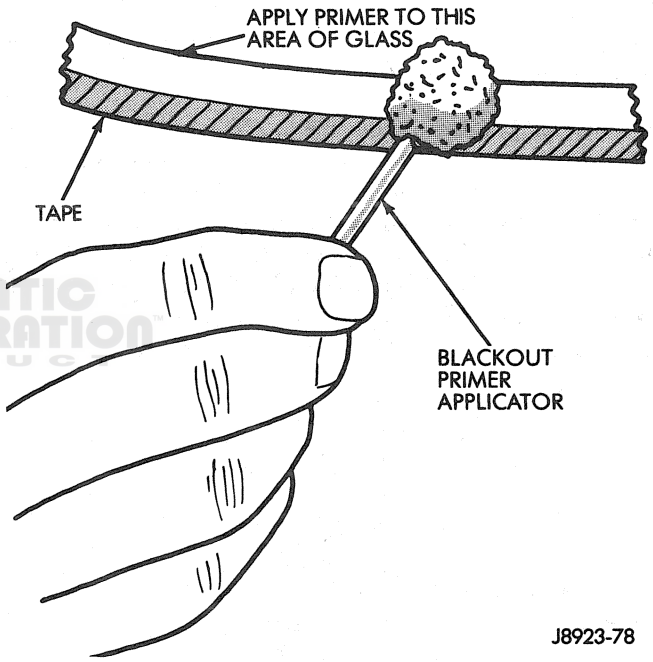


Fig. 3 Blackout Primer Application

INSTALLATION—EXTENDED METHOD

Normally, after a windshield is installed, the rearview mirror bracket also requires installation.**Do not install the bracket until after the windshield installation is completed.**

(1) Remove the all of urethane from all pinchweld flanges. Use an electric hot knife and a plow-type knife blade to remove the adhesive.

(2) Inspect and repair the windshield opening and pinchweld flanges.

(3) Prime the pinchweld flanges with a urethane base primer. However, if the flange is color-coated with paint, prime the flanges with a paint finish primer. **This is important because urethane adhesive will not adhere to all color-coat paints.**Allow primer sufficient time to dry.

REMOVAL AND INSTALLATION (Continued)

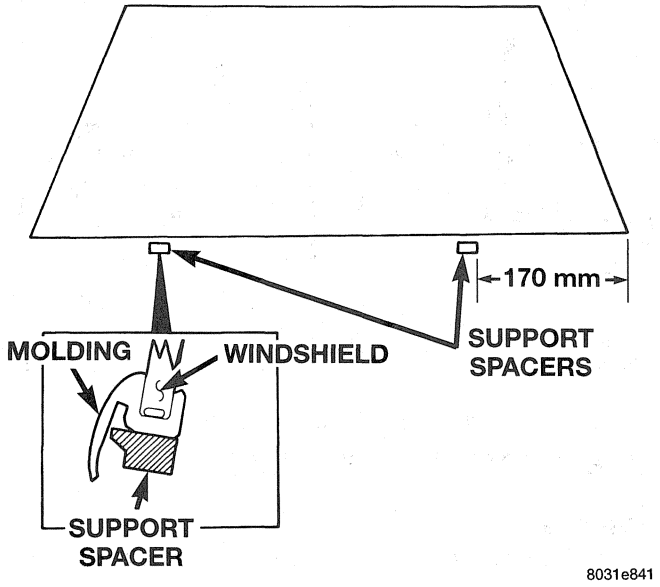


Fig. 4 Windshield Bottom Support Spacers

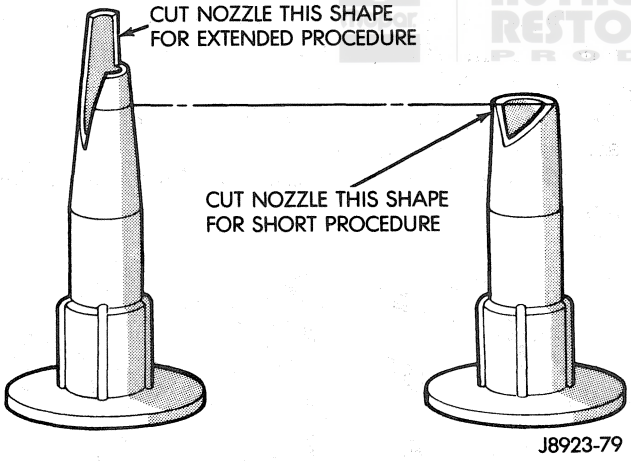


Fig. 5 Applicator Nozzle Preparation

NOTE: The reveal molding has an adhesive applied to the windshield contact surface to help secure the molding to the windshield during the installation procedure.

(4) Apply the reveal molding to the windshield:

- With the molding at room temperature, press the molding onto the windshield corners.
- From corner to corner, work the molding to the center of each side. (Some strectching of the molding may be required during this procedure).

(5) Install and inspect the fit of the windshield on the pinchweld flanges as follows:

- Position windshield until it is aligned within windshield opening.
- Measure the gap between the pinchweld flanges and glass around perimeter of the glass and flange.
- The reveal molding should equally cover the A-Pillars on both sides..
- The flanges should also extend above the glass edge equally around the perimeter of the opening.

(6) If the pinchweld flanges require repair, remove the windshield glass and straighten, align, or repair the flange(s) as necessary.

(7) Position the windshield in the opening and inspect the windshield fit again. Mark the windshield final position on the glass and body with a wax pencil (or use masking tape). The marks (or masking tape) will be used for installation alignment reference.

(8) If the replacement windshield does not have blackout primer:

- Attach a 25-mm (1-in) wide masking tape band around the interior side of glass 16 mm (5/8 in) from edge of glass (Fig. 2).
- Do not attach tape along the bottom of the glass and **attach only to the inside of glass.**
- Thoroughly mix and apply blackout primer to the 16 mm (5/8 in) surface area around the interior side of the glass (Fig. 3).
- Allow the primer to dry for at least 10-12 minutes.

(9) Apply a small amount of adhesive to the bottom support spacers and attach the support spacers to the bottom of the windshield, 170 mm. inboard from the outer windshield edge (Fig. 4).

(10) Cut the urethane applicator nozzle (Fig. 5).

(11) Apply a continuous bead of urethane to the surface area with blackout primer on the interior side of glass. The bead should be 9-mm (3/8-in) wide by 12.7-mm (1/2-in) deep for best results.

CAUTION: Be prepared to install the glass immediately after applying the adhesive, as the adhesive will begin to cure in less than 10 minutes.

(12) Align the windshield with the wax pencil installation alignment reference marks (or the tape strips). Position the windshield on pinchweld flanges and spacers.

(13) Force the windshield inward just enough to wet-out and set the urethane. Use care to avoid excessive squeeze-out of adhesive.

(14) Water test the windshield with a water spray after installation. Do not direct high pressure streams of water directly at the urethane. If any leaks are detected, apply urethane as necessary.

(15) If used, remove the masking tape from the inner surface of glass.

(16) Install all components and clean the vehicle. If necessary, refer to the installation procedures.

REMOVAL AND INSTALLATION (Continued)

(17) Open the vehicle windows to prevent interior pressure while the urethane adhesive is curing. **If not vented, pressure in the interior of vehicle will interfere with glass bonding.**

(18) Install the rearview mirror on the bracket.

REAR DOOR STATIONARY WINDOW GLASS

REMOVAL

(1) Lower the window glass.

(2) Pry the window beltline molding away from the clips and remove the molding from the door.

(3) Remove the window weatherstrip seals from the door.

(4) Remove the trim panel and waterdam from door inner panel.

(5) Remove the channel/division bar screws. Drill out the rivet head to remove it from the inner panel.

(6) Tilt the channel/division bar forward and remove it from the door.

(7) Remove the stationary glass support bracket bolts from the door inner panel reinforcement bracket (Fig. 6).

(8) Remove the stationary glass from the door (Fig. 7).

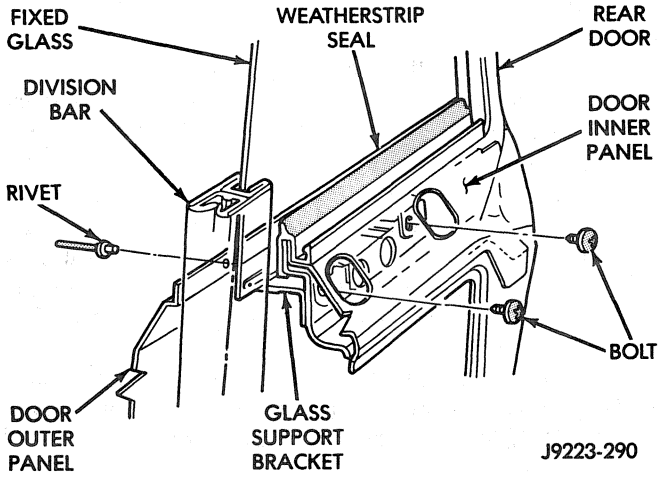


Fig. 6 Stationary Glass Support Bracket Bolts

INSTALLATION

(1) Install the glass in the door, and install the bolts in the reinforcement and support brackets.

(2) Tighten the bracket retaining bolts to 9 N·m (79 in-lbs) torque.

(3) Install the channel/division bar in the door.

(4) Install the channel/division bar screws and rivet. Tighten the screws to 6 N·m (5 ft-lbs) torque.

(5) Install the channel and belt weatherstrip seals.

(6) Install the beltline molding.

(7) Install the door waterdam and trim panel.

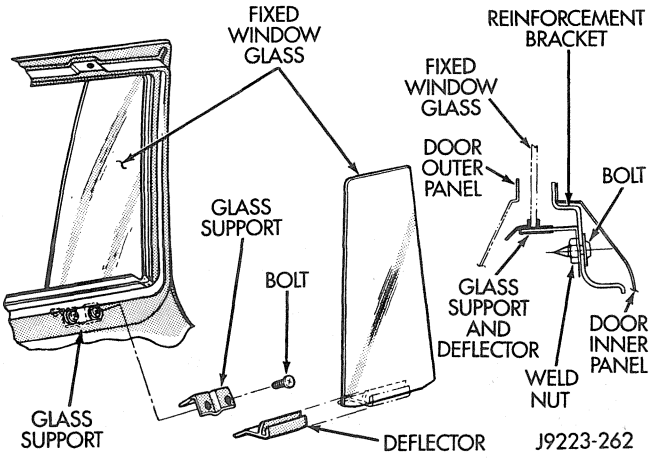


Fig. 7 Stationary Glass Removal/Installation

REAR QUARTER WINDOW GLASS

REMOVAL

(1) If equipped, remove the quarter window reveal molding (Fig. 8).

(2) Remove the quarter window interior trim covers.

(3) Separate the weatherstrip seal lip from the window opening flanges. Use a pry tool and carefully push the window glass and seal outward.

(4) Remove the weatherstrip seal and window glass from window opening.

(5) Remove the weatherstrip seal from the window glass.

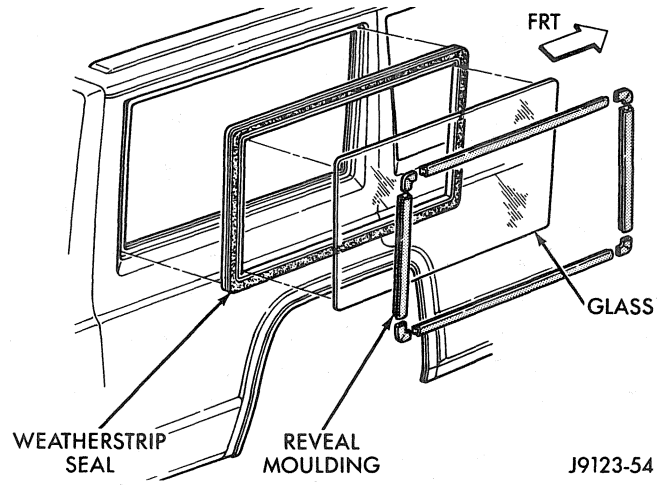


Fig. 8 Quarter Window Reveal Molding, Glass and Seal

INSTALLATION

(1) Clean the original sealant from the weatherstrip channels and window opening flanges.

(2) Apply a 4-mm (1/6-in) diameter bead of sealant to the window channel in the weatherstrip seal.

REMOVAL AND INSTALLATION (Continued)

(3) Install the weatherstrip on the window glass. Install the seal installation cord in the window opening flange channel (Fig. 9) as follows:

- Moisten a length of 6-mm (1/4-in) diameter cord with a soap and water solution.
- Ensure that the cord is long enough to go all the way around the perimeter of the weatherstrip.
- Insert the cord into the window opening flange channel in the weatherstrip seal.

(4) Apply a 6-mm (1/4-in) diameter bead of sealant to the window opening flanges.

(5) For two-door vehicles, apply a 3-mm (1/8-in) diameter bead of sealant at the quarter panel applique and liftgate pillar seam.

(6) Position the quarter window glass and the weatherstrip seal in the window opening (Fig. 10) with the free ends of the cord inside the vehicle (Fig. 11).

(7) Pull on each end of the cord to pull the weatherstrip seal channel lip over the window opening flanges.

(8) Test the vent window for water leaks.

(9) Install the interior trim cover.

(10) If equipped, install the quarter window reveal molding.

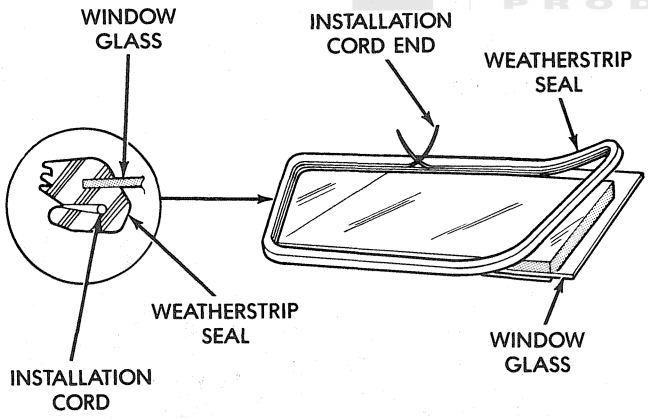


Fig. 9 Weatherstrip Seal and Cord Installation

LIFTGATE WINDOW GLASS

REMOVAL

(1) Remove the interior trim panels.

(2) Use a pry tool to separate the weatherstrip seal lip from the window opening flanges. Push the glass and weatherstrip seal outward from the top toward the rear of the vehicle.

(3) Remove the glass and weatherstrip seal from the liftgate (Fig. 12).

(4) Remove the weatherstrip seal from the window glass.

(5) Clean the weatherstrip channels and window opening flanges.

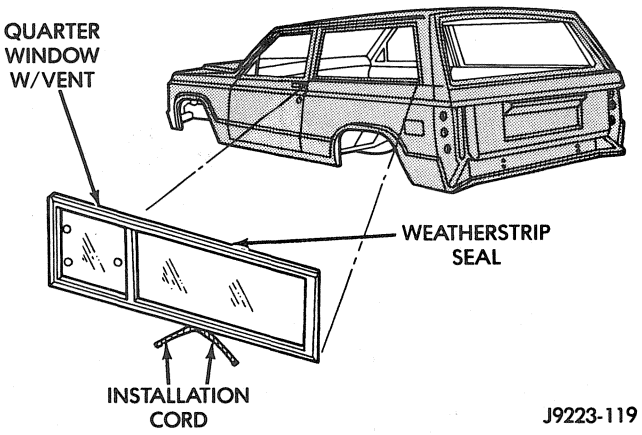


Fig. 10 Quarter Window With Vent

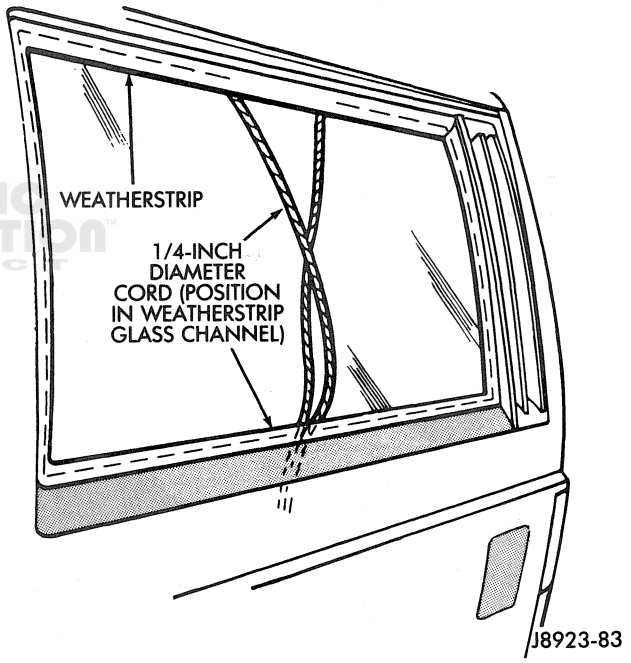


Fig. 11 Quarter Window Glass and Seal Installation

INSTALLATION

(1) Apply a 4-mm (1/6-in) diameter bead of sealant to liftgate glass channel in the weatherstrip seal.

(2) Install weatherstrip seal on the glass (Fig. 13). Install the seal installation cord in the window opening channel as follows:

- Moisten a length of 6-mm (1/4-in) diameter cord with a soap and water solution.
- Insert the cord into the window opening flange channel in the weatherstrip seal.

(3) Apply a 6-mm (1/4-in) diameter bead of sealant around the perimeter of the window opening flange in the liftgate.

(4) Install the window glass and the weatherstrip seal in the window opening with the cord according to the following instructions:

REMOVAL AND INSTALLATION (Continued)

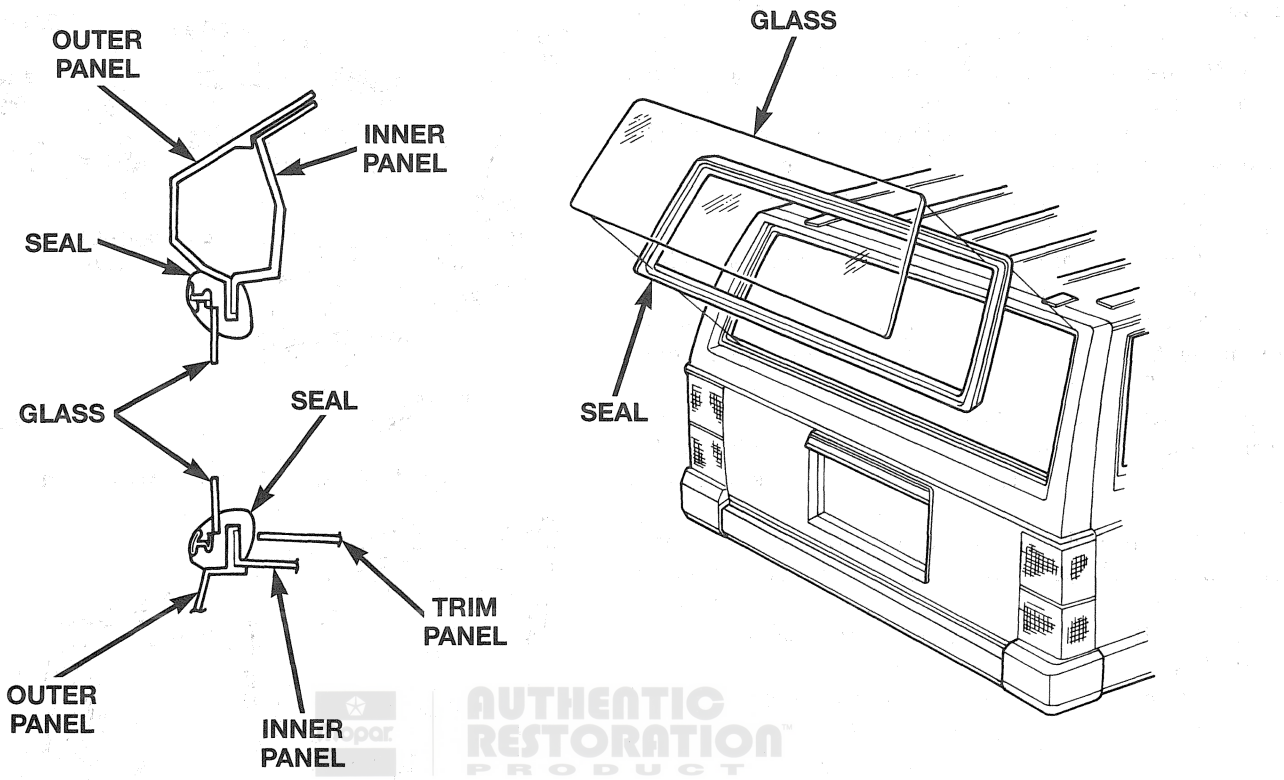


Fig. 12 Liftgate Window Glass and Seal

- Position the window glass and the weatherstrip seal in the window opening with the free ends of the cord inside the vehicle (Fig. 14).
- Pull on each end of the cord to pull the weatherstrip seal channel lip over the window opening flange.

(5) Test the liftgate window for water leaks.

(6) Install the interior trim covers.

(7) If equipped, install the liftgate window reveal molding.

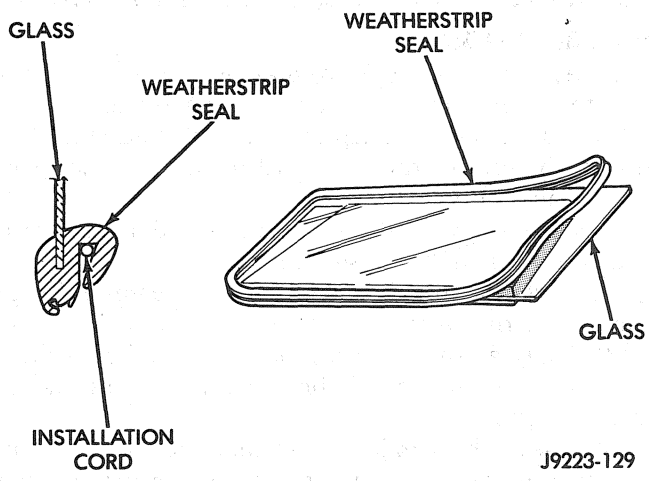


Fig. 13 Weatherstrip Seal and Cord Installation

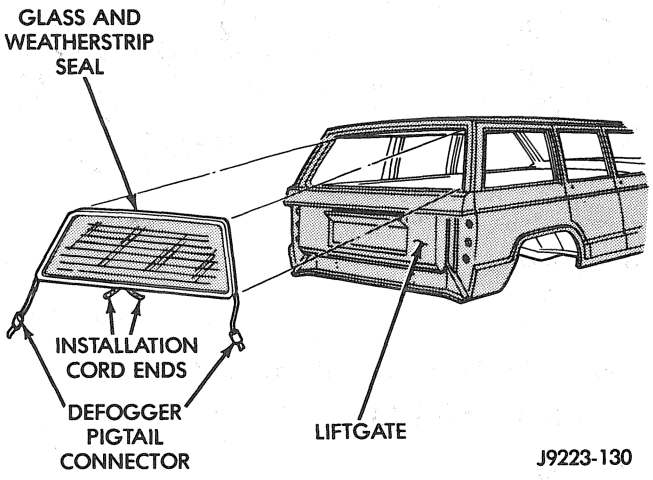
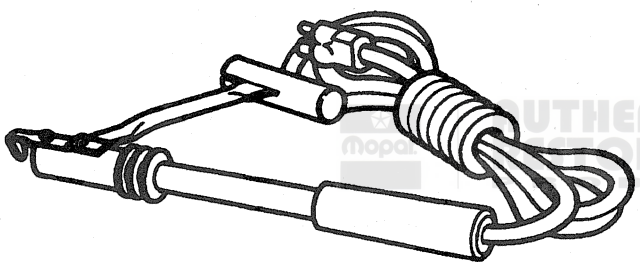


Fig. 14 Liftgate Window Glass Installation With Cord

SPECIAL TOOLS (Continued)

SPECIAL TOOLS

STATIONARY GLASS



Hot Knife C 4386

SEATS

INDEX

page

REMOVAL AND INSTALLATION
- BUCKET SEAT CUSHION AND COVER 12
- BUCKET SEAT PLATFORM 13
- BUCKET SEATBACK COVER AND FRAME 13
- HEAD RESTRAINT 12
- REAR SEAT CUSHION COVER 13
- REAR SEATBACK COVER 14
- REAR SEATBACK LATCH STRIKER AND BUMPER 14

SPECIAL TOOLS
- SPECIAL TOOLS—SEATS 15

REMOVAL AND INSTALLATION

HEAD RESTRAINT

REMOVAL

NOTE: When replacing a head restraint sleeve, the retaining tabs on the sleeve will be damaged during the removal process. Check the availability of replacement parts before servicing.

(1) Raise head restraint to the full up position.
(2) Turn head restraint lock thumbwheel to release head restraint and pull head restraint upward to remove from seat back.
(3) Insert head restraint sleeve extractor (special tool 6773) (Fig. 1) and (Fig. 2) into the seat back.
(4) The retaining tabs are positioned on each side of the sleeve, when inserting the extractor, ensure that the flat of the collar is facing the side of the seatback (Fig. 3).
(5) Using a small hammer, tap extractor downward to release sleeve retaining tab.
(6) Remove extractor tool from sleeve, rotate tool 180 degrees (Fig. 4) and repeat steps 3 and 4.
(7) Remove extractor tool from sleeve and remove sleeve from seat back.

INSTALLATION

(1) Postion the sleeve in the seat back.
(2) Firmly, push sleeve down to snap into place.
(3) Install head restraint.

BUCKET SEAT CUSHION AND COVER

REMOVAL

(1) Remove the seat from vehicle. If necessary, refer to removal procedure.
(2) Remove seat trim cover.
(3) Remove wire support rod and rear carpet seat track cover, and flap retainer.
(4) For power seats, remove control housing from seat cushion.

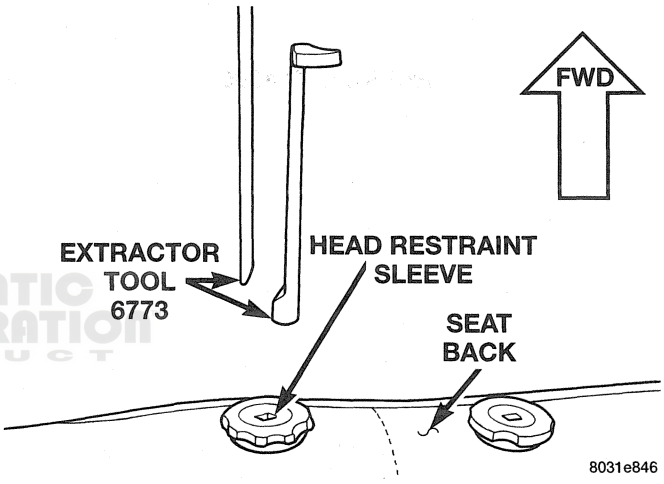


Fig. 1 Head Restraint Sleeve Extractor

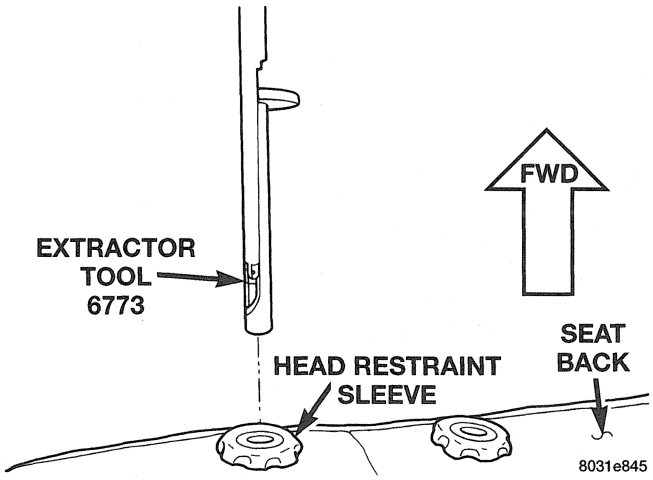


Fig. 2 Head Restraint Sleeve Extractor Instsallation

(5) Unclip skirt from seat cushion and seat frame.
(6) Remove seat cushion cover retaining screws and wire rods from cushion cover. Remove cover from cushion frame.

REMOVAL AND INSTALLATION (Continued)

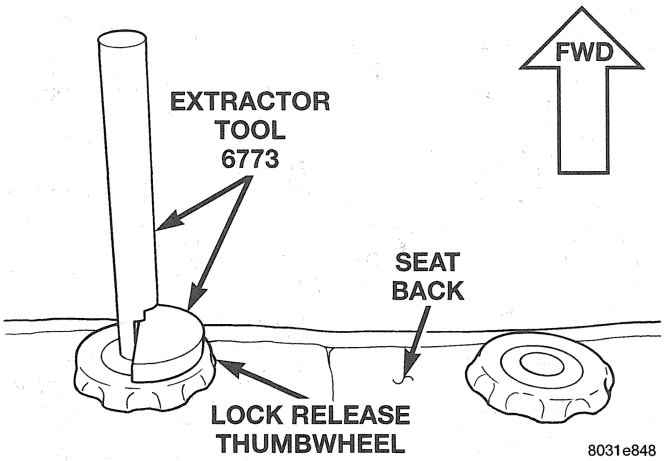


Fig. 3 Head Restraint Sleeve Extractor Positioning

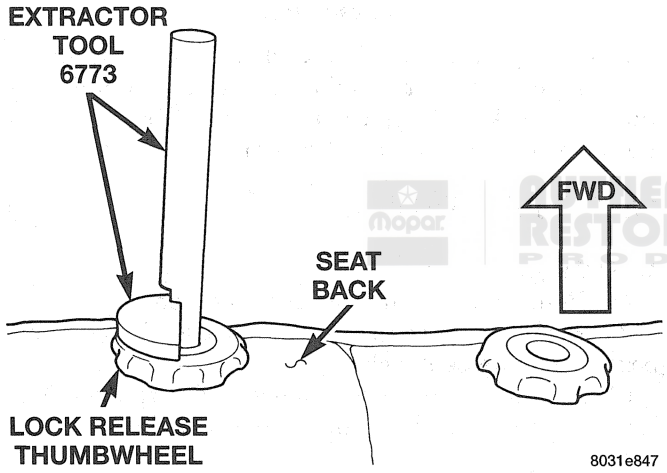


Fig. 4 Head Restraint Sleeve Extractor Positioning

INSTALLATION

(1) Install seat cushion cover on cushion frame. Install wire rods and retaining screws. Tighten screws to 2 N·m (13 in. lbs.) torque.

(2) Install cushion and retaining screws on seat frame.

(3) Clip skirt onto seat cushion and seat frame.

(4) For power seats, install control housing on seat cushion. Tighten screws to 2 N·m (13 in. lbs.) torque.

(5) Install rear carpet seat track cover and support rod and flap retainer.

(6) Install seat trim cover and screws onto seat platform.

(7) Install seat in vehicle. If necessary, refer to removal/installation procedure.

BUCKET SEATBACK COVER AND FRAME

REMOVAL

(1) Remove seat from vehicle. If necessary, refer to removal procedure.

(2) Remove seat cushion from frame. If necessary, refer to removal procedure.

(3) If equipped, remove head restraint.

(4) Remove head restraint guide sleeves from seatback. If necessary, refer to removal procedure.

(5) Squeeze plastic retainers together. Detach lower flap from front of cover.

(6) Remove cover retainer clips and remove cover from seatback.

(7) For power seats, remove retaining screws and remove the seat control from seat track/platform.

(8) Remove retaining screws and nuts. Remove seat frame from seat track/platform.

INSTALLATION

(1) Position seat frame on seat track/platform. Install retaining screws and nuts.

(2) For power seats, position seat control on seat track/platform. Install retaining screws. Tighten screws securely.

(3) Position cover on seatback. Install cover retainer clips.

(4) Attach cover bottom elastic band or attach Velcro flap to front of cover.

(5) Install seatback insert.

(6) Install head restraint guide sleeves.

(7) Install head restraint.

(8) Install cushion on frame. If necessary, refer to installation procedure.

(9) Install seat in the vehicle. If necessary, refer to the installation procedure.

(10) For power seats, test seat operation.

BUCKET SEAT PLATFORM

Bucket seat platforms are not repairable. If the seat platform is damaged, replace platform as a unit.

REAR SEAT CUSHION COVER

REMOVAL

(1) Remove the seat cushion from the vehicle.

(2) Remove the cover side, front and rear retaining clips from the wire retainers with an appropriate removal tool (Fig. 5).

(3) Remove the serrated retainers from the front ends of the cover with a trim panel removal tool (Fig. 6).

(4) Remove the seat cover from the cushion.

INSTALLATION

(1) Position the replacement cover on the cushion.

(2) Compress the cover and attach the retaining clips to the front and rear wire retainers.

(3) Install the serrated retainers at the ends of the cover.

(4) Install the seat cushion in the vehicle. If necessary, refer to the installation procedure.

REMOVAL AND INSTALLATION (Continued)

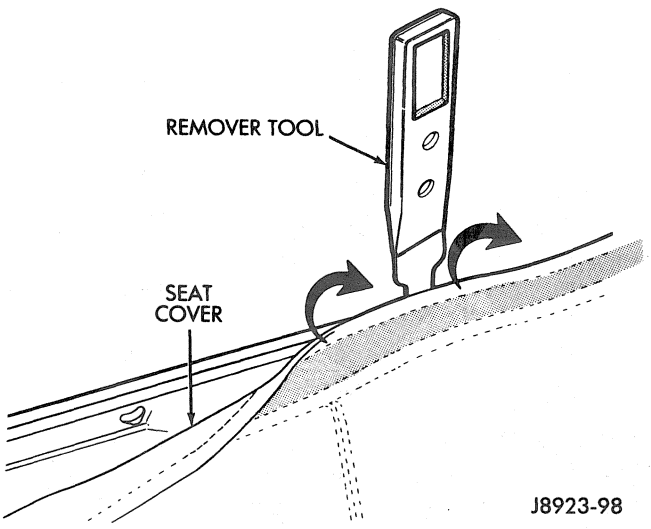


Fig. 5 Seat Cushion Cover Retaining Clip Removal

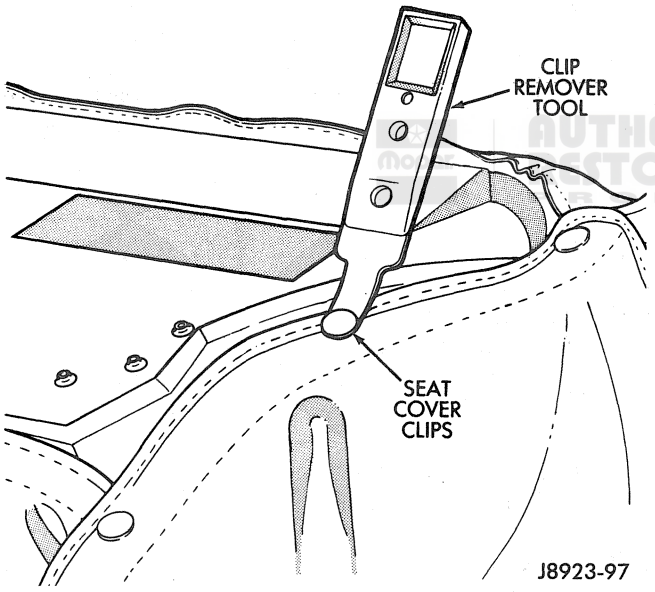


Fig. 6 Seat Cushion Cover Retaining Clip Removal

REAR SEATBACK LATCH STRIKER AND BUMPER

REMOVAL

(1) Disengage the seat cushion at the rear by pulling upward on the release strap.

(2) Tilt the seat cushion forward.

(3) Release the seatback latch from the striker.

(4) Tilt the seatback forward for access to the striker bracket.

(5) Remove the retaining screws and the latch striker bracket from the trim panel (Fig. 7).

INSTALLATION

(1) Position the latch striker bracket on the trim panel and install the retaining screws. Tighten the screws with 6 N·m (50 in. lbs.) torque.

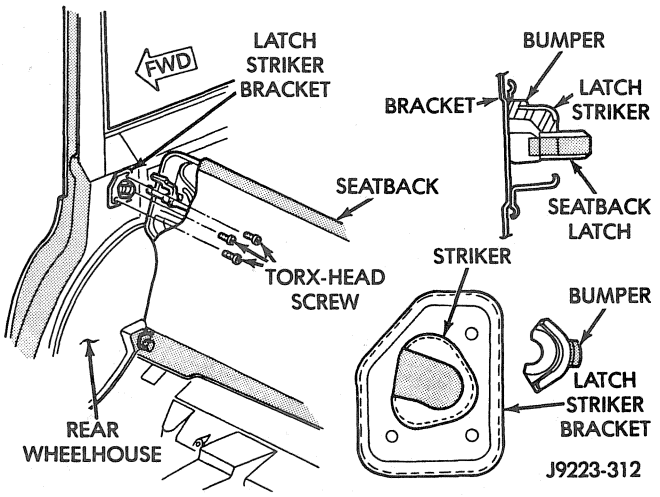


Fig. 7 Seatback Latch Striker Bracket Removal/ Installation

(2) Engage the seatback latch with the striker.

(3) Pivot the seat cushion to the horizontal position and lock it in-place by pressing firmly on the center of the cushion until the latch engages.

REAR SEATBACK COVER

REMOVAL

(1) Remove the seatback from the vehicle.

(2) Remove the seatback latch release handle and bezel from the seatback.

(3) Disengage the cover zipper and J-rail retainer. Remove the cover from the seatback pad (Fig. 8).

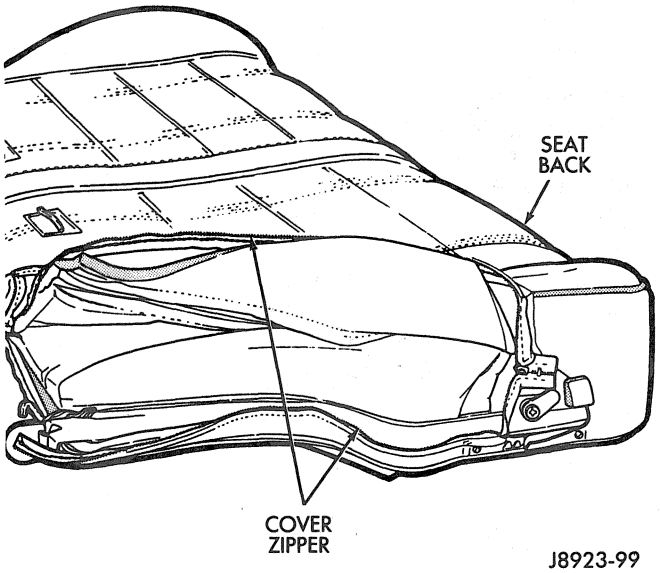


Fig. 8 Seatback Cover Removal

INSTALLATION

(1) Install the replacement cover on the seatback.

REMOVAL AND INSTALLATION (Continued)

(2) Attach the cover J-rail retainer clip to the frame/panel edge and engage the cover zipper.

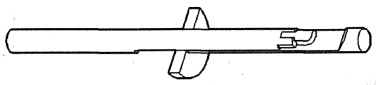
(3) Install the seat latch release bezel and handle on the cover and pad.

(4) Install the seatback in the vehicle.

AUTHENTIC RESTORATION PRODUCT

SPECIAL TOOLS

SPECIAL TOOLS—SEATS



Extractor Head Restraint Sleeve 6773

BODY COMPONENT SERVICE

INDEX

page

DIAGNOSIS AND TESTING
WATER LEAKS 17
WIND NOISE 18
SERVICE PROCEDURES
BODY LUBRICATION 18
REMOVAL AND INSTALLATION
A-PILLAR TRIM 47
AIR EXHAUST GRILLE 50
ASSIST HANDLE 48
B-PILLAR TRIM 48
BODY SIDE MOLDING/CLADDING 47
BODY STRIPES/DECALS 26
BUCKET SEAT 53
C-PILLAR TRIM 49
COWL GRILLE 25
COWL WEATHERSTRIP SEAL 24
CROSSMEMBER AIR DEFLECTOR 24
DASH PANEL INSULATOR PANEL 24
DRIP RAIL MOLDING 64
EXTERIOR NAMEPLATES 26
FRONT CARPET/MAT 56
FRONT DOOR GLASS EXTERIOR MOLDING . . . 39
FRONT DOOR GLASS RUN CHANNEL WEATHERSTRIP 37
FRONT DOOR GLASS 41
FRONT DOOR HINGE PIN 33
FRONT DOOR HINGE 34
FRONT DOOR INNER BELT SEAL 37
FRONT DOOR INSIDE HANDLE ACTUATOR . . . 36
FRONT DOOR LATCH STRIKER 36
FRONT DOOR LATCH 35
FRONT DOOR LOCK CYLINDER 35
FRONT DOOR OUTER BELT SEAL 37
FRONT DOOR OUTSIDE HANDLE 34
FRONT DOOR RESTRAINT 34
FRONT DOOR SPACER BLOCKS—TWO-DOOR VEHICLES 40
FRONT DOOR TRIM PANEL 30
FRONT DOOR WEATHERSTRIP 38
FRONT DOOR WINDOW REGULATOR 39
FRONT DOOR 32
FRONT FENDER/LINER/WHEELHOUSE FLARE . 28
FRONT INNER SCUFF PLATE 48
FRONT SHOULDER BELT/BUCKLE 51
FULL FLOOR CONSOLE 54
GRILLE OPENING PANEL (GOP) 19
GRILLE 18
HEADLINER 58
HOOD HINGE 21
HOOD LATCH 23

page

HOOD LATCH STRIKER 23
HOOD RELEASE CABLE 23
HOOD 21
LIFTGATE HINGE 60
LIFTGATE LATCH STRIKER 63
LIFTGATE LATCH 62
LIFTGATE LOCK CYLINDER 62
LIFTGATE OUTSIDE HANDLE 61
LIFTGATE PILLAR TRIM 51
LIFTGATE SUPPORT ROD BALL STUD 61
LIFTGATE SUPPORT ROD CYLINDER 61
LIFTGATE TRIM PANEL 59
LIFTGATE WEATHERSTRIP 63
LIFTGATE 59
LOWER A-PILLAR COWL TRIM 48
LUGGAGE RACK 65
MINI-FLOOR CONSOLE 53
OUTER SCUFF PLATES 51
PARKING BRAKE HANDLE COVER 54
QUARTER AND WHEELHOUSE TRIM PANELS . 50
QUARTER TRIM PANEL EXTENSION 49
QUARTER VENT WINDOW 64
QUARTER WINDOW APPLIQUE 64
RADIATOR SUPPORT CROSSMEMBER 20
REAR CARPET/MAT 56
REAR DOOR GLASS EXTERIOR MOLDING 45
REAR DOOR GLASS RUN CHANNEL WEATHERSTRIP 45
REAR DOOR HINGE PIN 42
REAR DOOR HINGE 42
REAR DOOR INNER BELT SEAL 45
REAR DOOR INSIDE HANDLE ACTUATOR 44
REAR DOOR LATCH STRIKER 44
REAR DOOR LATCH 43
REAR DOOR OUTSIDE HANDLE 43
REAR DOOR RESTRAINT 42
REAR DOOR TRIM PANEL 41
REAR DOOR WEATHERSTRIP 46
REAR DOOR WINDOW GLASS 46
REAR DOOR WINDOW REGULATOR 46
REAR DOOR 42
REAR SEAT CUSHION 54
REAR SEATBACK 55
REAR SHOULDER/LAP BELT/BUCKLE 52
REAR WHEELHOUSE FLARES AND LINERS . . . 63
REARVIEW MIRROR SUPPORT BRACKET 57
REARVIEW MIRROR 57
SAFETY LATCH STRIKER 24
SIDE VIEW MIRRORS 28
SUNVISORS 58

ADJUSTMENTS
DOOR LATCH ADJUSTMENT 66
DOOR 66
HOOD 65
LIFTGATE 67
SPECIFICATIONS
BODY LUBRICANTS 68
SPECIAL TOOLS
SPECIAL TOOLS—BODY 68

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Over compensating on door or glass adjustments to stop a water leak that occurs under severe conditions, can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA, PERSONAL INJURY CAN RESULT.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in the direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations refer to Group 0, Lubrication and Maintenance, General Information section.

WATER LEAK DETECTION

To detect a water leak point of entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water splashes or runs from the cavity it is dammed up in, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on a incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly light area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment can not be detected by water testing, pressurize the passenger compartment and soap test exterior of

DIAGNOSIS AND TESTING (Continued)

the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to assure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket the leak entry point could be at that location.

WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be air tight in normal driving conditions. Moving sealing surfaces will not always seal air tight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross-winds. Over compensating on door or glass adjustments to stop wind noise that occurs under severe conditions, can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

Wind noise can also be caused by improperly fitted exterior moldings or body ornamentation. Loose moldings can flutter, creating a buzzing or chattering noise. An open cavity or protruding edge can create whistling or howling noise. Inspect the exterior of the vehicle to verify that these conditions do not exist.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

(1) Drive the vehicle to verify the general location of the wind noise.

(2) Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied drive vehicle. If noise goes away after a piece of tape is applied, remove tape, locate and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

SERVICE PROCEDURES

BODY LUBRICATION

All mechanisms and linkages should be lubricated when necessary. This will maintain ease of operation and provide protection against rust and excessive wear. The weatherstrip seals should be lubricated to prolong their life as well as to improve door sealing.

All applicable exterior and interior vehicle operating mechanisms should be:

- Inspected.
- Cleaned.
- Pivot/sliding contact areas on the mechanisms should then be lubricated.

(1) When necessary, lubricate the operating mechanisms with the specified lubricants.

(2) Apply silicone lubricant to a cloth and wipe it on door seals to avoid over-spray that can soil passenger clothing.

(3) Before applying lubricant, the component should be wiped clean. After lubrication, any excess lubricant should be removed.

(4) The hood latch, latch release mechanism, latch striker and safety latch should be lubricated periodically.

(5) The door lock cylinders should be lubricated 2 times each year (preferably autumn and spring):

- Spray a small amount of lock cylinder lubricant directly into the lock cylinder.
- Apply a small amount to the key and insert it into the lock cylinder.
- Rotate it to the locked position and then back to the unlocked position several times.
- Remove the key. Wipe the lubricant from it with a clean cloth to avoid soiling of clothing.

REMOVAL AND INSTALLATION

GRILLE

REMOVAL

(1) Remove the screws attaching the grille (Fig. 1) to the grille opening panel (GOP).

(2) Seperate the grille from the GOP.

INSTALLATION

(1) Position the grille at the GOP.

(2) Install the screws. Tighten screws to 1 N·m (13 in-lbs) torque

REMOVAL AND INSTALLATION (Continued)

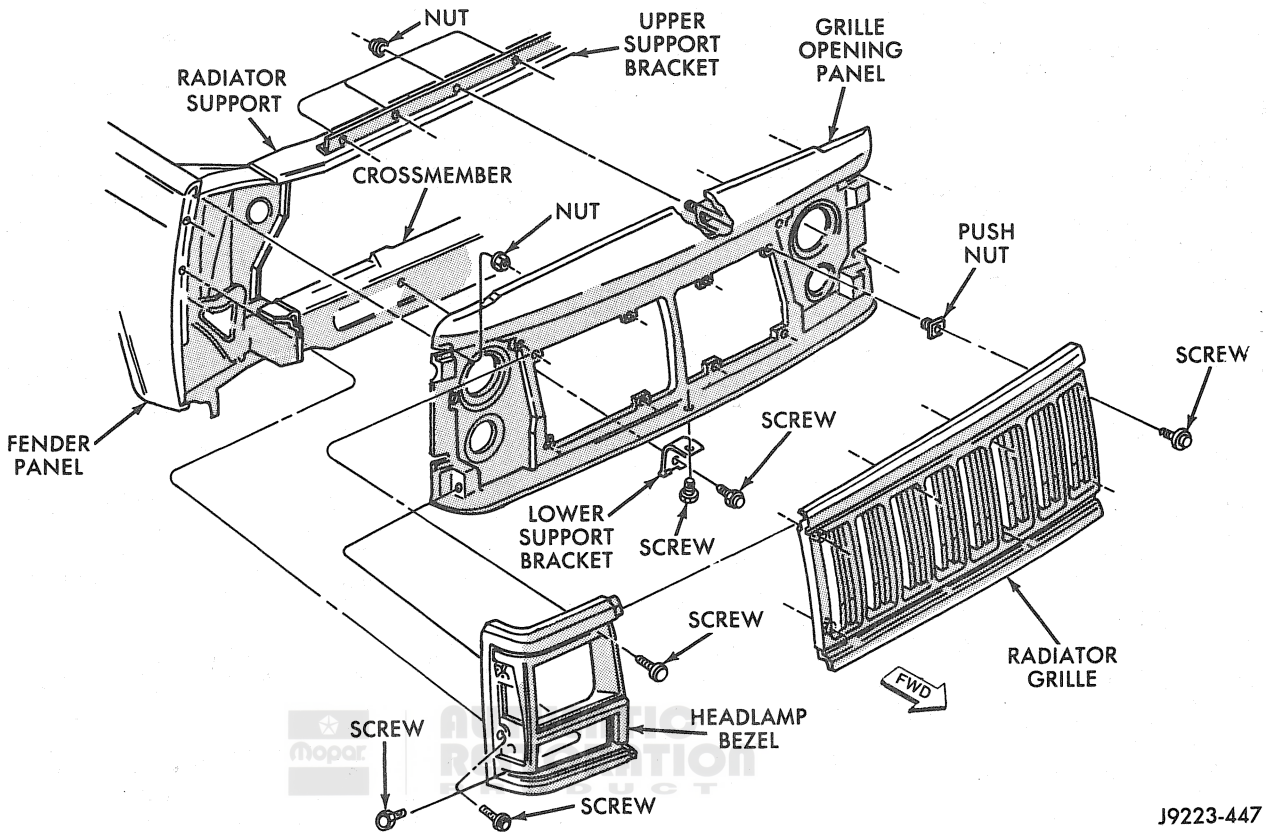


Fig. 1 Grille & GOP

GRILLE OPENING PANEL (GOP)

REMOVAL

(1) Remove the grille.

(2) Remove the screws, side marker lenses and the headlamp bezels from the grille opening panel GOP (Fig. 1).

(3) Remove the headlamps and park/turn signal lamps from the GOP.

(4) Open the hood.

(5) Remove the nuts that attach the grille opening panel GOP to the bracket on radiator support crossmember.

(6) Remove the nuts that attach the grille opening panel GOP to the front fenders (Fig. 2).

(7) Remove the screws that attach the grille opening panel GOP support bracket to the front sill crossmember (Fig. 3).

(8) Pull the grille opening panel GOP forward and disconnect the clips and all the front lamp harness connectors.

(9) Remove the grille opening panel GOP from the vehicle.

(10) If necessary, remove the air inlet baffles from GOP (Fig. 4).

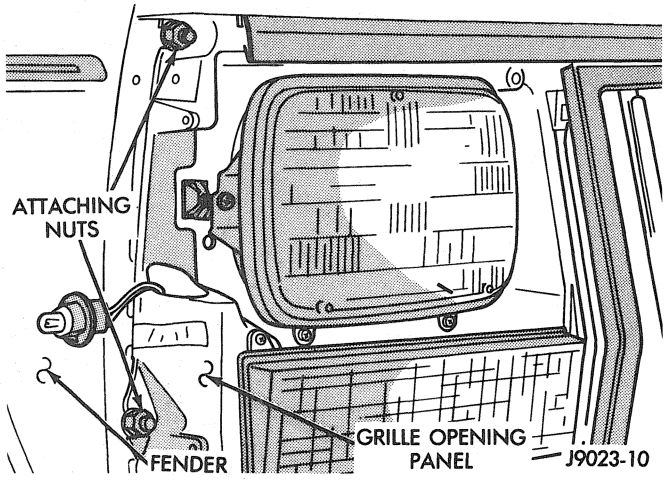


Fig. 2 GOP Attaching Nuts At Front Fender

INSTALLATION

(1) Place the grille opening panel GOP on bumper and connect all front lamp wire harness connectors.

(2) Position the grille opening panel GOP on the vehicle and install the side and upper nuts. Tighten nuts to 7 N·m (58 in-lbs) torque.

(3) Install the screw to attach grille opening panel GOP to the crossmember support bracket. Tighten the screw to 1 N·m (11 in-lbs) torque.

REMOVAL AND INSTALLATION (Continued)

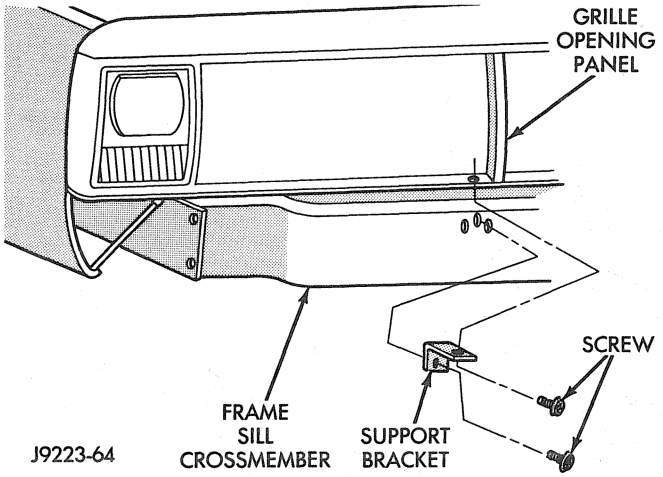


Fig. 3 Crossmember-to-GOP Support Bracket

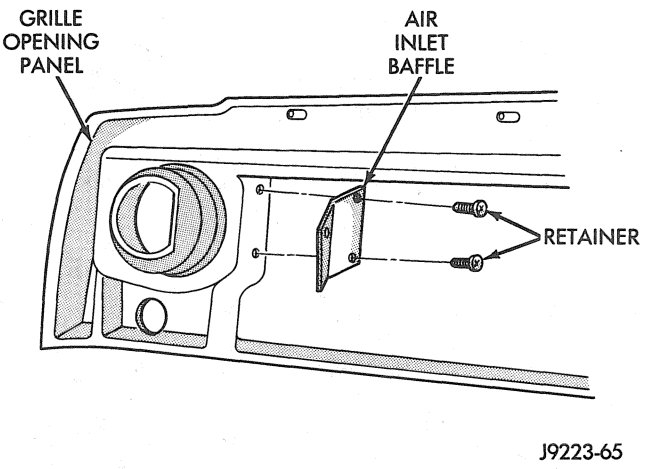


Fig. 4 GOP Air Inlet Baffles

(4) Install headlamps and park/turn signal lamps in GOP.

(5) Install the headlamp bezels on the GOP. Tighten the screws to 1 N·m (13 in-lbs) torque.

(6) Install the side marker lenses and screws on the grille opening panel GOP. Tighten the screws to 1 N·m (13 in-lbs) torque.

(7) Install the grille.

(8) Adjust the headlamp aim, if necessary. Refer to the headlamp beam adjustment procedure within Group 8L.

RADIATOR SUPPORT CROSSMEMBER

REMOVAL

(1) Remove the grille opening panel GOP.

(2) For 2.5L engines, remove the power steering pump reservoir from the left filler panel.

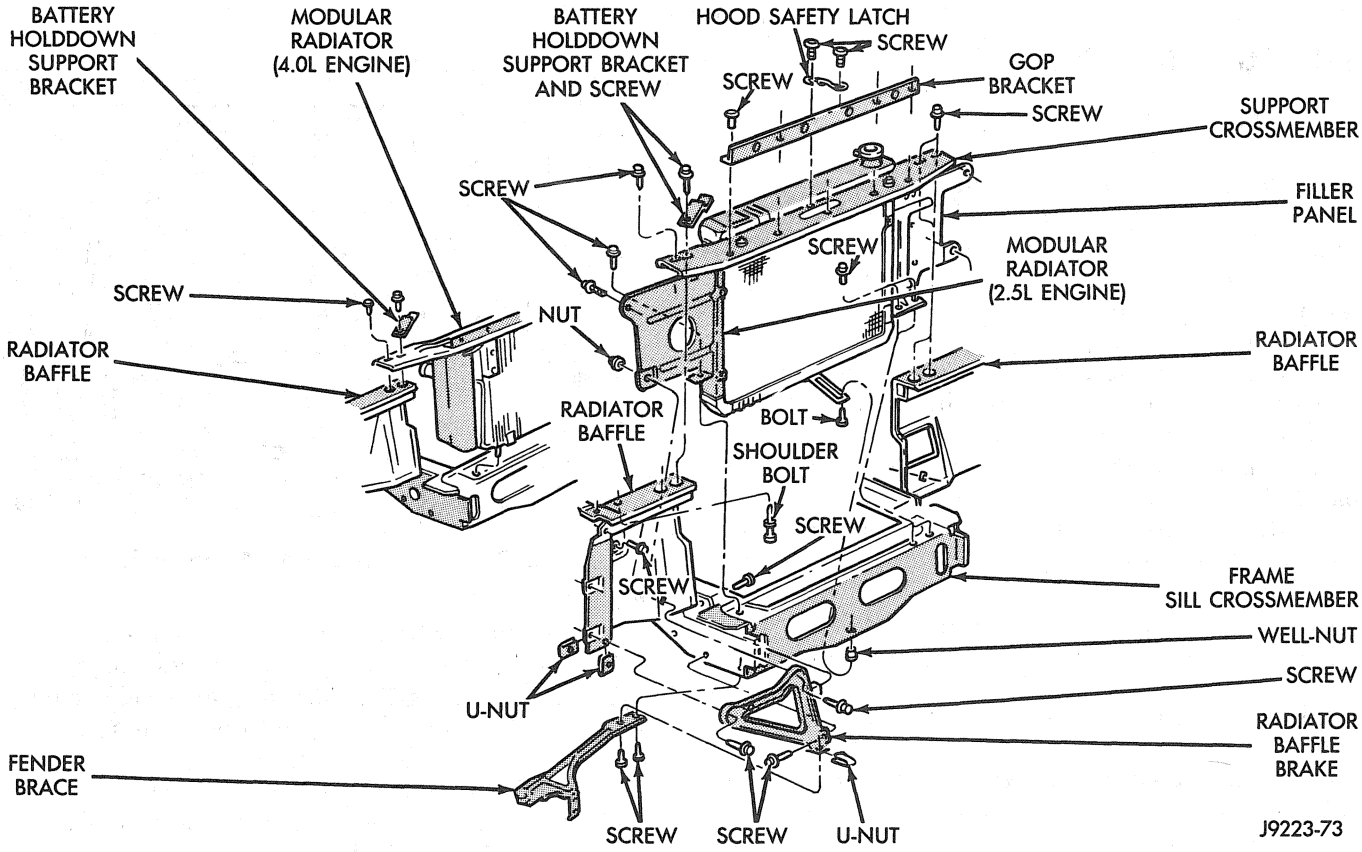


Fig. 5 Radiator Support Crossmember & Modular Radiator

REMOVAL AND INSTALLATION (Continued)

(3) Remove the radiator support crossmember and radiator from the front of vehicle (Fig. 5).

(4) If additional disassembly is required, remove the horns, baffle braces and the wire harnesses from the baffles.

INSTALLATION

(1) If removed, install the horns, baffle braces and the wire harnesses on the baffles.

(2) Position the radiator and the radiator support crossmember at the front of vehicle. Install and tighten screws to 9 N·m (76 in-lbs) torque.

(3) For 2.5L engines, install the power steering pump reservoir on the left filler panel.

(4) Install the grille opening panel GOP.

HOOD

REMOVAL

(1) Raise hood.

(2) Disconnect the underhood lamp wire harness connector, if equipped.

(3) Drill out and remove the rivets that attach the hood release cable bellcrank to the hood (Fig. 6).

(4) Disconnect the bellcrank from the latch connecting rod and the release cable. Remove the bellcrank from the hood.

(5) Remove the latch release cable clips and remove the cable from the hood (Fig. 7).

(6) Remove the screws that attach the latches to the hood (Fig. 8).

(7) Disconnect the latches from the hood and latch connecting rod. Remove the latches from the hood.

(8) Remove the nuts that attach the safety latch to the hood. Remove the safety latch from the hood.

(9) Remove the clips and latch connecting rod from the hood.

(10) Mark the location of hood, the hinges and the hinge shims for installation.

(11) Remove the screws that attach the hinges to the hood. Remove the hood from the vehicle with the aid of a helper.

(12) Remove the insulation panel from the hood (Fig. 9).

INSTALLATION

(1) Install the insulation panel on the hood.

(2) Position the hood on the shims and hinges; finger-tighten the hinge bolts.

(3) Align the hinges and shims with the reference marks. Tighten the hinge bolts to 30 N·m (22 ft-lbs) torque.

(4) Connect the latch release cable and latch connecting rod to the bellcrank.

(5) Position the bellcrank on the hood and install the rivets.

(6) Attach the latch release cable to the clips.

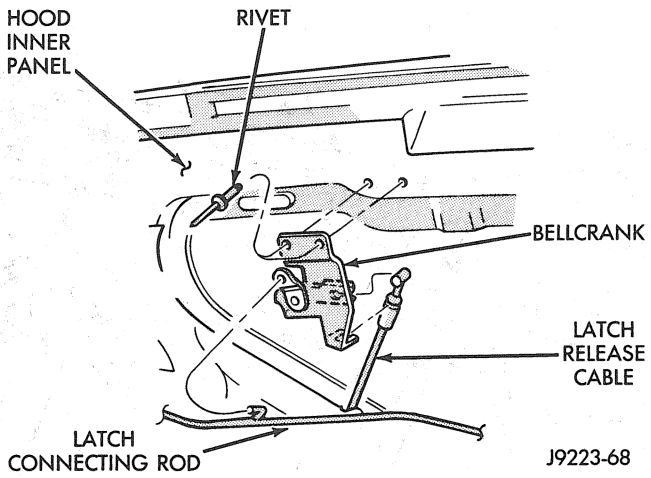


Fig. 6 Hood Release Cable Bellcrank

(7) Connect the latches to the latch rod and position them on the hood.

(8) Install the screws to attach the latches to the hood. Tighten the screws to 9 N·m (77 in-lbs) torque.

(9) Position the safety latch on the hood and install the attaching nuts. Tighten the screws to 13 N·m (115 in-lbs) torque.

(10) Test latch release cable and latches for proper operation.

(11) Connect the underhood lamp wire harness connector.

(12) Inspect the hood for proper alignment and adjust as necessary.

HOOD HINGE

REMOVAL

(1) Remove the hood from the vehicle.

(2) Remove the seal from the hinge base (Fig. 10).

(3) Remove the hinge retaining nuts from the studs.

(4) Remove the restraint cable and hinge from the cowl panel.

INSTALLATION

(1) Position the hinge over the studs and place the restraint cable on the right side, lower stud.

(2) Install the hinge nuts on the studs. Tighten the restraint cable nut to 4 N·m (38 in-lbs) torque. Tighten the remaining nuts to 9 N·m (77 in-lbs) torque.

NOTE: If a replacement hinge seal is being installed, position it around the hinge arm, force it against the hinge base.

(3) Position the hinge seal around the hinge arm and on hinge base.

(4) Install the hood.

(5) Adjust the hood as necessary.

REMOVAL AND INSTALLATION (Continued)

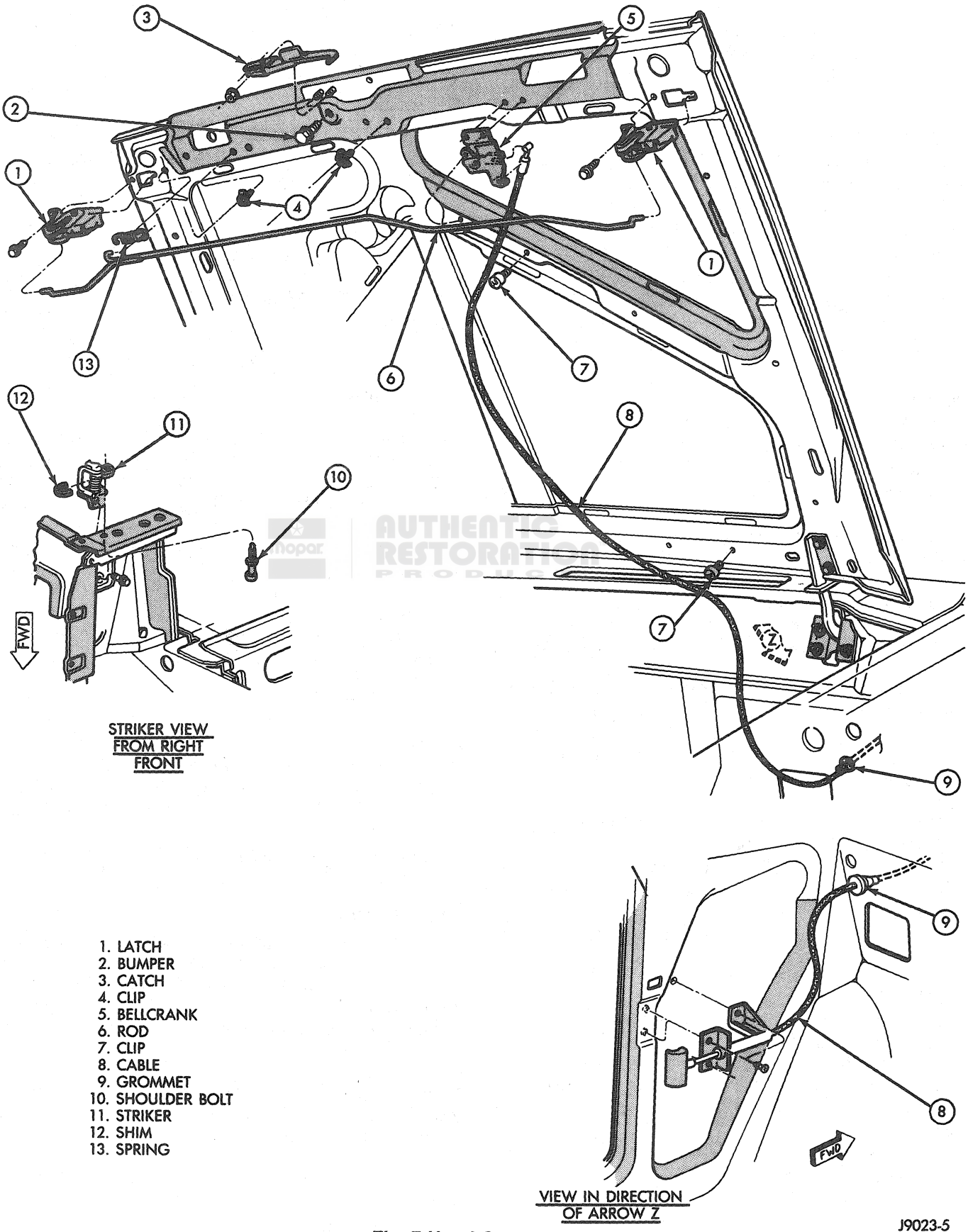


Fig. 7 Hood Components

REMOVAL AND INSTALLATION (Continued)

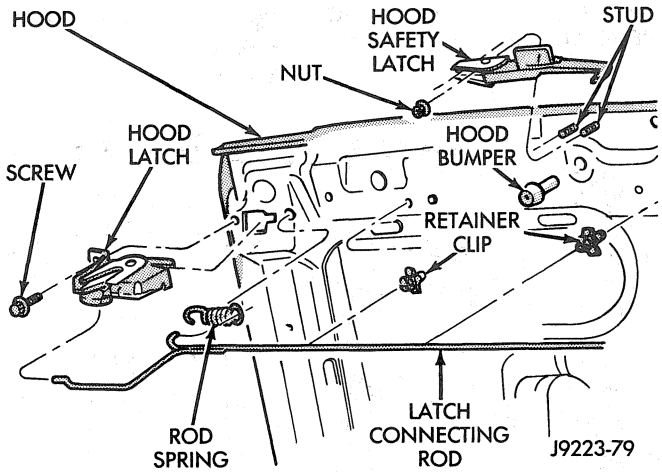


Fig. 8 Hood Latch & Safety Latch

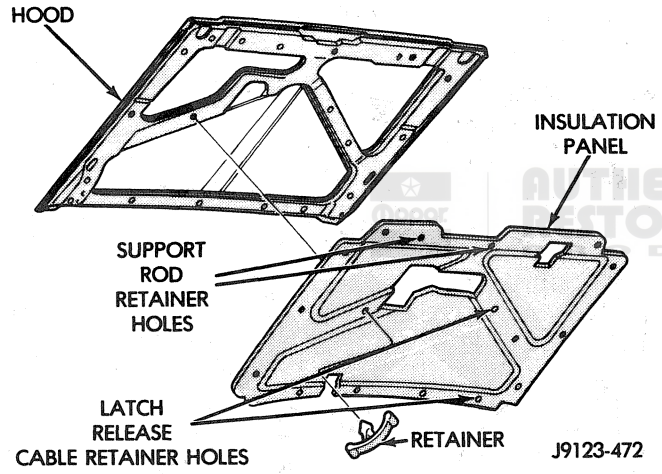


Fig. 9 Hood Insulation Panel

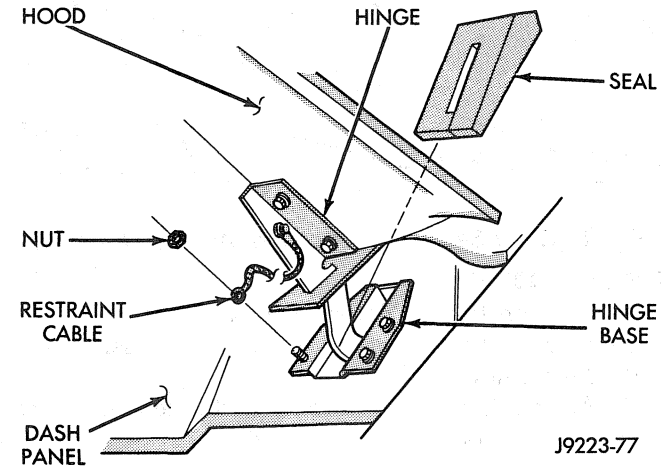


Fig. 10 Hood Hinge and Seal

HOOD LATCH

REMOVAL

(1) Remove the screw that attaches the latch to the hood inner panel.

(2) Disconnect the latch from the hood and latch connecting rod. Remove the latch from the hood.

INSTALLATION

(1) Connect the latch to the latch connecting rod and position it on the hood inner panel.

(2) Install the screw that attaches the latch to the hood inner panel.

(3) Tighten the screw to 9 N·m (77 in-lbs) torque.

(4) Test the operation of the latch release cable and latch.

HOOD LATCH STRIKER

REMOVAL

(1) Remove the grille opening panel (GOP).

(2) Remove the screws that attach the striker to the radiator baffle.

(3) Remove the striker and shims from the baffle.

INSTALLATION

(1) Position the shims and striker on the radiator baffle and install the screws.

(2) Tighten the screws to 21 N·m (15 ft-lbs) torque.

(3) Test the striker/hood alignment by opening and closing the hood several times. Adjust the striker, if necessary.

HOOD RELEASE CABLE

REMOVAL

(1) Drill out the bellcrank to hood rivet heads and remove the rivets.

(2) Disconnect the bellcrank from the latch rod and the hood release cable. Remove the bellcrank from the hood.

(3) Disconnect the hood release cable from the clips on the hood.

(4) Remove the left cowl side trim panel.

(5) Remove the cable bracket screws from the cowl side panel.

(6) Pull the cable through the dash panel and remove it from under the instrument panel.

INSTALLATION

(1) Insert the replacement cable end through the hole in the dash panel into the engine compartment.

(2) Pull the cable forward and seat the grommet in the dash panel.

(3) Position the cable bracket on the cowl side panel and install the screws. Tighten the screws to 13 N·m (111 in-lbs) torque.

REMOVAL AND INSTALLATION (Continued)

(4) Install the left cowl side trim panel.
(5) Connect the cable and latch rod to the bellcrank.
(6) Position the bellcrank on the hood and install the rivets.
(7) Attach the cable to the clips.
(8) Test the release cable for proper operation.

SAFETY LATCH STRIKER

REMOVAL

(1) Remove the striker screws from the radiator support crossmember (Fig. 11).
(2) Remove the striker from the crossmember.

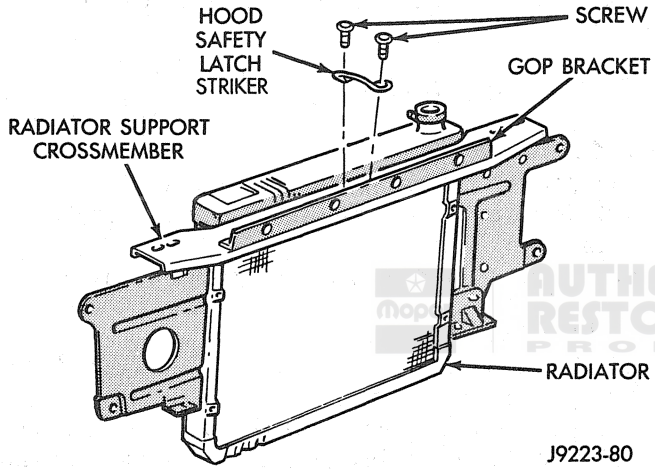


Fig. 11 Hood Safety Latch Striker

INSTALLATION

(1) Position the striker on the radiator support crossmember and install the screws. Tighten the screws to 9 N·m (77 in-lbs) torque.
(2) Test the safety latch operation.

COWL WEATHERSTRIP SEAL

REMOVAL

(1) Pry upward along the length of seal.
(2) Detach the seal retainers from the cowl panel.
(3) Remove the seal from cowl panel.

INSTALLATION

(1) Position the weatherstrip seal on the cowl panel. Press to insert retainers into the cowl panel holes (Fig. 12).

CROSSMEMBER AIR DEFLECTOR

REMOVAL

(1) Remove the rivets that attach the air deflector to the fender flares (Fig. 13).
(2) Remove screws that attach air deflector to the crossmember.

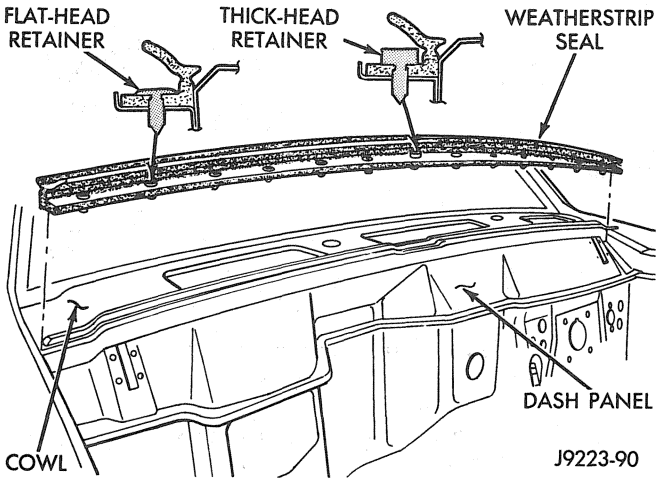


Fig. 12 Cowl Seal and Retainers

(3) Remove the air deflector from the crossmember.

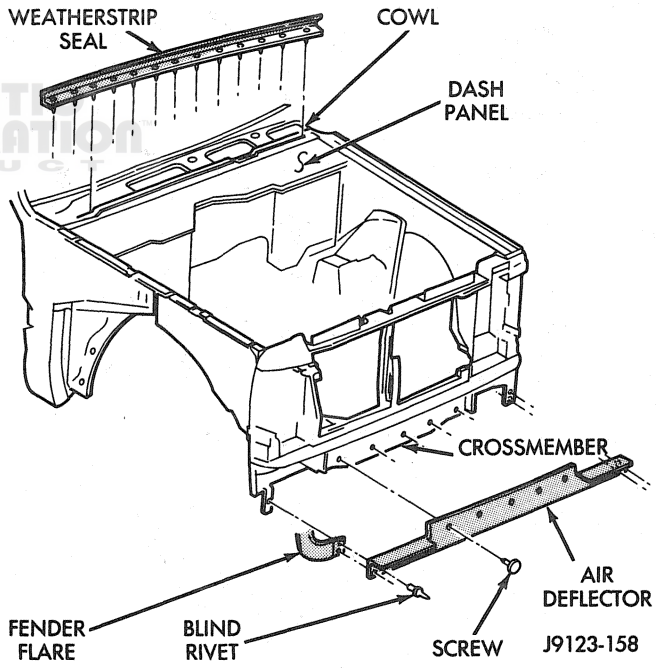


Fig. 13 Cowl Seal and Crossmember Air Deflector

INSTALLATION

(1) Position the air deflector on the crossmember.
(2) Attach the air deflector to the crossmember with the screws.
(3) Attach the air deflector to the fender flares with blind rivets.

DASH PANEL INSULATOR PANEL

REMOVAL

(1) Remove the push-on nuts from the studs (Fig. 14).

REMOVAL AND INSTALLATION (Continued)

(2) Remove the screws that attach the panel to the dash panel.

(3) Remove the insulator panel from the dash panel and engine compartment.

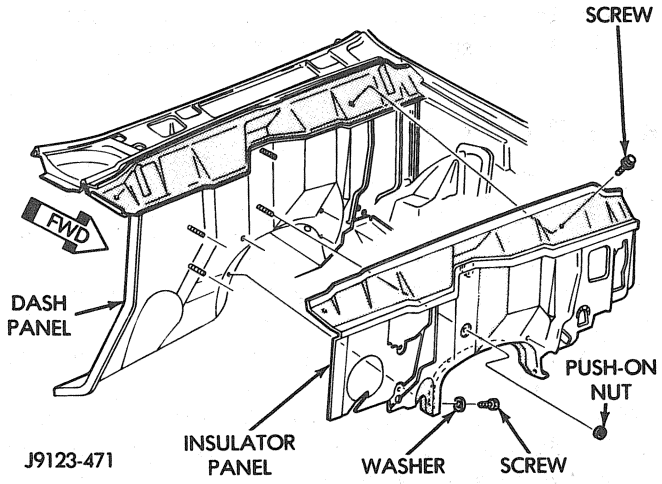


Fig. 14 Dash Panel Insulator Panel

INSTALLATION

(1) Position the insulator panel on the dash panel.

(2) Install the push-on nuts on the studs.

(3) Attach the panel to the dash panel with screws. Tighten the screws to 2 N·m (18 in-lbs) torque.

COWL GRILLE

REMOVAL

(1) Use a wax pencil to mark the position of the wiper arms (Fig. 15).

(2) Remove the windshield wiper arms from the pivots.

(3) Remove the screws that attach the grille to the cowl.

(4) Remove the windshield washer tubes from the nozzles.

(5) Remove the cowl grille and screen from the cowl (Fig. 16).

(6) If necessary, remove the push-rivets and washer nozzles from the cowl grille.

(7) If necessary, remove the cowl grille push-nuts from the cowl panel (Fig. 17).

(8) If necessary, remove the nuts and cowl grille support bracket from the dash panel.

INSTALLATION

(1) If removed, install the cowl grille support bracket on the dash panel. Tighten the nuts to 9 N·m (77 in-lbs) torque.

(2) If removed, install the push-nuts in the cowl panel and the support bracket.

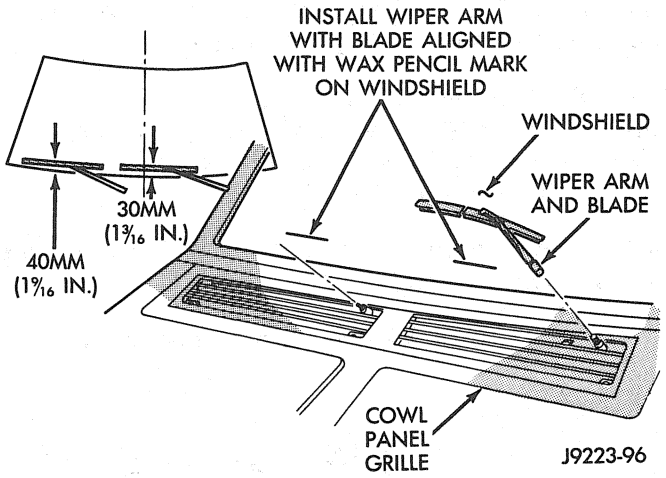


Fig. 15 Wiper Locations

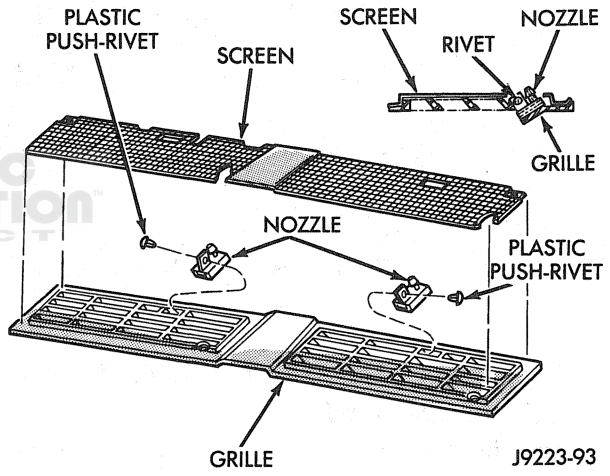


Fig. 16 Cowl Grille, Screen & Washer Nozzles

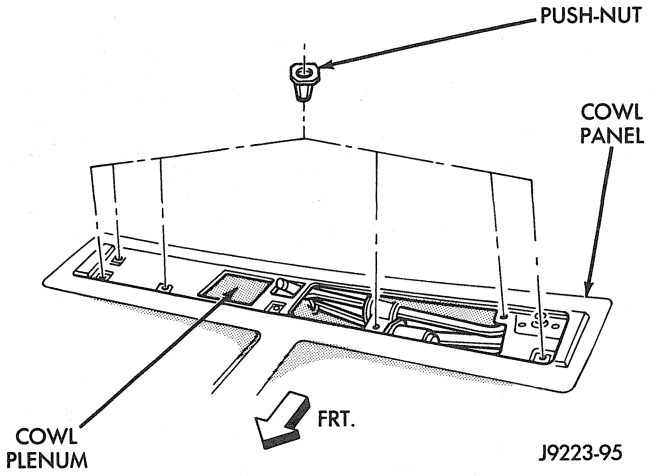


Fig. 17 Cowl Grille Push-Nuts

(3) If removed, install the push-rivets and washer nozzles in the cowl grille.

REMOVAL AND INSTALLATION (Continued)

CAUTION: The washer fluid tubes must be routed and installed so that they are not pinched.

(4) Position the cowl grille and screen on the cowl. Install the windshield washer tubes on the nozzles.

(5) Install the cowl screen and grille screws. Tighten in sequence (Fig. 18).

NOTE: Force the cowl grille rearward while tightening the screws.

(6) Install the windshield wiper arms on the pivots.

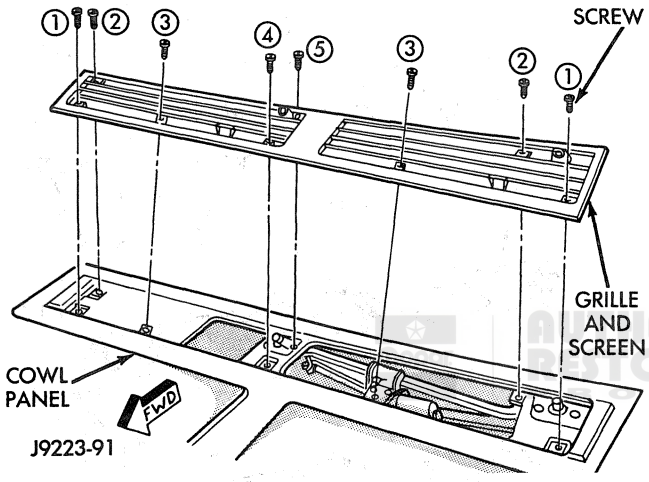


Fig. 18 Cowl Grille Screw Tightening Sequence

EXTERIOR NAMEPLATES

All of the nameplates, are attached with adhesive. (Fig. 19).

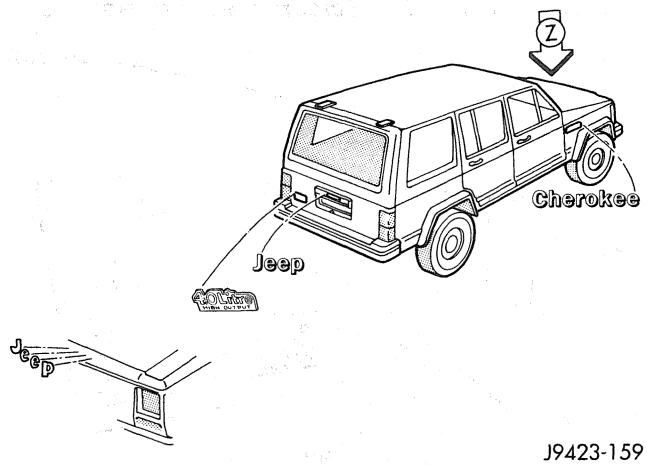


Fig. 19 Exterior Nameplates

REMOVAL

(1) Pry the nameplate from vehicle panel.

INSTALLATION

(1) Clean the panel surface.

(2) Remove the carrier backing and position the replacement nameplate on the panel. Push inward to seat it.

NOTE: Placing a piece of masking tape over the face of the nameplate before the carrier backing is removed may aid in positioning the nameplate.

BODY STRIPES/DECALS

Small nicks, scratches and other surface marks in a body stripe/decal can be touched-up with paint.

To eliminate blisters and air bubbles in a body stripe/decal, pierce them with a needle or pin.

A heat gun can also be used to remove small wrinkles in a stripe/decal.

Body stripe/decal replacement requires that the metal repair and paint refinish be completed first.

The work area temperature should be between 18°C (65°F) and 32°C (90°F).**A tape stripe/decal should not be replaced if the work area temperature is less than 18°C (65°F).**

The following equipment and material are necessary for removal and installation:

- Liquid dish detergent (for the wetting solution).
- Mixture of wetting solution.
- Commercial wax and silicone removal solution.
- Isopropyl (rubbing) alcohol.
- Small squeegee (plastic or hard rubber).
- Water bucket and sponge.
- Clean wiping rags or paper towels.
- Heat gun (or infra-red heat bulb).
- Wax pencil.
- Sharp knife, single edge razor blade or X-acto knife.
- Pair of scissors.
- Needle or pin.

WARNING: USE TAPE STRIPE/DECAL REMOVAL SOLUTION IN A WELL-VENTILATED AREA ONLY.

A tape stripe/decal removal solution can be used for removal at areas where a heat gun is ineffective. Follow the manufacturers instructions whenever this type of product is used.

REMOVAL

(1) Clean the repaired surface, adjacent panels and door openings as necessary.

(2) Start at one end of the tape stripe/decal and apply heat with a heat gun. Slowly peel the stripe/decal from the panel by pulling it back. **Do not pull the tape stripe/decal outward from panel.**

INSTALLATION

(1) The area that will be covered by the tape stripe/decal must be cleaned with cleaning solution.

(2) Freshly painted surfaces must be thoroughly dry.

REMOVAL AND INSTALLATION (Continued)

(3) Clean the painted surface with a commercial wax and silicone removal solution. Wipe the surface with a clean cloth and allow it to dry.

(4) Prepare a wetting solution by mixing two or three teaspoons of dish detergent with 1 gallon of water. Do not use soap.

NOTE: Too much detergent will reduce the effectiveness of the mixture.

(5) Use a clean sponge and apply the wetting solution to the adhesive side of the tape stripe/decal and to the painted panel surface. The wetting solution will permit ease of tape stripe/decal movement when positioning it.

(6) Align a straight edge with the existing tape stripe/decal ends (Fig. 20).

NOTE: If applicable, the body panel character line can be used as the tape stripe/decal alignment reference.

(7) Position the tape stripe/decal and carrier on the body panel and the mark length with a wax pencil.

(8) Cut the stripe/decal and carrier at the required length with scissors.

(9) Position the stripe/decal and carrier on the body panel and hold it in-place with masking tape (Fig. 21).

(10) Lift the bottom edge of tape stripe/decal and carrier. Use the tape sections as hinges, and reverse the position of stripe/decal and carrier.

CAUTION: Always remove the carrier from the tape stripe/decal, never remove the tape stripe/decal from carrier

(11) Bend a corner of carrier outward and then, with a flick of the finger, separate the corner of carrier from the decal.

(12) Separate approximately 15 cm (6 in) of the carrier from one end of the tape stripe/decal.

(13) Return the tape stripe/decal back to its original position. If a solution is being used, position adhesive side of the tape stripe/decal on panel. Apply the solution to the outside of the tape stripe/decal.

(14) Hold the tape stripe/decal against the panel surface while separating the carrier from the stripe/decal (Fig. 22).

(15) Where applicable, extend the tape stripe/decal 12 mm (1/2 in) beyond door edge. Wrap it around the edge and press it to the door flange.

(16) If applicable, remove the cover from face of tape stripe/decal.

(17) Inspect the tape stripe/decal with reflected light to find any damage. Remove all the air and/or moisture bubbles.

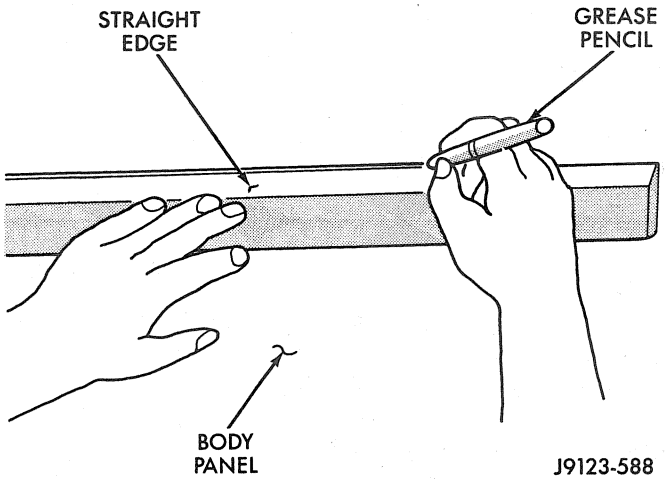


Fig. 20 Stripe/Decal Alignment Reference Mark

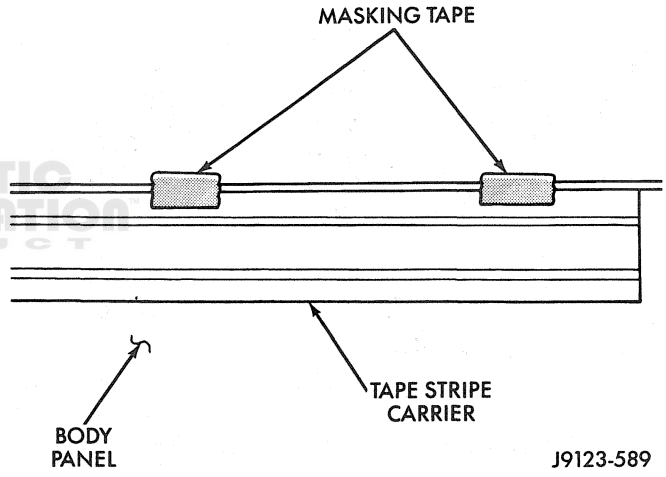


Fig. 21 Tape Stripe/Decal And Carrier Retained On Body Panel

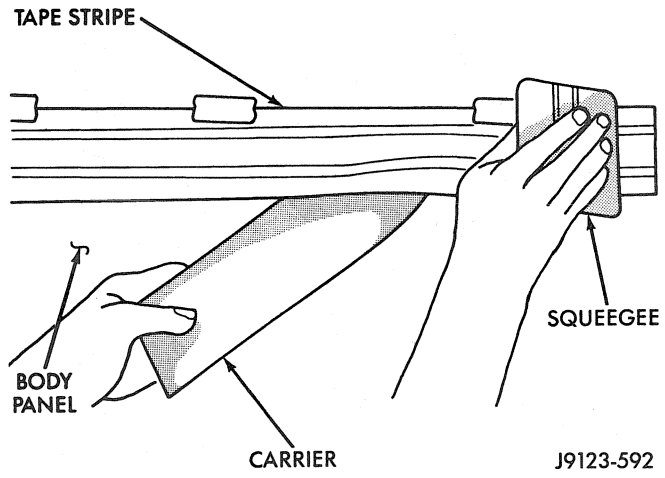


Fig. 22 Tape Stripe/Decal Installation

REMOVAL AND INSTALLATION (Continued)

SIDE VIEW MIRRORS

REMOVAL

(1) Remove the door trim panel.
(2) Remove the mirror inside trim cover screw (Fig. 23).
(3) For power/manual mirrors, remove the inside trim cover.
(4) For remote control mirrors, loosen the toggle control setscrew (Fig. 24).
(5) For remote control mirrors, remove the inside trim cover (Fig. 25).
(6) Remove the mirror screws.
(7) Remove the mirror from the door. Refer to Group 8, Electrical.

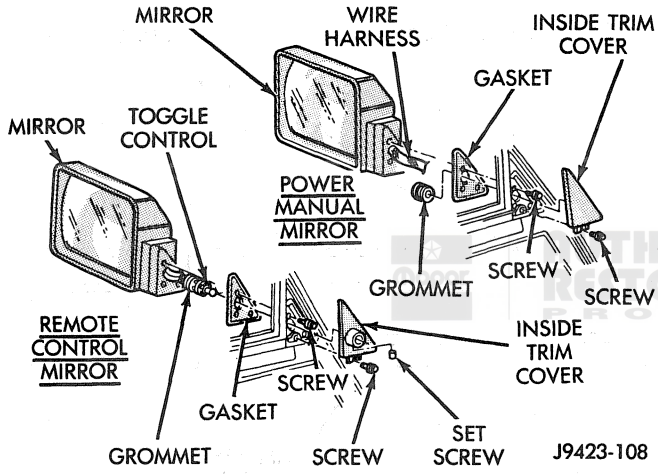


Fig. 23 Remote Mirrors—Power/Manual

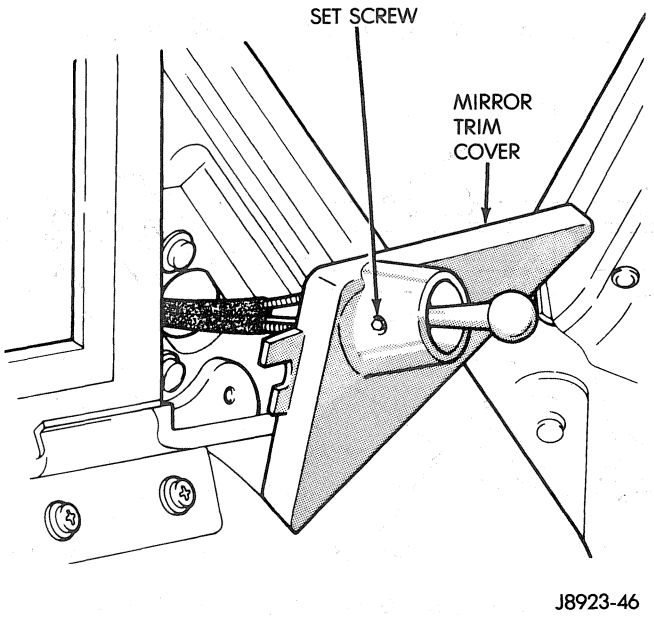


Fig. 24 Remote Mirror Toggle Control Set Screw

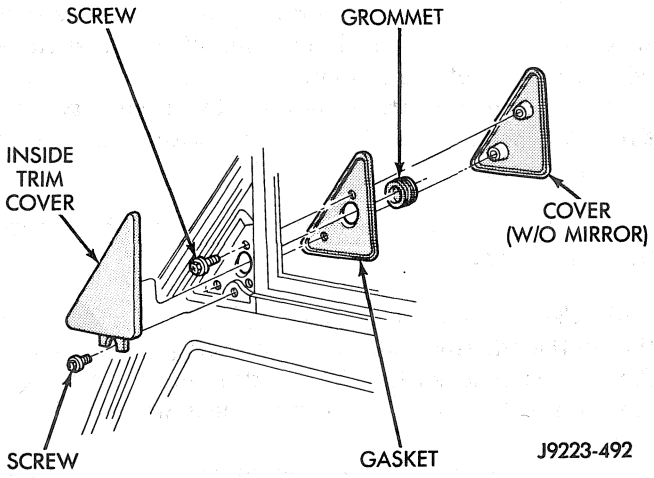


Fig. 25 Trim Covers Without External Mirror

INSTALLATION

(1) Position the mirror adjacent to the vent window.
(2) Install the mirror screws. Tighten the screws securely.
(3) For remote mirrors, position the inside trim cover over the toggle control and tighten the setscrew.
(4) Install the inside trim cover.
(5) Install the inside trim cover screw.
(6) Install the door trim panel.

FRONT FENDER/LINER/WHEELHOUSE FLARE

REMOVAL

(1) Remove the front bumper.
(2) Right fender only:
- If equipped, remove the radio antenna mast, and components from the fender.
- Remove the battery and tray from the fender inner panel.
- Remove windshield washer reservoir from fender inner panel.
- Remove the hood ajar switch, if equipped, from fender (Fig. 29).
- Remove the Power Distribution Center (PDC), the coolant recovery bottle and speed servo from fender the inner panel.
- Remove the vapor canister from the fender inner panel.
- Remove the A/C Receiver/Drier from the fender inner panel.
- If equipped, remove the Daytime Running Light (DRL) module from the fender inner panel.
- Support the hood and remove the hood support rod from the fender inner panel.

(3) Remove the hood bumper from the fender inner panel (Fig. 27).
(4) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

(5) Remove the front wheel.

(6) Remove the fender liner, fender flare and retainers (Fig. 28):

- Remove the screws that attach the lower part of flare to the fender outer panel.
- Remove the rivets that attach the flare to the air deflector.
- Remove the retainers that attach the fender liner to the fender inner panel.
- Remove the nuts that attach the fender liner to the fender outer panel and flare retainers.
- Remove the fender liner from between the fender panels.
- Remove the push-nuts that attach the retainers to the fender outer panel.
- Remove the retainers and flare from the fender outer panel.

(7) Remove the grille opening panel (GOP).

(8) Remove the air deflector.

(9) Remove the rocker panel molding from the fender.

(10) Remove all the fender braces (Fig. 26).

(11) Remove the fender lower screws (Fig. 26).

(12) Remove the fender top, front and the rear screws. Remove the fender from the inner fender panel (Fig. 26).

INSTALLATION

(1) Position the fender on the inner fender panel.

(2) Install all of the fender screws finger-tight.

(3) Install the fender braces.

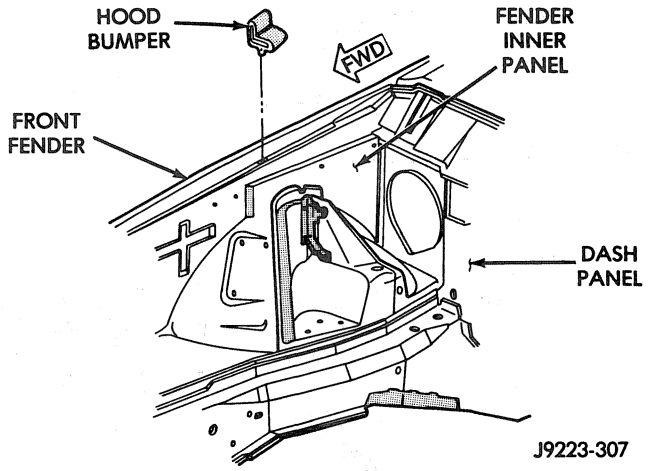


Fig. 27 Hood Bumper

(4) Align the fender with the body panels and tighten the fender screws to 8.5 N·m (76 in-lbs) torque.

(5) Install the grille opening panel (GOP).

(6) Install the air deflector.

(7) Install the fender flare and retainers. Then install the fender liner:

- Position the retainers and the flare on the fender.
- Install the push-nuts to attach the retainers to the fender.
- Position the fender liner between the fender and fender inner panel.

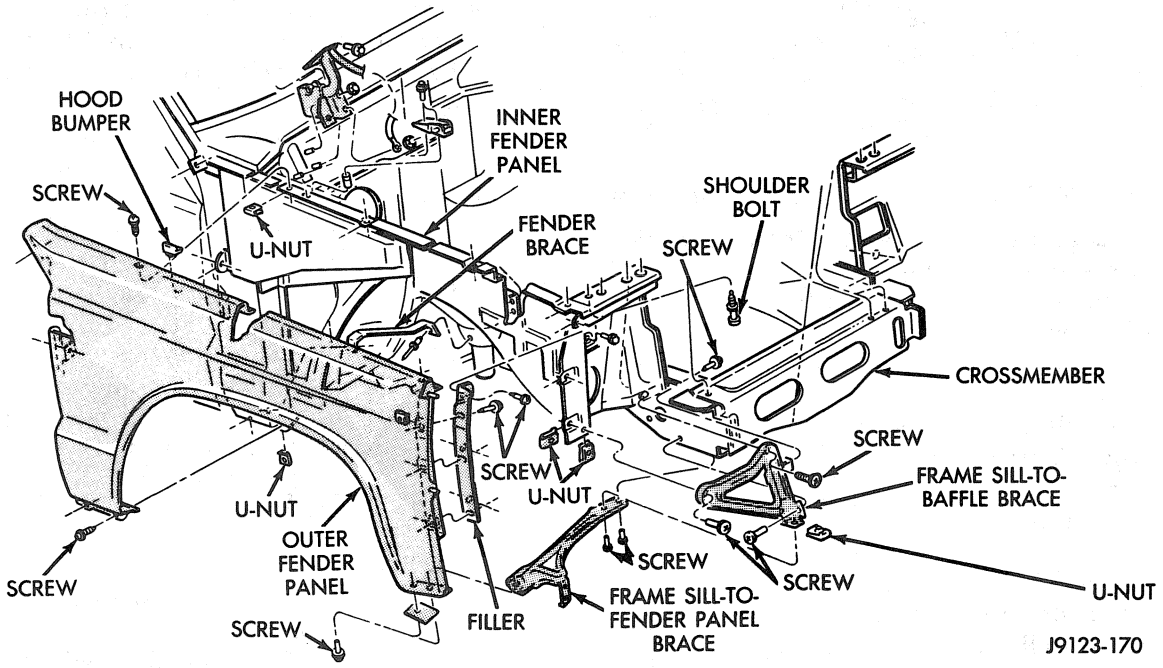


Fig. 26 Fender Removal/Installation

REMOVAL AND INSTALLATION (Continued)

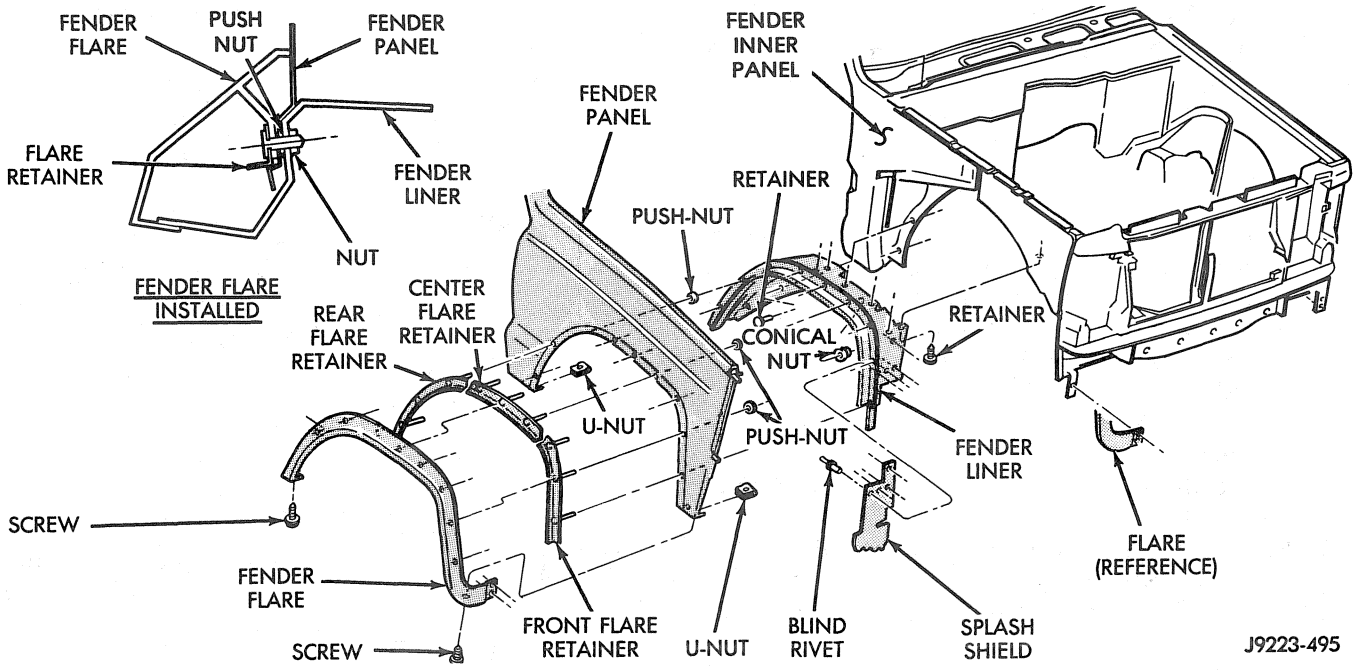


Fig. 28 Fender Flare & Liner Removal/Installation

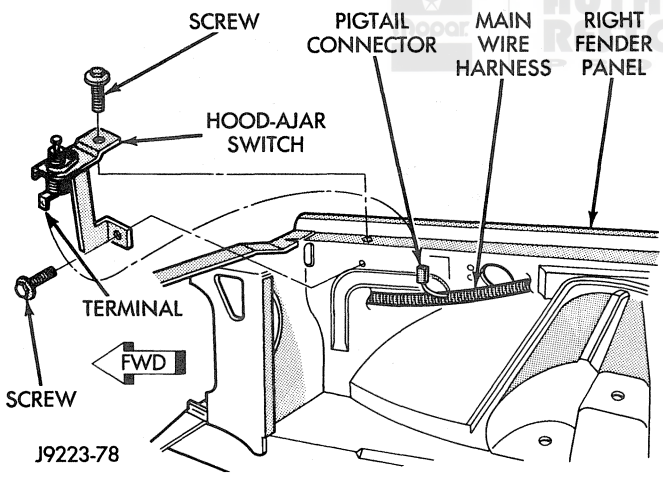


Fig. 29 Hood Ajar Switch Removal/Installation

- Install the nuts to attach the fender liner to the fender and flare retainers.
- Install the retainers to attach the fender liner to the fender inner panel.
- Install the rivets to attach the flare to the air deflector.
- Install the screws to attach the flare to the fender. Tighten the screws to 1 N·m (13 in-lbs) torque.

(8) Connect the front lamp wire harness connectors to the engine wire harness connectors.

(9) Install the front lamps.

(10) Install the front bumper.

(11) Install the wheel, remove the support and lower the vehicle.

(12) Right fender only: install the hood support rod on the fender inner panel.

(13) Install the hood bumper on the fender inner panel.

(14) Right fender only: install the Daytime Running Light (DRL) module on fender inner panel.

(15) Right fender only: install the A/C Receiver/Drier on the fender inner panel.

(16) Right fender only: install the vapor canister on the fender inner panel. Tighten the vapor canister screws to 5 N·m (45 in-lbs) torque.

(17) Right fender only: install the PDC, coolant recovery bottle and speed servo on the fender inner panel.

(18) Right fender only: install the hood ajar switch, if equipped. Tighten the screws to 2 N·m (15 in-lbs) torque.

(19) Right fender only: install the windshield washer fluid reservoir on the inner panel.

(20) Right fender only: install the battery tray and battery on the inner panel.

(21) Right fender only: if equipped, install the radio antenna. Tighten the nut/escutcheon to 4.5 N·m (40 in-lbs) torque. Tighten the power antenna bracket screws to 2 N·m (20 in-lbs) torque.

FRONT DOOR TRIM PANEL

REMOVAL

(1) Remove the door inside latch release handle screw (Fig. 30).

(2) Remove the regulator handle.

(3) Remove the armrest lower screws (Fig. 31).

REMOVAL AND INSTALLATION (Continued)

(4) Remove the trim panel fasteners from door inner panel with a pry tool (use special tool C-4829) (Fig. 32).

(5) Move the doortrim panel outward and disconnect the handle-to-latch rods (Fig. 33). For vehicles equipped with power door locks/windows/mirrors, disconnect the wire harness connector.

(6) Remove the trim panel from door.

(7) If necessary, remove the waterdam from the door.

(8) If necessary, replace the armrest J-clip (Fig. 34) and (Fig. 35).

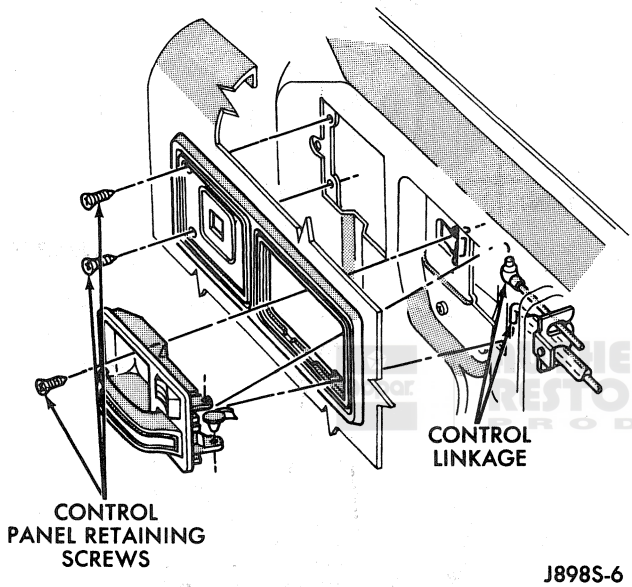


Fig. 30 Front Door Inside Latch Release Handle

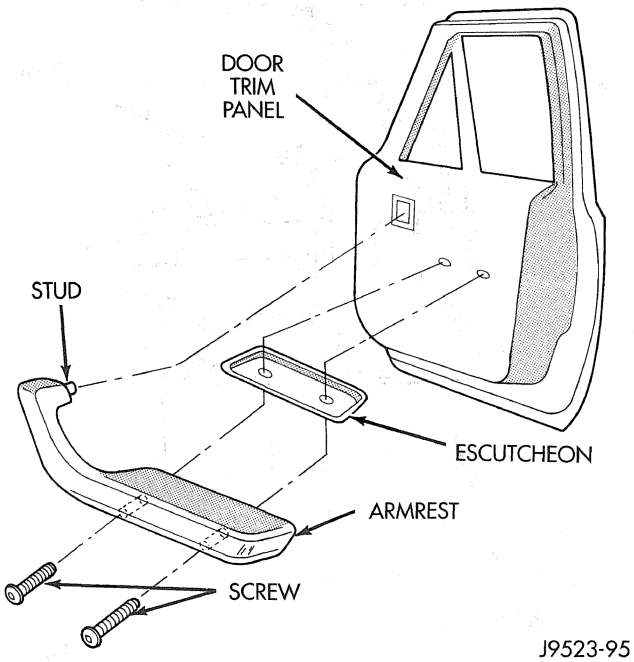


Fig. 31 Front Door Armrest Removal/Installation

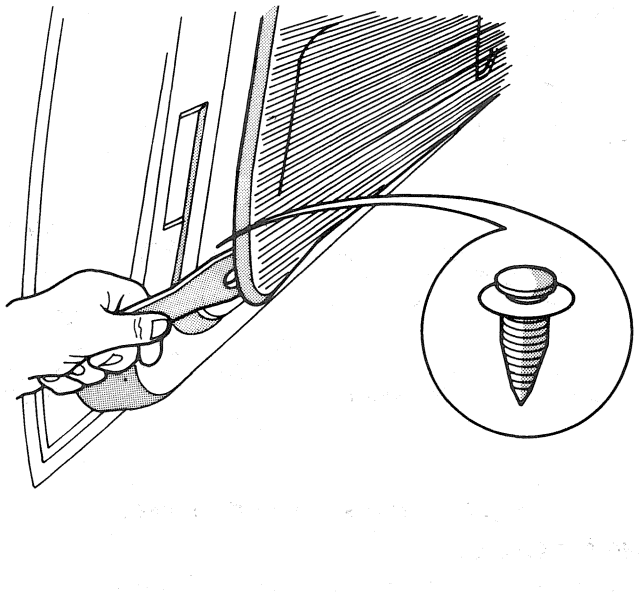


Fig. 32 Detaching Trim Panel Push-In Fasteners

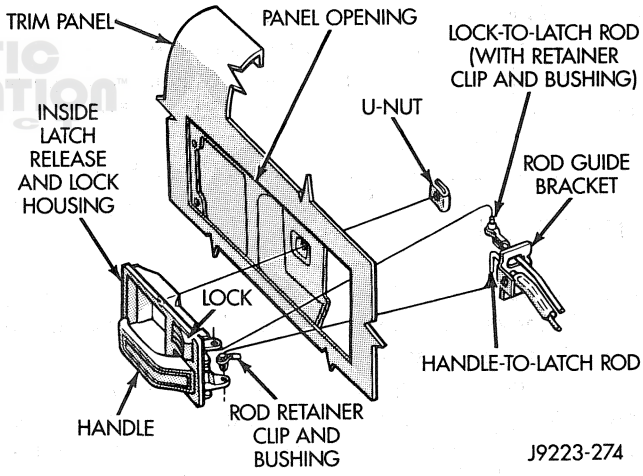


Fig. 33 Door Inside Latch Release Rods

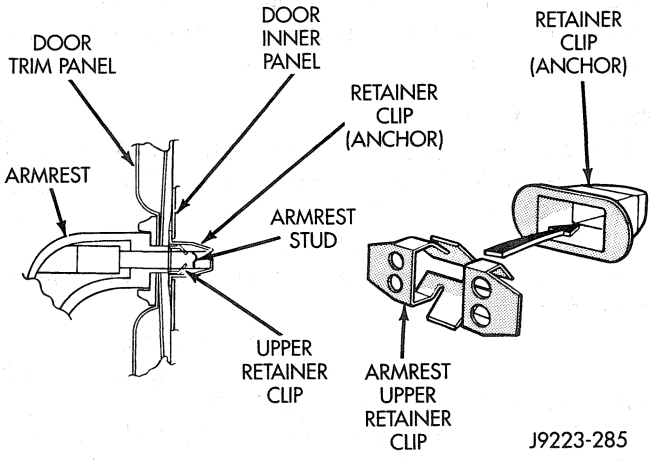


Fig. 34 Armrest Upper Retainer Clip and Anchor

REMOVAL AND INSTALLATION (Continued)

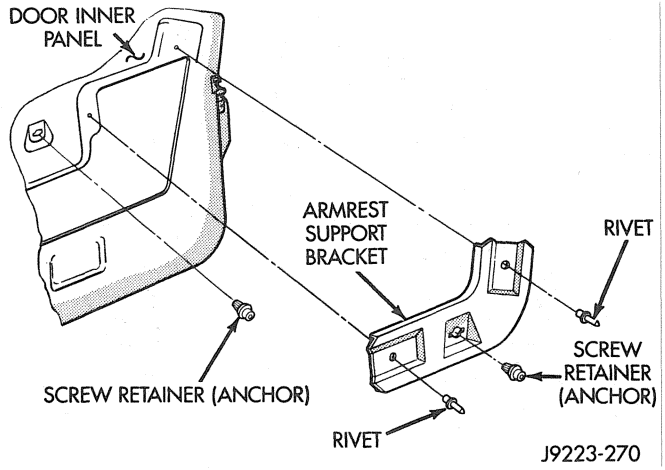


Fig. 35 Armrest Support Bracket

INSTALLATION

(1) If door waterdam was removed, apply sealant to the edges before installing.

(2) Position the waterdam on door inner panel.

(3) Connect the rods to the inside latch release handle. For vehicles with power door locks/windows/mirrors, connect the wire harness connector.

(4) Position the trim panel on the door inner panel and press the retainers inward. Tighten the armrest screws to 4 N·m (34 in-lbs) torque.

(5) Install the window glass regulator handle.

FRONT DOOR

REMOVAL

(1) Remove the door restraint (check) retaining pin (Fig. 36) with a punch.

(2) For vehicles equipped with power windows and power door locks, remove the trim panel and disconnect all components. Slide the wire harness out of the boot and door.

(3) Remove the door hinge bolts, plates and shims (Fig. 37). Remove the door from the vehicle.

(4) Identify and retain the door hinge plates and the shims for correct installation.

INSTALLATION

(1) If a new front door is being installed, coat the door interior with anti-corrosion wax. Seal the door flange with sealant (Fig. 38).

(2) Before installing a replacement door, transfer original window glass, and components to replacement door.

(3) Position the door in the body opening.

(4) Align the door hinges, plates and shims with bolt holes and install the hinge bolts.

(5) Position the door restraint (check) in the bracket with the holes aligned and insert the pin. Tap the pin to seat it in the bracket.

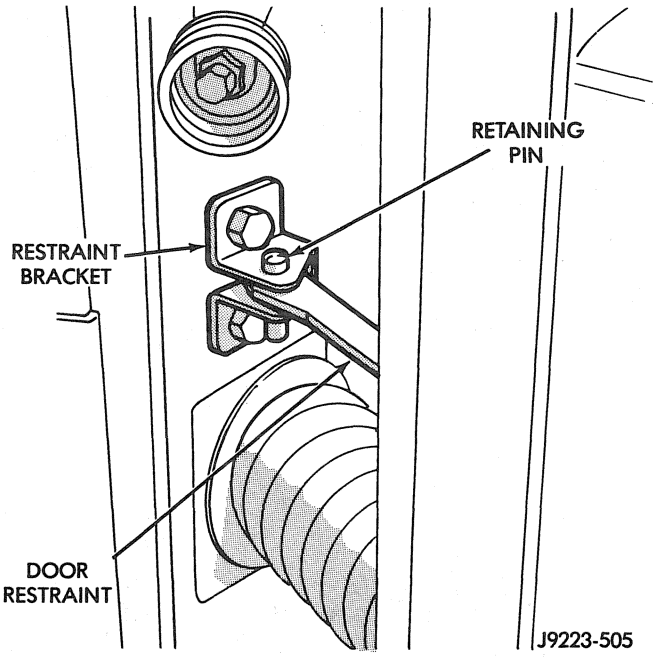


Fig. 36 Door Restraint Retaining Pin

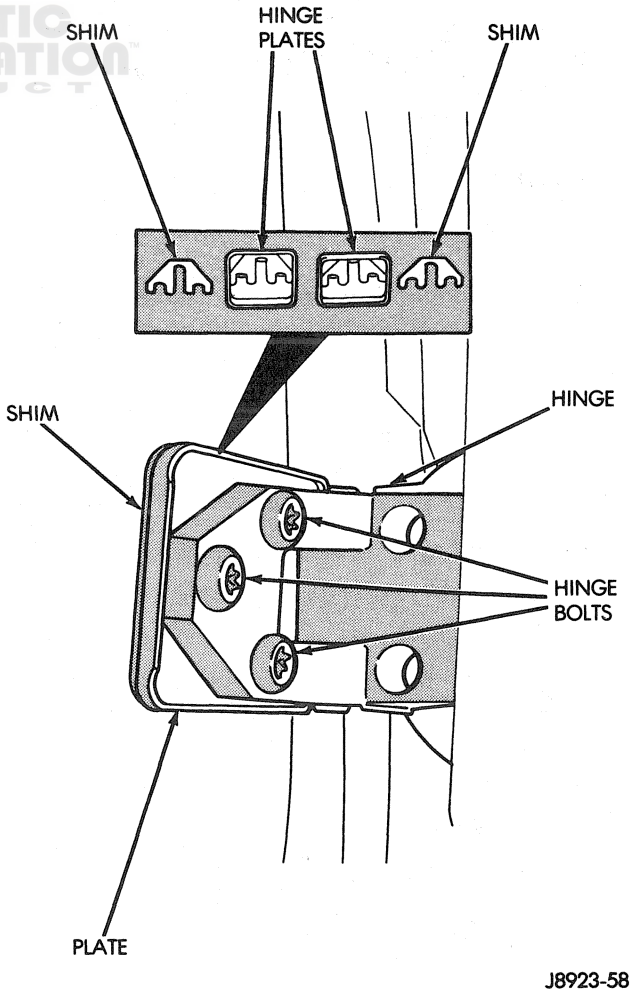


Fig. 37 Door Hinges, Bolts, Plates and Shims

REMOVAL AND INSTALLATION (Continued)

(6) Align/adjust the door as necessary. Tighten the hinge bolts to 35 N·m (26 ft-lbs) torque.

(7) Apply general purpose sealant around the door hinges/door face mating area.

(8) Adjust/align the latch striker and latch as necessary.

(9) If applicable, route and connect the wire harness connectors.

(10) Install the door waterdam (if removed), trim panel, armrest and regulator handle.

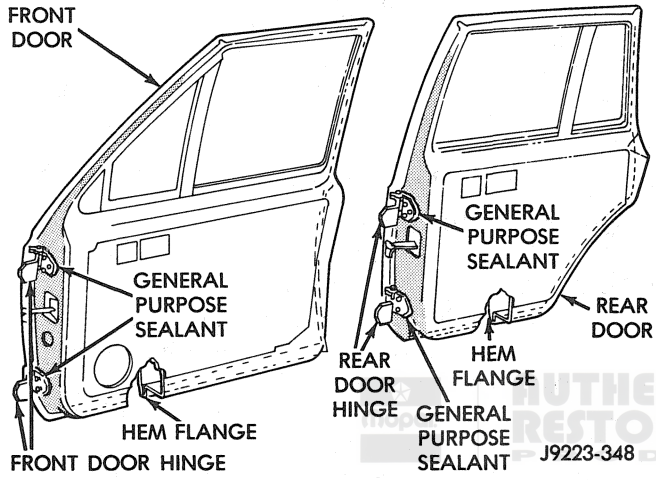


Fig. 38 Replacement Door Preparation

FRONT DOOR HINGE PIN

REMOVAL

(1) Open the door wide for access and remove the door hinge pin and bushing with a punch.

INSTALLATION

(1) Insert a bushing in both body hinge halves from the bottom (Fig. 39).

(2) Allow the bushing material to stick out of the top of the hinge. Use the round end of a ball-peen hammer, lightly tap the bushing material to begin to roll it outward (Fig. 40).

(3) When the entire edge of the bushing is rolled outward, turn the hammer over and lightly tap the bushing material to form a flat head (Fig. 41). The head must be flat without overlapping or distorting the bushing material.

(4) Slide the door half of the upper and lower hinges onto the body half of both hinges and align the hinge pin holes.

(5) Carefully start the hinge pins through the hinges (they will fit snugly) and then use a two pound hammer, carefully seat both hinge pins (Fig. 42). Be careful not to bend the hinge when driving the hinge pin, support may be required under the hinge.

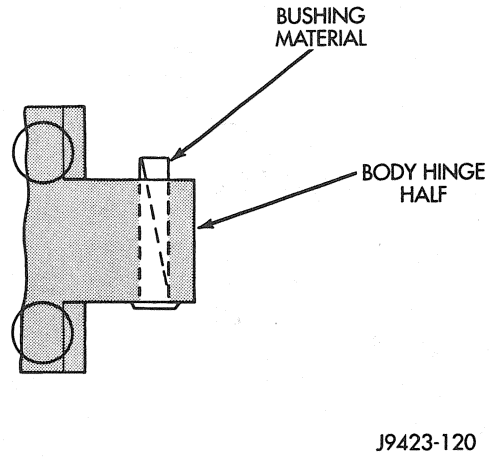


Fig. 39 Install Bushing In Hinge

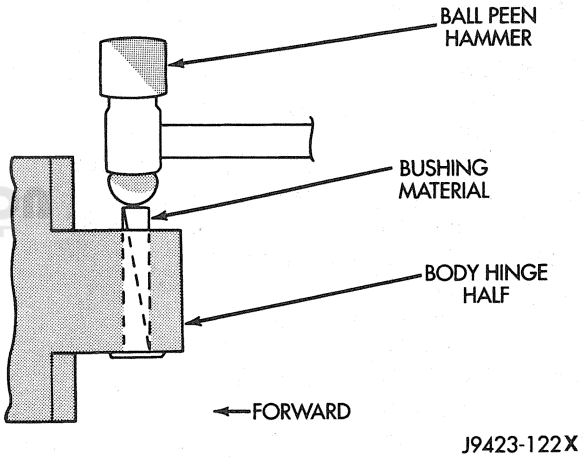


Fig. 40 Begin To Roll Bushing Material Outward

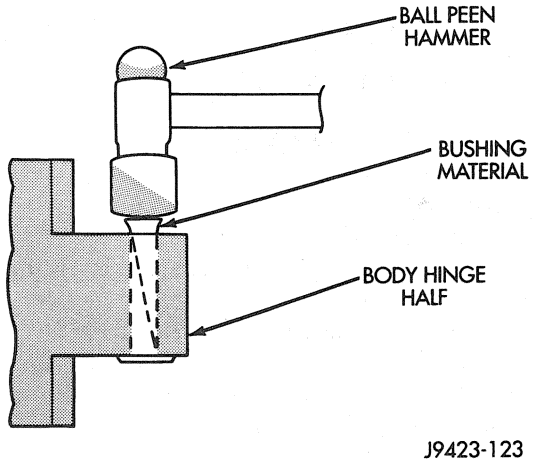


Fig. 41 Forming A Head On The Bushing

REMOVAL AND INSTALLATION (Continued)

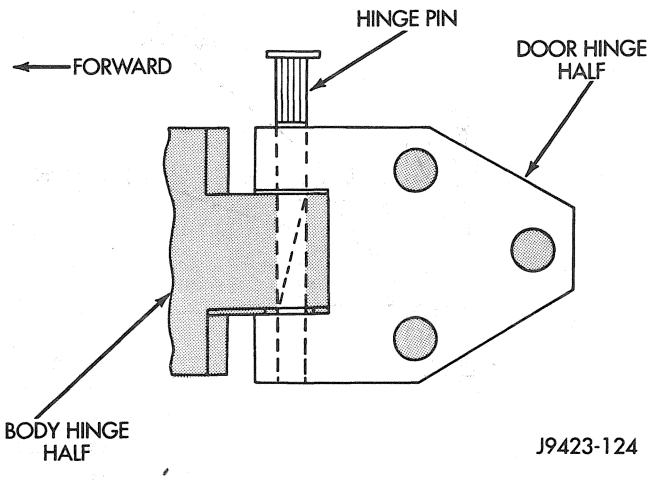


Fig. 42 Installing The Hinge Pin

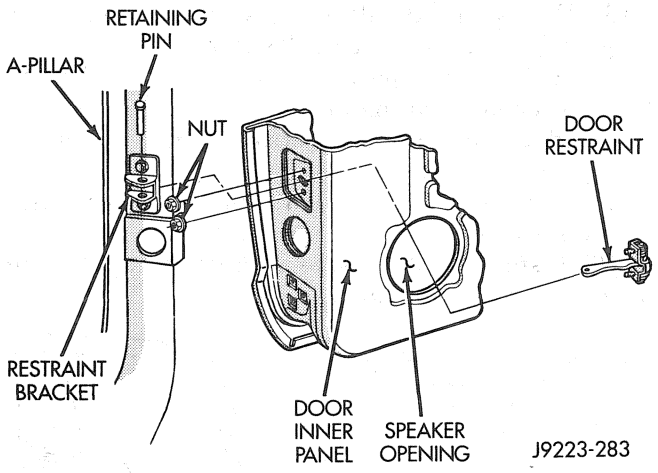


Fig. 43 Door Restraint (Check)

FRONT DOOR HINGE

REMOVAL

(1) Remove the door restraint (check) retaining pin.
(2) Open the door wide for access and remove the door hinge pin and bushing.
(3) Remove the door hinge bolts, plates and shims.
(4) Retain the door hinge plates and shims for correct installation.
(5) Separate the hinge halves.

INSTALLATION

(1) Position the hinge plates, shims and replacement hinge-half on the door face.
(2) Align the door hinges, plates and shims with bolt holes and install hinge bolts.
(3) Install the hinge pin and bushing.
(4) Adjust/align latch striker and latch as necessary.
(5) Install the door restraint (check) retaining pin.

FRONT DOOR RESTRAINT

REMOVAL

(1) Remove the door trim panel.
(2) Remove the door radio speaker from door inner panel.
(3) Remove the door restraint (check) retaining pin from the bracket with a punch.
(4) Remove the nuts and remove the restraint via the speaker opening. (Fig. 43).

INSTALLATION

(1) Position the door restraint in the door by way of the opening and install the nuts. Tighten the nuts to 10 N·m (7 ft-lbs) torque.
(2) Position the door restraint in bracket with the holes aligned and insert the retaining pin.
(3) Install the radio speaker and door trim panel.

FRONT DOOR OUTSIDE HANDLE

REMOVAL

(1) Remove the door trim panel and waterdam.
(2) Remove the access hole cover and remove the door handle nuts (Fig. 44).
(3) Disconnect the handle-to-latch rod from the handle latch release lever arm.
(4) Remove the nuts and handle from the door.
(5) Remove the gaskets from the door outer panel surface, if necessary.

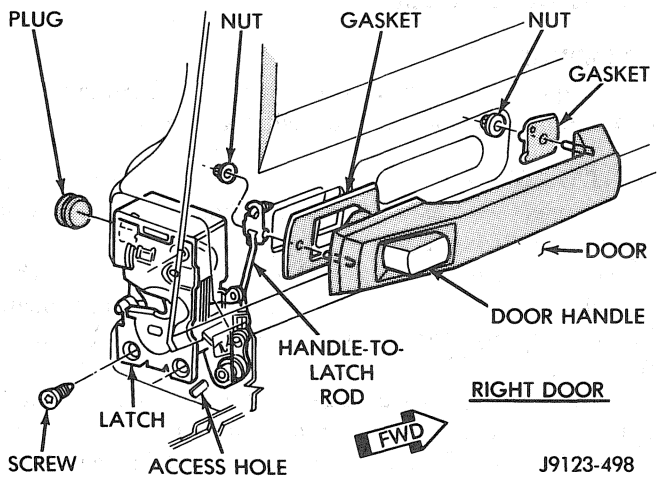


Fig. 44 Outside Handle Removal/Installation

INSTALLATION

(1) Assemble the replacement door handle, if necessary (Fig. 45). Apply silicone spray lubricant to the components.
(2) If the original gaskets were removed, position the replacement gaskets on the handle. Position the handle on the door outer panel.
(3) Install and tighten the handle nuts.
(4) Connect the latch-to-handle rod to the handle latch release lever arm.

REMOVAL AND INSTALLATION (Continued)

(5) Install the door waterdam and trim panel.
(6) Adjust the door latch as described in door latch adjustment.

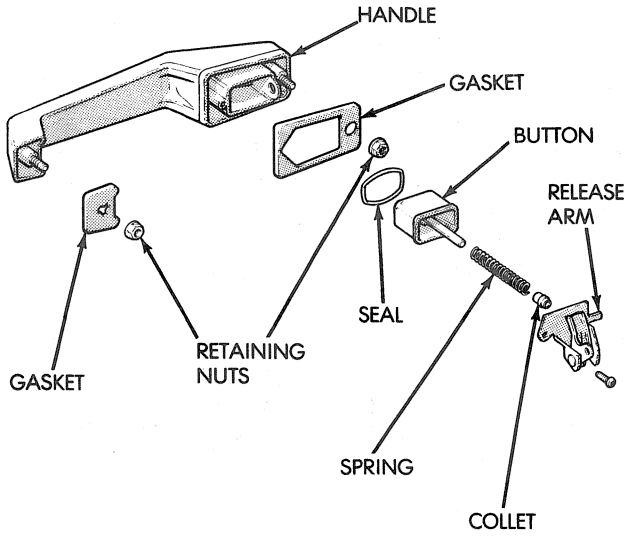


Fig. 45 Door Handle Components

FRONT DOOR LOCK CYLINDER

REMOVAL

(1) Remove the door trim panel and waterdam.
(2) Disconnect the door latch-to-lock cylinder rod at the door latch (Fig. 46).
(3) If equipped, disconnect the security alarm switch connector from the lock cylinder.
(4) Remove the key lock cylinder retainer clip. Remove the lock cylinder, gasket and clip from the door opening (Fig. 47).
(5) If applicable, remove the door latch-to-lock cylinder rod from the original lock cylinder. Connect it to the replacement lock cylinder.

INSTALLATION

(1) Position the lock cylinder and gasket in the door opening. Hold the lock cylinder in the opening with the retainer clip.
(2) Connect the door latch-to-lock cylinder rod to the door latch.
(3) If equipped, connect the security alarm switch connector to the lock cylinder.
(4) Test and, if necessary, adjust the door latch-to-lock cylinder rod operation.
(5) Install the door trim panel and waterdam.
(6) Adjust the door latch as described in door latch adjustment.

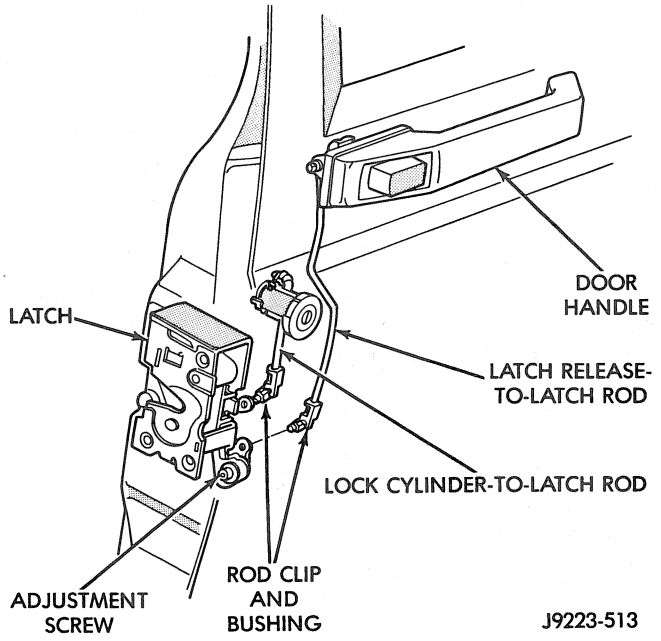


Fig. 46 Door Lock Cylinder/Latch

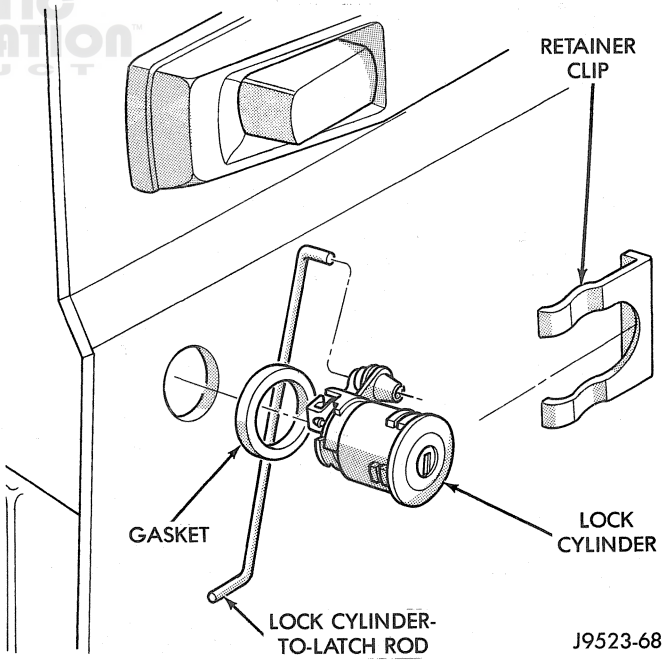


Fig. 47 Door Lock Cylinder Removal/Installation

FRONT DOOR LATCH

REMOVAL

(1) Remove the access plug located at the upper end of the door.
(2) Remove the door trim panel and waterdam.
(3) Remove the door external handle from the door outer panel.
(4) Remove the door latch screws.

REMOVAL AND INSTALLATION (Continued)

(5) Remove the retainer clip and key lock cylinder from the door outer panel.

(6) Disconnect all the rods from the door latch (Fig. 48).

(7) Remove the door latch from the door face.

(8) For vehicles equipped with power door locks, remove the lock motor rivets. Remove the motor and latch as a unit from the door. Detach the rod and motor from the latch (Fig. 49).

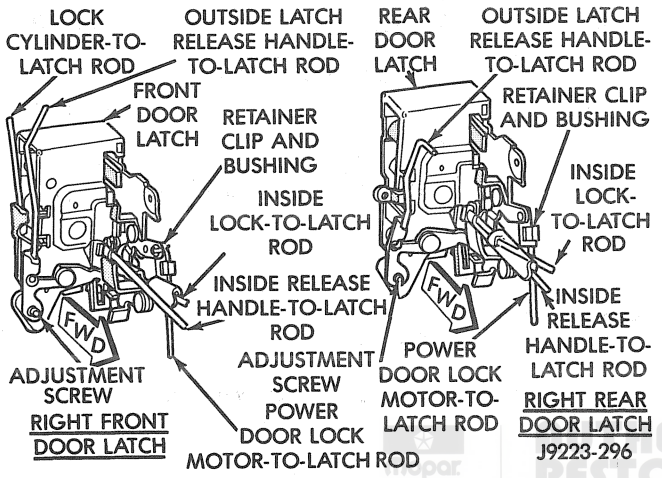


Fig. 48 Door Latches

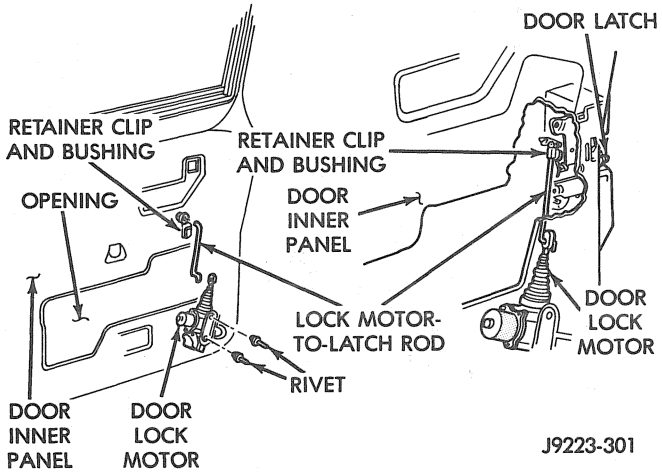


Fig. 49 Door Lock Motor

INSTALLATION

(1) If necessary, install a replacement latch striker.

(2) For vehicles equipped with power door locks, attach the rod and lock motor to the latch. Attach the lock motor to the door panel with either rivets or with bolts and nuts.

(3) Install the door latch at the door face and connect all the rods to the latch.

(4) Install the latch screws. Tighten the screws to 9 N·m (77 in-lbs) torque.

(5) Install the external handle.

(6) Install the latch-to-door handle rod.

(7) Install the key lock cylinder and retainer clip.

(8) Install the door waterdam and trim panel.

(9) Install the door access plug.

(10) Adjust the door latch as described in door latch adjustment.

FRONT DOOR LATCH STRIKER

REMOVAL

(1) Open door and rotate latch striker counter clockwise (Fig. 50).

INSTALLATION

(1) Position latch striker at B-pillar and install latch striker. Tighten latch striker to 50 N·m (52 ft. lbs.) torque.

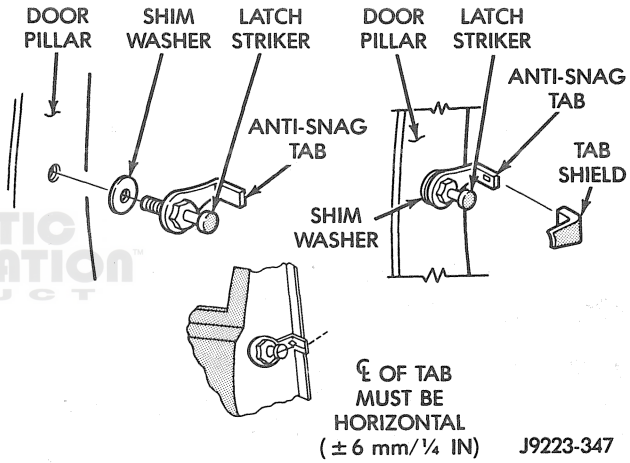


Fig. 50 Door Latch Striker Removal/Installation

FRONT DOOR INSIDE HANDLE ACTUATOR

REMOVAL

(1) Remove the door inside latch release handle screws (Fig. 51).

(2) Move the door release handle outward and disconnect the handle-to-latch rods (Fig. 52). For vehicles equipped with power door locks/windows, also disconnect the wire harness connector.

(3) Remove the door trim panel and waterdam.

(4) Drill-out the rivet heads and remove the rod guide bracket rivets from the door inner panel (Fig. 53).

(5) Remove the rod guide brackets and rods from the door.

INSTALLATION

(1) Position the rod guide brackets and rods in the door.

(2) Install rod the guide bracket rivets in the door inner panel (Fig. 54).

(3) Install the door trim panel and waterdam.

REMOVAL AND INSTALLATION (Continued)

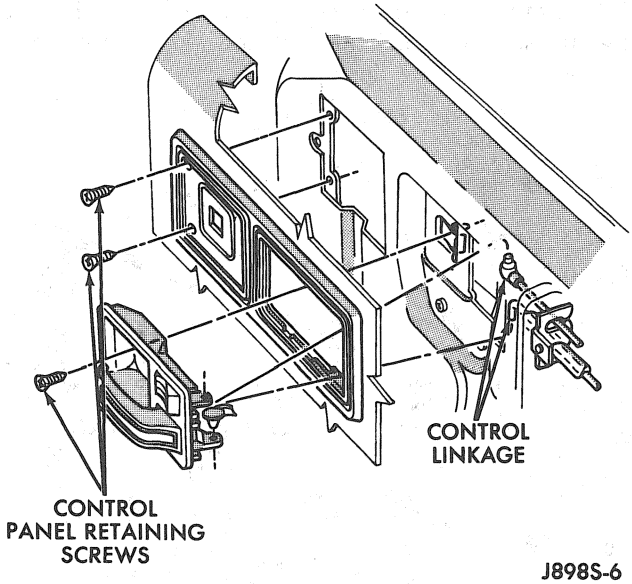


Fig. 51 Front Door Inside Latch Release Handle

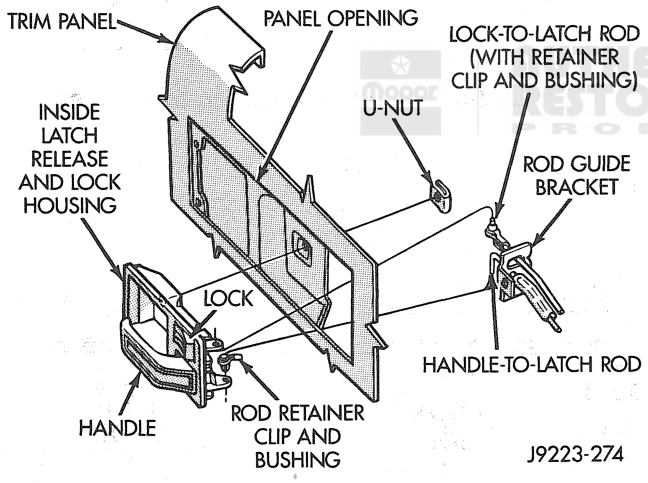


Fig. 52 Door Inside Latch Release Rods

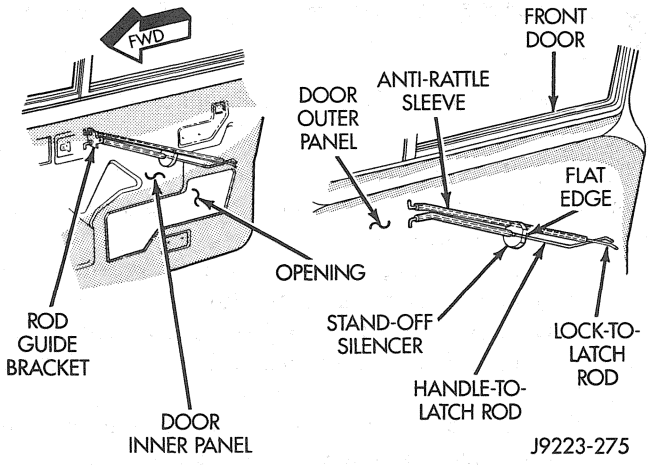


Fig. 53 Front Door Rod Guide Bracket and Rods

(4) Adjust the door latch as described in door latch adjustment.

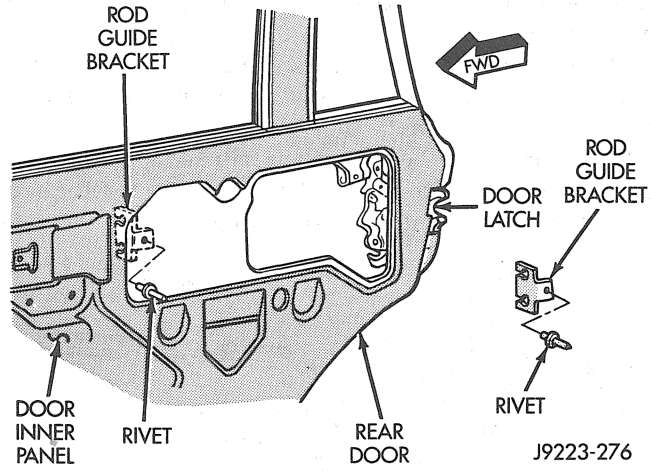


Fig. 54 Rod Guide Bracket Installation

FRONT DOOR INNER BELT SEAL

Refer to the Front Door Run Channel Weatherstrip Removal/Installation in this group for service procedures.

FRONT DOOR OUTER BELT SEAL

Refer to the Front Door Run Channel Weatherstrip Removal/Installation in this group for service procedures.

FRONT DOOR GLASS RUN CHANNEL WEATHERSTRIP

REMOVAL

(1) Open the window.

(2) The glass run channel weatherstrip (Fig. 55) can be removed by hand or with the aid of a small putty knife (or similar tool).

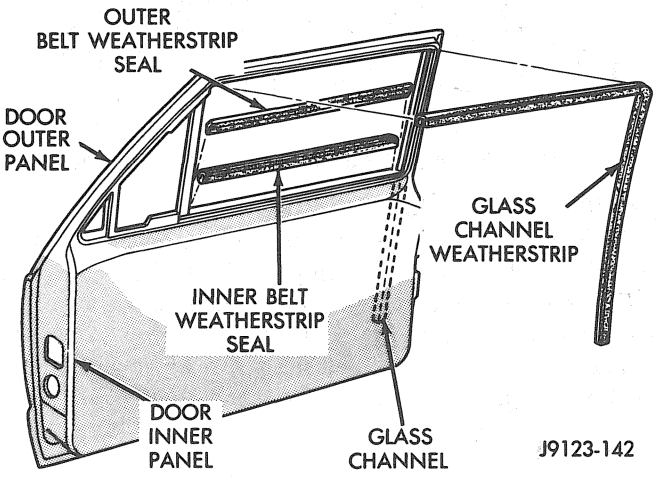


Fig. 55 Front Door Glass Run Channel Weatherstrip

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Start at the upper, rear corner. A small amount of adhesive can be used to hold the weatherstrip seal in-place, if necessary.

(2) As applicable, move forward or rearward and downward evenly until the weatherstrip seal is fully seated in the channel.

(3) Position the belt weatherstrip seals at the window edge (Fig. 56) and (Fig. 57) and force them downward until seated on the flange.

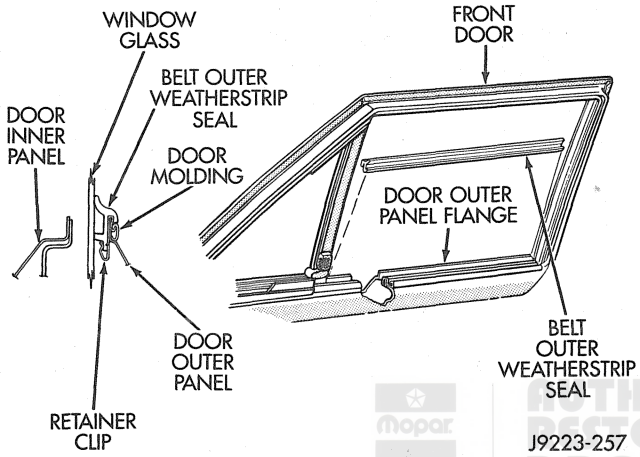


Fig. 56 Front Door Belt Outer Weatherstrip

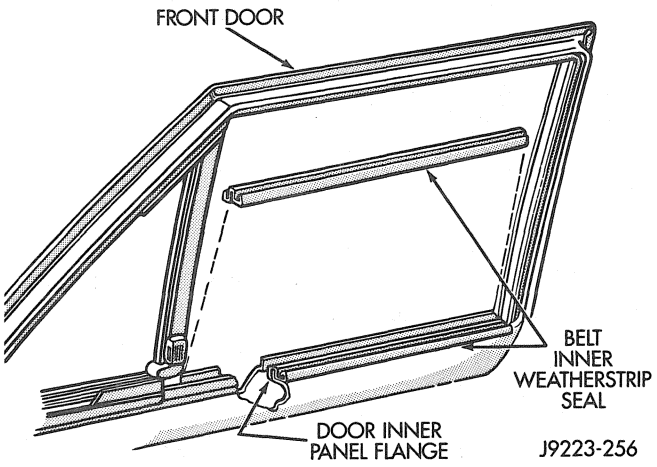


Fig. 57 Front Door Belt Inner Weatherstrip

FRONT DOOR WEATHERSTRIP

The door weatherstrip seal is attached to the periphery of the door opening in the body.

The door secondary seal is attached to the A-pillar with plastic blind rivets (Fig. 58).

The door-to-rocker panel seals are attached to the door inner panels with adhesive tape (Fig. 59).

REMOVAL

(1) Remove the retaining push-studs with an appropriate pry tool.

(2) Remove the door-to-rocker panel seals by heating the seal with a heat gun and slowly peeling the seal away from the door.

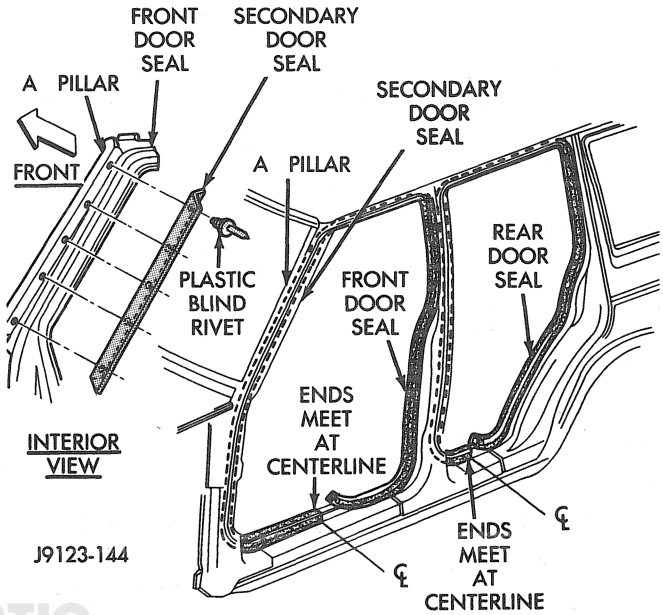


Fig. 58 Door Opening Weatherstrip Seals

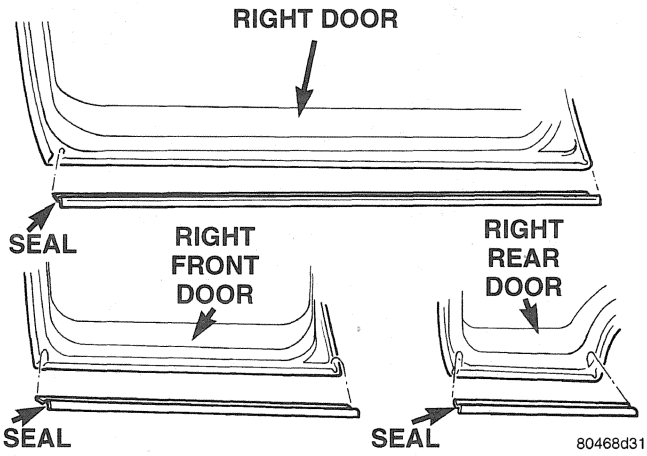


Fig. 59 Door-To-Rocker Panel Seals

INSTALLATION

The weatherstrip seal is attached to the flange around the perimeter of the door opening with adhesive and plastic push-studs.

(1) When installing a door opening weatherstrip seal, start at the door sill center line.

(2) Move upward and around the perimeter of the door opening and seat the weatherstrip on the flange (Fig. 60).

(3) Position the door-to-rocker panel seal on the door inner panel aligning tape to bottom edge.

(4) Attach the seal to the door inner panel using 10–15 lbs. of pressure.

REMOVAL AND INSTALLATION (Continued)

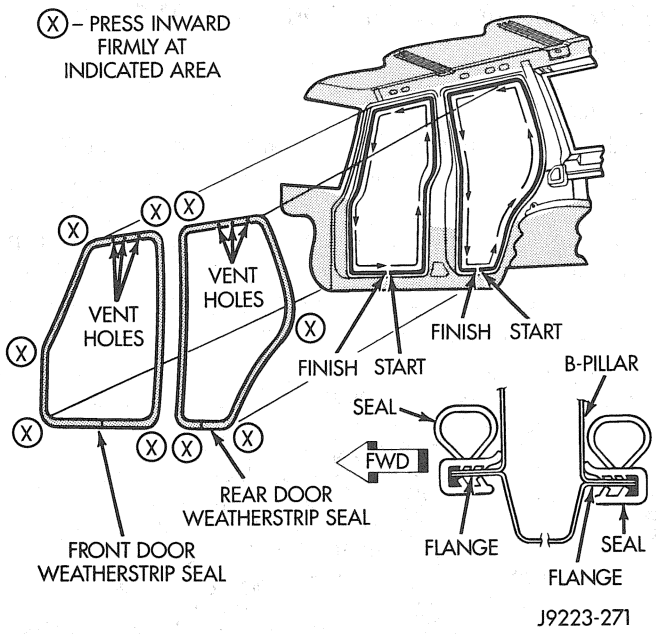


Fig. 60 Door Opening Weatherstrip

(5) Install the front door secondary seal with plastic blind rivets.

FRONT DOOR GLASS EXTERIOR MOLDING

REMOVAL

(1) Open the window completely.

(2) Pry and pull the molding sections from the door panel flange and clips.

INSTALLATION

(1) When installing window moldings, start at the forward end of the upper molding.

(2) Force the molding onto the door panel and continue rearward until it is completely seated on the flange.

(3) Mate the rear molding with the upper molding and force the molding edge inward.

(4) Continue pressing and moving downward to complete the installation.

(5) Position the lower molding on the clips and force it downward.

FRONT DOOR WINDOW REGULATOR

REMOVAL

(1) Remove the door trim panel and waterdam.

(2) Remove the window glass front channel bottom screw (Fig. 61).

(3) Remove the window regulator rivets by driving the rivet centers out with a punch. Remove the rivets with a 1/4-inch drill bit (Fig. 62) and (Fig. 63).

(4) Lower the window to provide access to the regulator-to-glass screw.

(5) Remove the regulator-to-glass screw, bushing and retainer from the regulator (Fig. 64).

(6) Lift the window glass upward and separate it from the regulator. Support the window glass.

(7) Remove the window glass regulator from the door.

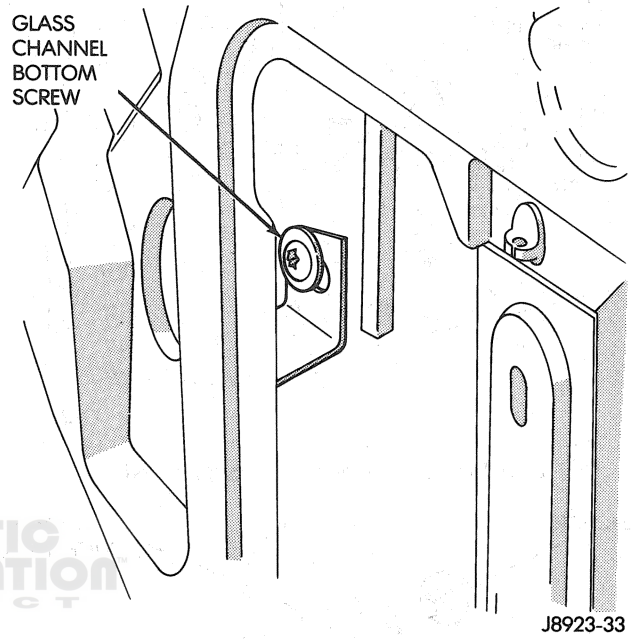


Fig. 61 Window Glass Front Channel Bottom Screw

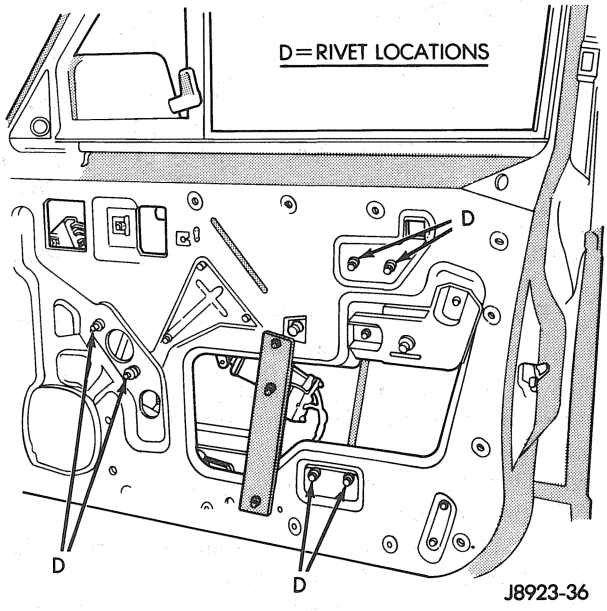


Fig. 62 Manual Window Regulator Rivets

INSTALLATION

(1) Position the window glass regulator within the door panels.

(2) Attach the regulator on door inner panel with replacement rivets or screws and nuts.

REMOVAL AND INSTALLATION (Continued)

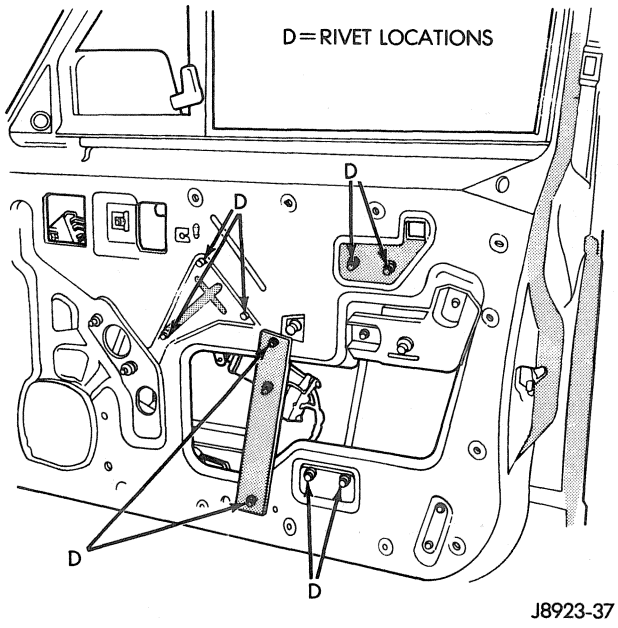


Fig. 63 Power Window Regulator Rivets

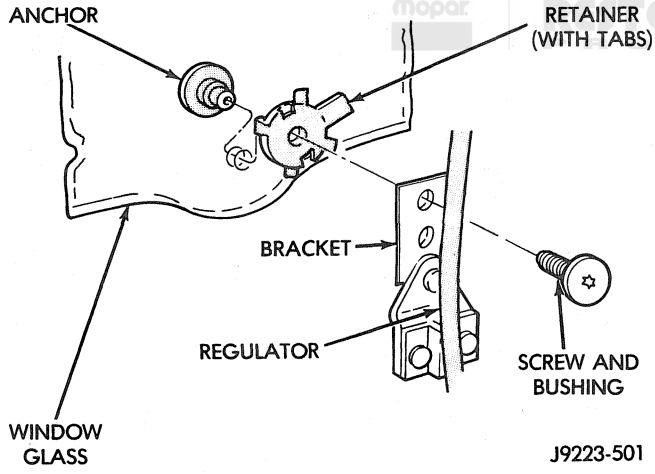


Fig. 64 Regulator-To-Glass Screw Removal/ Installation

(3) Remove the support and position window glass at regulator. Install the regulator-to-window retainer, bushing and screw.

(4) Tighten the regulator-to-glass screw to 4 N·m (36 in-lbs) torque.

(5) Install the glass channel bottom screw. Tighten screw to 9 N·m (7 ft-lbs) torque.

(6) Attach the door waterdam to the door inner panel with sealant.

(7) Install the trim panel.

FRONT DOOR SPACER BLOCKS—TWO-DOOR VEHICLES

REMOVAL

(1) Upper spacer block: drill-out the rivet heads and remove them from the reinforcement plate (Fig. 65).

(2) Lower spacer block: remove the screws from the door face (Fig. 66).

(3) As applicable, remove the spacer block from the door window frame or door face.

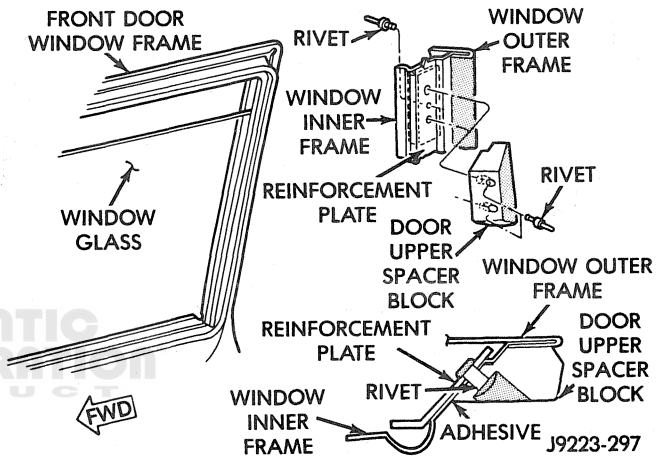


Fig. 65 Front Door Upper Spacer Block—Two-Door

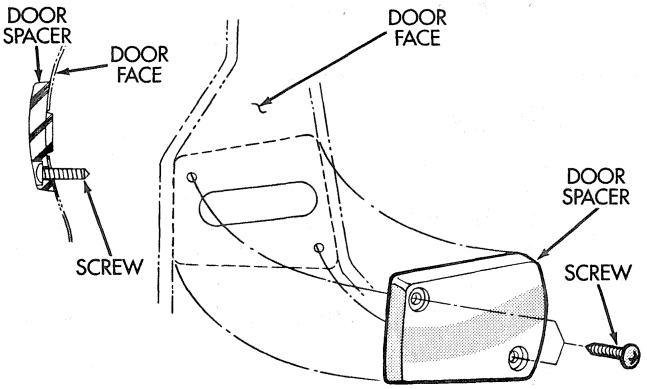


Fig. 66 Front Door Lower Spacer Block—Two-Door

INSTALLATION

(1) As applicable, position the spacer block on the door window frame or door face.

(2) Upper spacer block: Install the replacement rivets in the spacer block and reinforcement plate.

(3) Lower spacer block: install the screws in the door face. Tighten the screws to 1 N·m (11 in-lbs) torque.

REMOVAL AND INSTALLATION (Continued)

FRONT DOOR GLASS

REMOVAL

(1) Remove the door trim panel and waterdam.
(2) Remove the window glass channel hardware, beltline molding and weatherstrip seals (Fig. 67) and (Fig. 68).
(3) Remove the glass channel bottom screw.
(4) Remove the regulator-to-window glass screw, bushing and retainer.
(5) Lift the glass upward and out of the door.

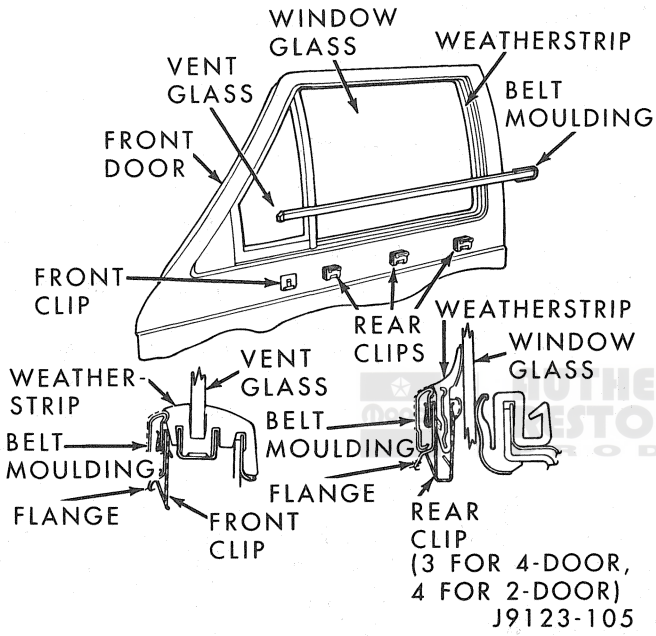


Fig. 67 Front Door Beltline Molding and Weatherstrip Seals

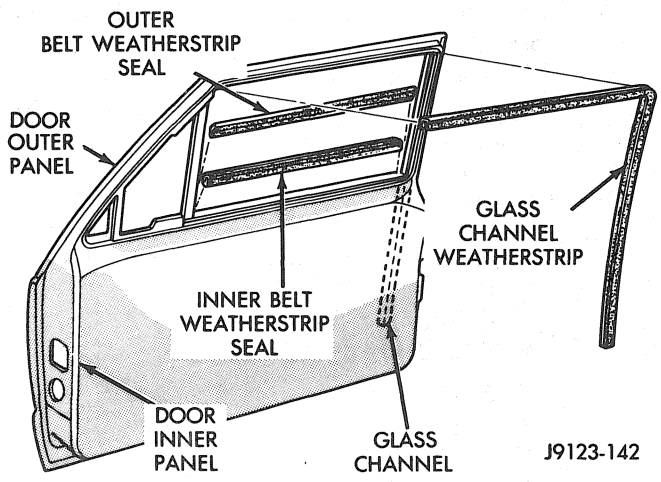


Fig. 68 Front Door Weatherstrip Seals

INSTALLATION

(1) Position the glass in the door and install the regulator-to-glass retainer, bushing and screw.
(2) Tighten the screw to 4 N·m (36 in-lbs) torque.
(3) Install the channel bottom screw. Tighten the screw to 9 N·m (7 ft-lbs) torque.
(4) Install the channel hardware, beltline molding and weatherstrip seals.
(5) Attach the door waterdam to the door inner panel with adhesive/sealant.
(6) Install the door trim panel.

REAR DOOR TRIM PANEL

REMOVAL

(1) Remove the door inside latch release handle screw.
(2) Remove the regulator handle.
(3) Remove the armrest lower screws (Fig. 69).
(4) Remove the trim panel fasteners from door inner panel with a pry tool (use special tool C-4829) (Fig. 70).
(5) Move the door trim panel outward and disconnect the handle-to-latch rods (Fig. 71). For vehicles equipped with power door locks/windows, disconnect the wire harness connector.
(6) Remove the trim panel from door.
(7) If necessary, remove the waterdam from the door.
(8) If necessary, replace the armrest J-clip, retainer clip anchor and armrest support bracket.

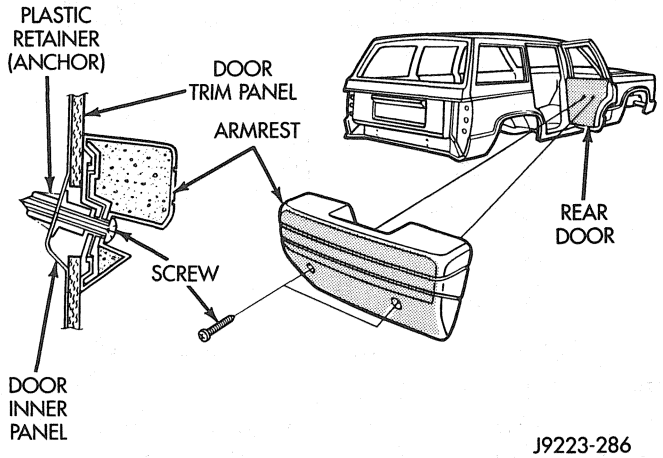


Fig. 69 Rear Door Armrest Removal/Installation

INSTALLATION

(1) If door waterdam was removed, apply sealant to the edges before installing.
(2) Position the waterdam on door inner panel.
(3) Connect the rods to the inside latch release handle. For vehicles with power door locks/windows, connect the wire harness connector.
(4) Position the trim panel on the door inner panel and press the retainers inward. Tighten the armrest screws to 4 N·m (34 in-lbs) torque.
(5) Install the window glass regulator handle.

REMOVAL AND INSTALLATION (Continued)

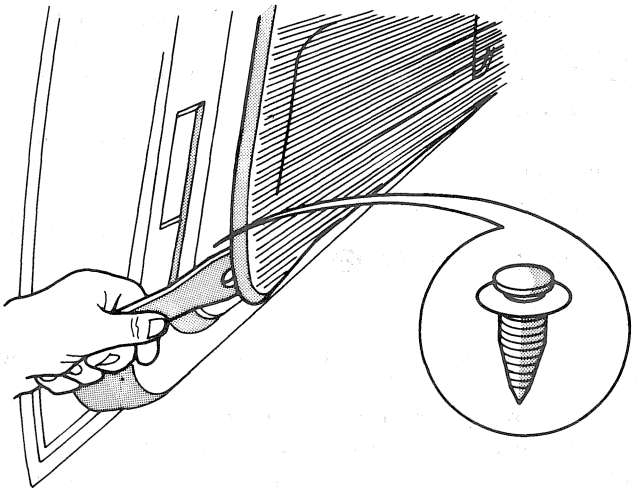


Fig. 70 Detaching Trim Panel Push-In Fasteners

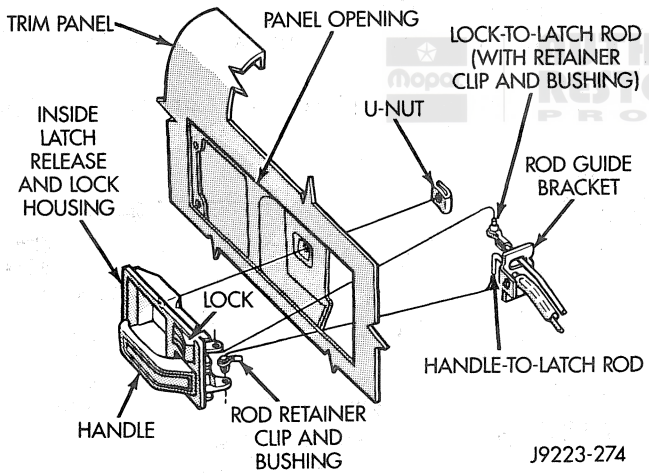


Fig. 71 Door Inside Latch Release Rods

REAR DOOR

Refer to the Front Door removal and installation procedure in this group for service information.

REAR DOOR HINGE

REMOVAL

(1) Remove the door restraint (check) retaining pin.

(2) with the door closed, remove the door hinge pin and bushing with a punch (Fig. 72).

(3) Remove the door hinge bolts, plates and shims.

(4) Retain the door hinge plates and shims for correct installation.

(5) Separate the hinge halves.

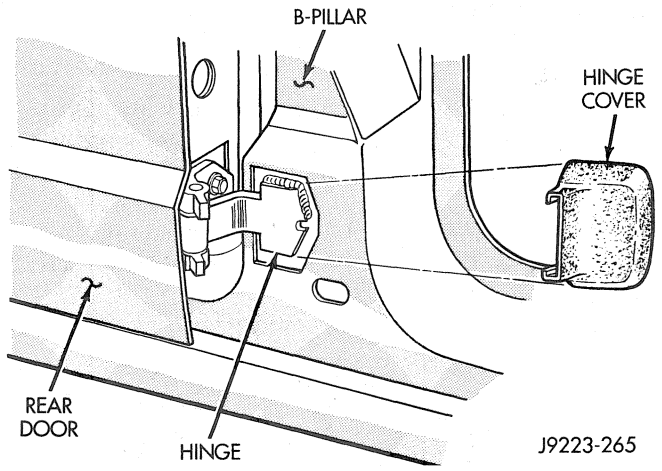


Fig. 72 Rear Door Hinge

INSTALLATION

(1) Position the hinge plates, shims and replacement hinge-half on the door face.

(2) Align the door hinges, plates and shims with bolt holes and install hinge bolts.

(3) Adjust/align latch striker and latch as necessary.

(4) Install the door restraint (check) retaining pin with a punch.

REAR DOOR HINGE PIN

Refer to the Front Door Hinge Pin Removal/Installation procedure in this group for service procedures.

REAR DOOR RESTRAINT

REMOVAL

(1) Remove the door trim panel.

(2) Remove the door restraint (check) retaining pin from the bracket with a punch.

(3) Remove the nuts and remove the restraint via the access opening in the door inner panel (Fig. 73).

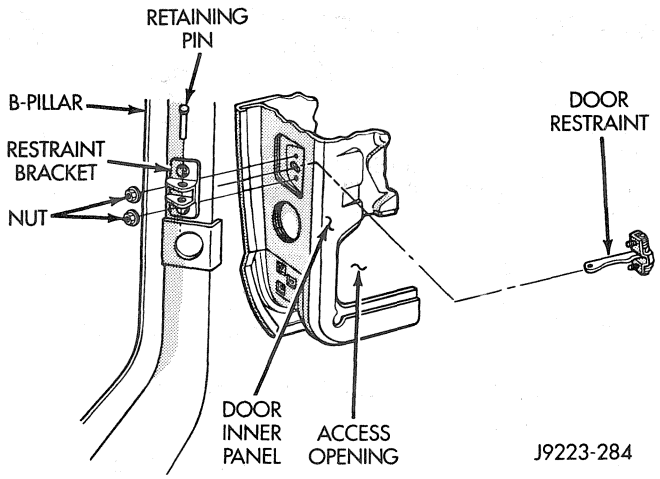


Fig. 73 Door Restraint (Check)

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Position the door restraint in the door by way of the opening and install the nuts. Tighten the nuts to 10 N·m (7 ft-lbs) torque.

(2) Position the door restraint in bracket with the holes aligned and insert the retaining pin.

REAR DOOR OUTSIDE HANDLE

REMOVAL

(1) Remove the door trim panel and waterdam.

(2) Remove the access hole cover and remove the door handle nuts (Fig. 74).

(3) Disconnect the handle-to-latch rod from the handle latch release lever arm.

(4) Remove the nuts and handle from the door.

(5) Remove the gaskets from the door outer panel surface, if necessary.

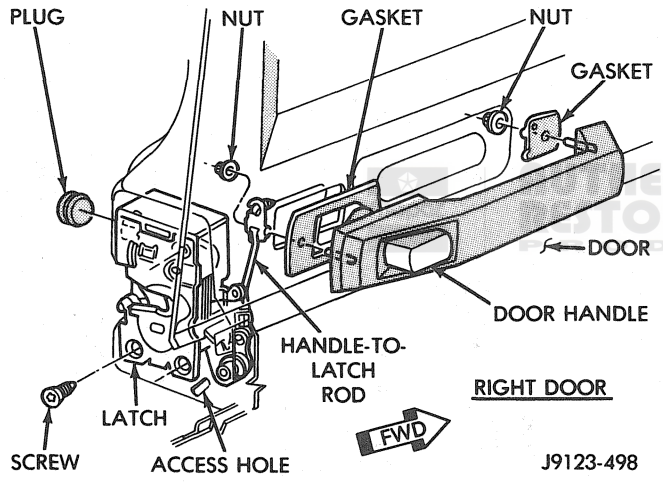


Fig. 74 Door External Handle Removal/Installation

INSTALLATION

(1) Assemble the replacement door handle, if necessary (Fig. 75). Apply silicone spray lubricant to the components.

(2) If the original gaskets were removed, position the replacement gaskets on the handle. Position the handle on the door outer panel.

(3) Install and tighten the handle nuts.

(4) Connect the latch-to-handle rod to the handle latch release lever arm.

(5) Install the door waterdam and trim panel.

(6) Adjust the door latch as described in door latch adjustment.

REAR DOOR LATCH

REMOVAL

(1) Remove the access plug located at the upper end of the door.

(2) Remove the door trim panel and waterdam.

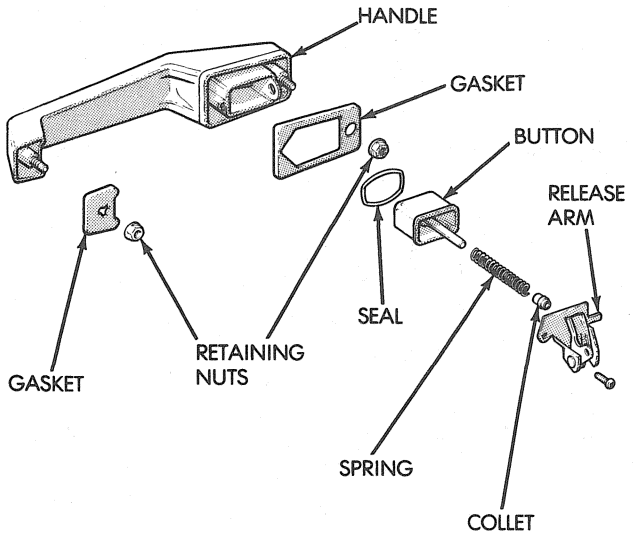


Fig. 75 Door Handle Components

(3) Remove the door external handle from the door outer panel.

(4) Remove the door latch screws.

(5) Remove the retainer clip and key lock cylinder from the door outer panel.

(6) Disconnect all the rods from the door latch (Fig. 76).

(7) Remove the door latch from the door face.

(8) For vehicles equipped with power door locks, remove the lock motor rivets. Remove the motor and latch as a unit from the door. Detach the rod and motor from the latch (Fig. 77).

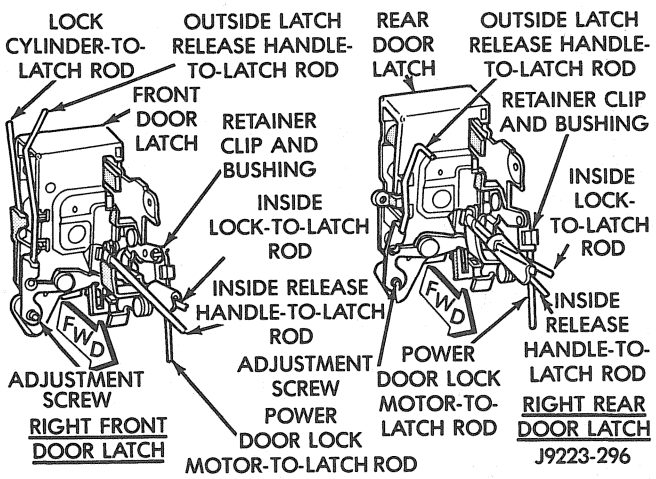


Fig. 76 Door Latches

INSTALLATION

(1) For vehicles equipped with power door locks, attach the rod and lock motor to the latch. Attach the lock motor to the door panel with either rivets or with bolts and nuts.

REMOVAL AND INSTALLATION (Continued)

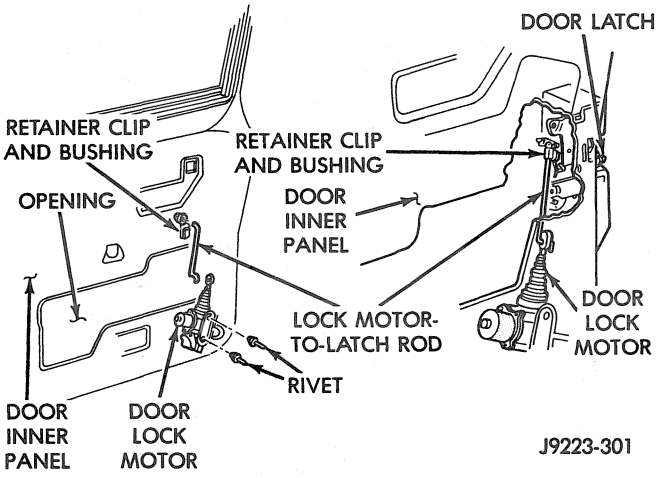


Fig. 77 Door Lock Motor

(2) Install the door latch at the door face and connect all the rods to the latch.

(3) Install the latch screws. Tighten the screws to 9 N·m (77 in-lbs) torque.

(4) Install the external handle.

(5) Install the latch-to-door handle rod.

(6) Install the key lock cylinder and retainer clip.

(7) Install the door waterdam and trim panel.

(8) Install the door access plug.

(9) Adjust the door latch as described in door latch adjustment.

REAR DOOR LATCH STRIKER

Refer to Front Door Latch Striker Removal/Instllation procedure in this group for service procedures.

REAR DOOR INSIDE HANDLE ACTUATOR

REMOVAL

(1) Remove the door inside latch release handle screws (Fig. 78).

(2) Move the door release handle outward and disconnect the handle-to-latch rods (Fig. 79). For vehicles equipped with power door locks/windows, also disconnect the wire harness connector.

(3) Remove the door trim panel and waterdam.

(4) Drill-out the rivet heads and remove the rod guide bracket rivets from the door inner panel (Fig. 80).

(5) Remove the rod guide brackets and rods from the door.

INSTALLATION

(1) Position the rod guide brackets and rods in the door.

(2) Install rod the guide bracket rivets in the door inner panel (Fig. 81).

(3) Install the door trim panel and waterdam.

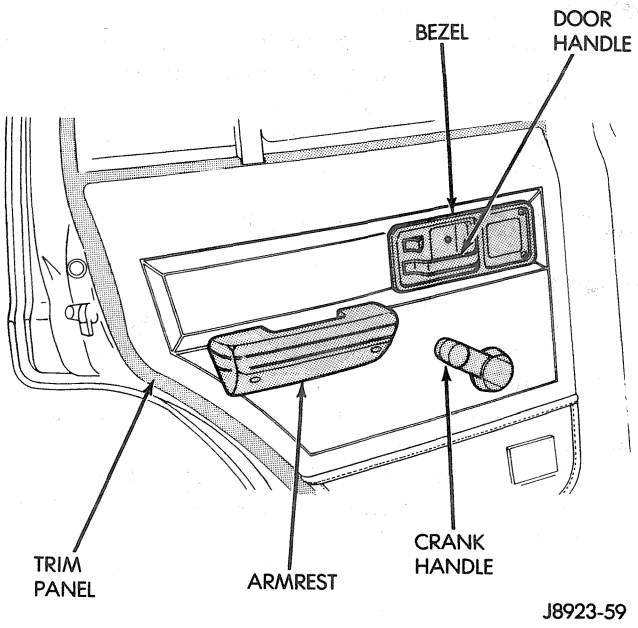


Fig. 78 Inside Handle Actuator

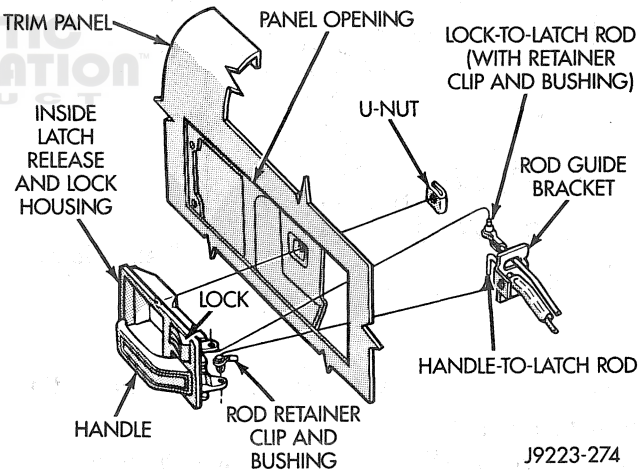


Fig. 79 Door Inside Latch Release Rods

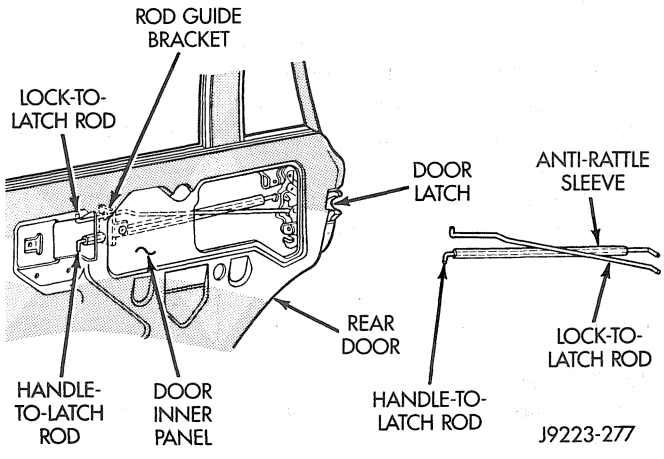


Fig. 80 Door Rod Guide Bracket And Rods

REMOVAL AND INSTALLATION (Continued)

(4) Adjust the door latch as described in door latch adjustment.

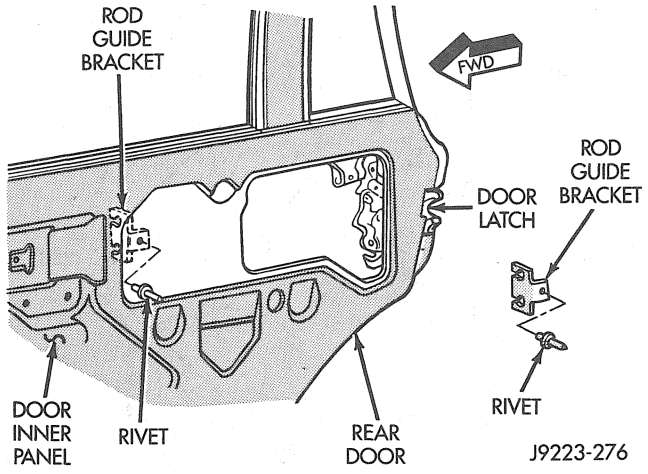


Fig. 81 Rod Guide Bracket Installation

REAR DOOR INNER BELT SEAL

Refer to the Rear Door Glass Run Channel Weatherstrip Removal/Installation procedure in this group for service procedures.

REAR DOOR GLASS RUN CHANNEL WEATHERSTRIP

REMOVAL

(1) Open the window.

(2) The glass run channel weatherstrip seals (Fig. 82) can be removed by hand or with the aid of a small putty knife (or similar tool).

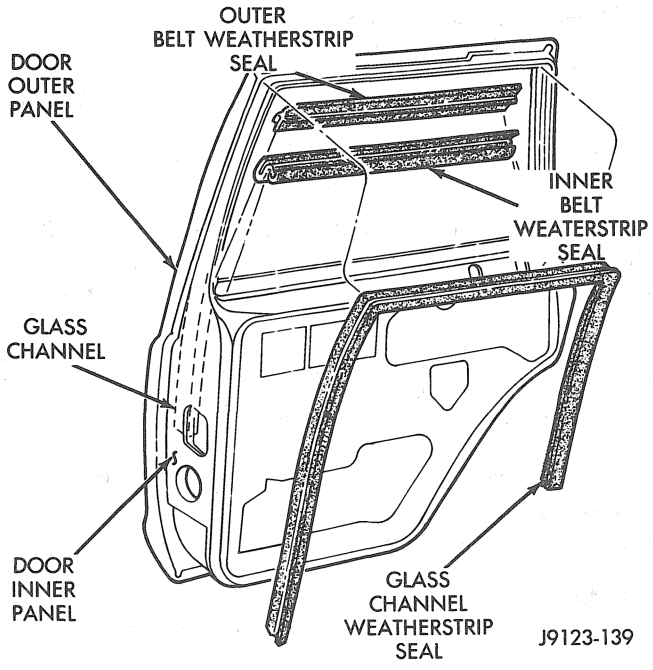


Fig. 82 Rear Door Glass Run Channel Weatherstrip

INSTALLATION

(1) To install a rear door glass run channel weatherstrip, start at the upper, front corner.

(2) As applicable, move forward or rearward and downward evenly until the weatherstrip seal is fully seated in the channel.

(3) Position the belt weatherstrip seals at the window edge (Fig. 83) and force them downward until seated on the flange.

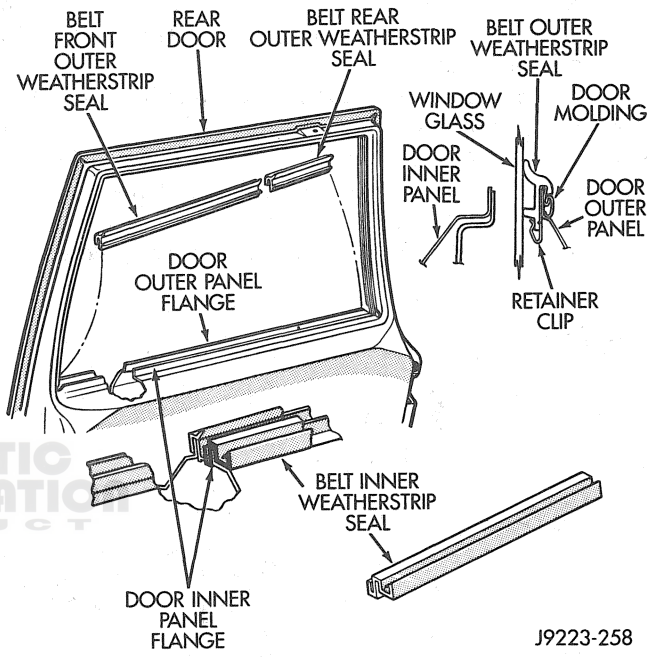


Fig. 83 Rear Door Belt Outer and Inner Weatherstrip Seal

REAR DOOR GLASS EXTERIOR MOLDING

REMOVAL

(1) When removing the door window exterior molding, open the window completely.

(2) Pry and pull the molding sections from the door panel flange and clips.

INSTALLATION

(1) When installing window moldings, start at the forward end of the upper molding.

(2) Force the molding onto the door panel and continue rearward until it is completely seated on the flange.

(3) Mate the rear molding with the upper molding and force the molding edge inward.

(4) Continue pressing and moving downward to complete the installation.

(5) Position the lower molding on the clips and force it downward.

REMOVAL AND INSTALLATION (Continued)

REAR DOOR WEATHERSTRIP

Refer to the Front Door Weatherstrip Removal/Installation procedure in this group for service procedures.

REAR DOOR WINDOW REGULATOR

REMOVAL

(1) Remove the door trim panel and waterdam.

(2) Remove the window glass attaching screw, bushing and retainer from the regulator (Fig. 84). Support the glass.

(3) Remove the regulator rivets by driving out the rivet center with a punch. Next, drill out the rivet body with a 1/4 inch diameter drill bit (Fig. 85).

(4) Power window: disconnect the wire harness connector from the regulator drive motor.

(5) Remove the regulator and drive motor, if equipped.

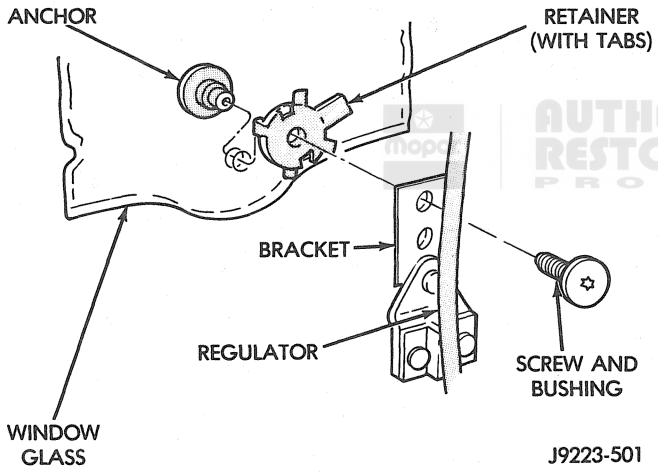


Fig. 84 Regulator To Glass Screw Removal/ Installation

INSTALLATION

(1) Position window regulator and, if equipped, drive motor within the door panels.

(2) Attach the regulator to door inner panel with replacement rivets or with screws and nuts (Fig. 86).

(3) Connect the regulator wire harness connector.

(4) Position the window glass at the regulator and install the retainer, bushing and screw.

(5) Tighten the glass screw to 4 N·m (36 in-lbs) torque.

(6) Install the waterdam and trim panel.

REAR DOOR WINDOW GLASS

REMOVAL

(1) Lower the window glass.

(2) Pry the window beltline molding from the clips and remove the molding from the door.

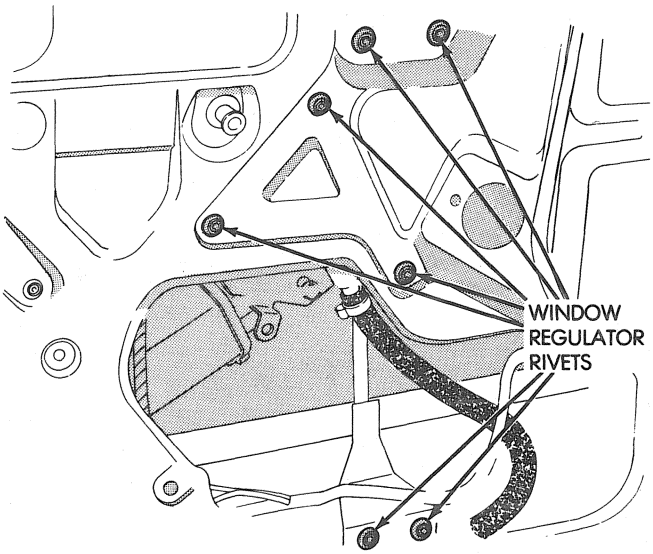


Fig. 85 Rear Door Window Regulator Rivets

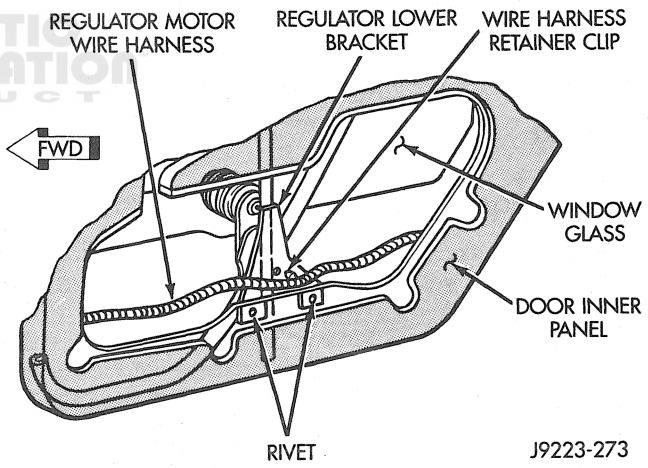


Fig. 86 Power Regulator Lower Bracket Rivet Installation

(3) Remove the window weatherstrip seals from the door.

(4) Remove the trim panel and waterdam from the door inner panel.

(5) Remove the channel/division bar screws and drill-out the rivet head to remove (Fig. 87).

(6) Tilt the channel/division bar forward and remove it from the door.

(7) Remove the window glass screw, bushing and retainer from the regulator.

(8) Remove the window glass from door.

INSTALLATION

(1) Install the glass in the door, and install the retainer, bushing and screw.

REMOVAL AND INSTALLATION (Continued)

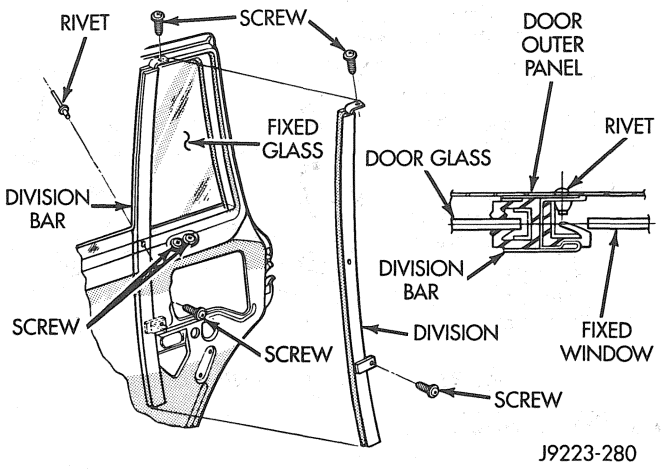


Fig. 87 Window Channel/Division Bar Screws and Rivet

(2) Tighten the glass attaching screw 6 N·m (53 in-lbs) torque.

(3) Install the window glass channel/division bar in the door.

(4) Install the window glass channel/division bar screws and rivet. Tighten the screws to 6 N·m (5 ft-lbs) torque.

(5) Install the window glass channel and belt weatherstrip seals.

(6) Install the window beltline molding.

(7) Install the door waterdam and trim panel.

BODY SIDE MOLDING/CLADDING

REMOVAL

(1) Loosen the vinyl body side molding (Fig. 88) with a heat gun.

(2) Lift edge of molding with a putty knife and peel molding from body panel. Apply heat to any location where the molding remains adhered to a panel.

(3) Remove the adhesive from the body panel with 3M All Purpose Cleaner, or an equivalent cleaner.

(4) If the original molding will be installed, also remove all adhesive from it.

INSTALLATION

(1) Install 3M 06379 double-sided tape on the molding.

(2) For vertical alignment, use masking tape or a string as reference.

(3) Remove the backing from the tape, align the molding and position it on the body panel.

(4) Press the molding onto the body panel with a roller or hand pressure.

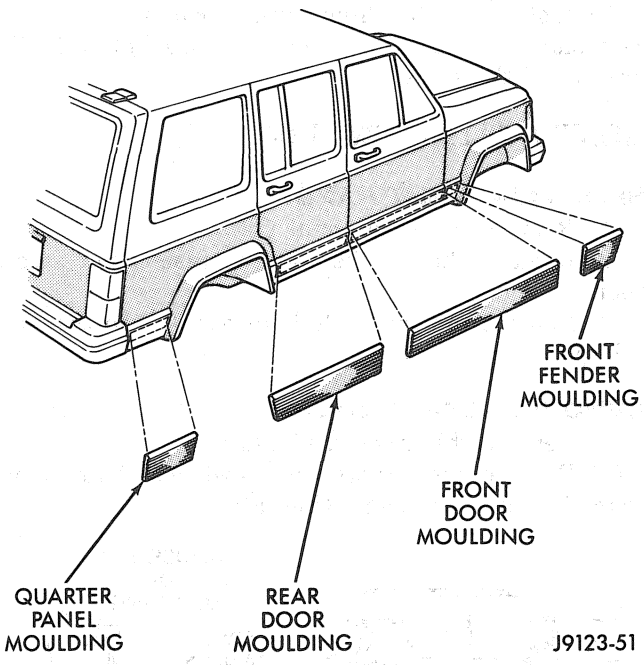


Fig. 88 Body Side Molding/Cladding—4-Door

A-PILLAR TRIM

REMOVAL

(1) Remove the retaining screws and the inner scuff plate, cowl side trim panel and headliner front trim molding from the interior of the vehicle.

(2) Remove the retaining screws and the windshield side molding from the A-pillar and door header (Fig. 89).

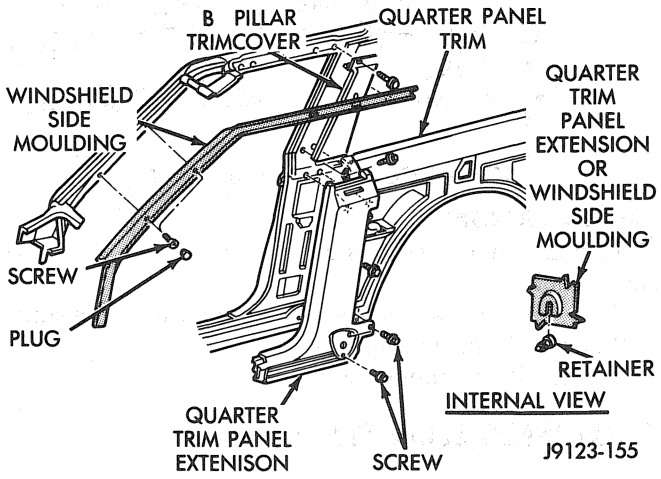


Fig. 89 A-pillar Trim, Quarter Trim and Extension Panels

INSTALLATION

(1) Position the A-pillar trim on the A-pillar and door header. Install the retaining screws and tighten to 1 N·m (11 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

(2) Install the headliner front trim molding, the cowl side trim panel and the inner scuff plate in the interior of the vehicle.

LOWER A-PILLAR COWL TRIM

REMOVAL—RIGHT HAND

(1) Remove the inner scuff plate.
(2) Remove the nut behind the fuse panel access door.
(3) Remove the cowl side trim panel from the cowl side panel.

REMOVAL—LEFT HAND

(1) Remove the inner scuff plate.
(2) Remove the screws and cowl side trim panel from the cowl side panel (Fig. 90).

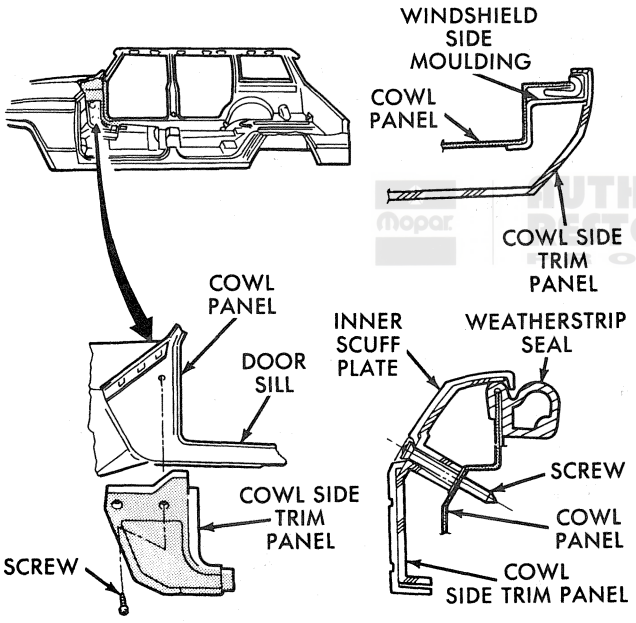


Fig. 90 Cowl Side Trim Panel

INSTALLATION

(1) Position the cowl side trim panel on the cowl side panel.
(2) Install the screws/nut. Tighten the screws/nut to 2 N·m (20 in. lbs.) torque.
(3) Install the inner scuff plate.

FRONT INNER SCUFF PLATE

REMOVAL

(1) Remove the retaining screws and the inner scuff plate from the front door sill (Fig. 91).

INSTALLATION

(1) Position the inner scuff plate on the front door sill and install the retaining screws. Tighten the screws to 1 N·m (11 in. lbs.) torque.

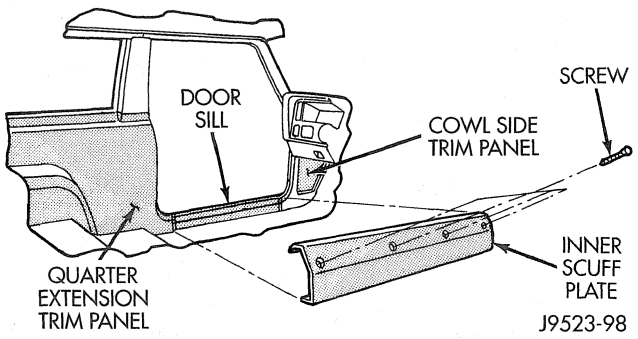


Fig. 91 Front Inner Scuff Plate

ASSIST HANDLE

REMOVAL

(1) Using a trim stick or equivalent, open the end covers that conceal the assist handle retaining screws.
(2) Remove the screws.
(3) Remove the assist handle from the trim molding.

INSTALLATION

(1) Position the handle on the trim molding and install the screws. Tighten the screws to 3 N·m (22 in. lbs.) torque.
(2) Install the covers over the screws.

B-PILLAR TRIM

REMOVAL

(1) Remove the inner scuff plate from the door sill.
(2) Remove the cowl side trim panel, the headliner trim molding and the A-pillar trim from the interior of the vehicle (Fig. 92).
(3) Remove the shoulder belt turning loop.
(4) Remove the B-pillar trim cover (Fig. 93).

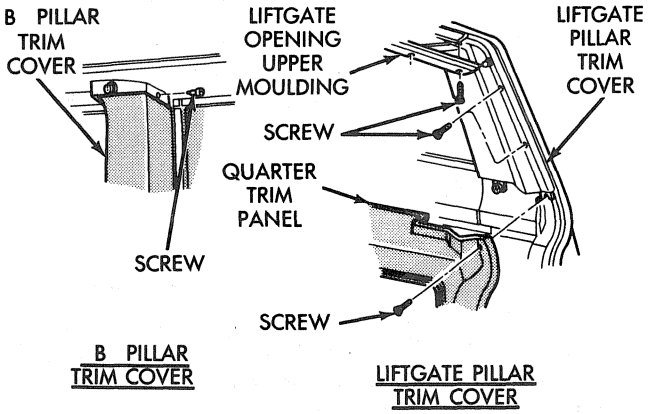


Fig. 92 B-Pillar Trim

REMOVAL AND INSTALLATION (Continued)

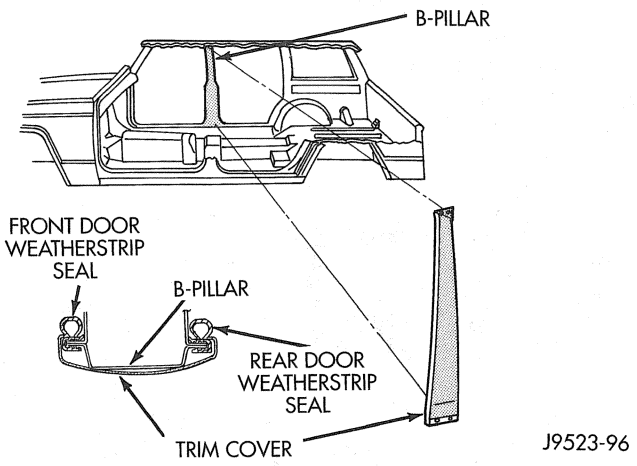


Fig. 93 B-Pillar Trim —4-Door Vehicles

INSTALLATION

(1) Position the trim cover on the B-pillar and install the retaining screws. Tighten to 1 N·m (11 in. lbs.) torque.

(2) Install the shoulder belt turning loop.

(3) Install the A-pillar trim, the headliner trim molding and the cowl side trim panel.

(4) Install the inner scuff plate.

C-PILLAR TRIM

REMOVAL

(1) Remove the retaining screws and the inner scuff plate from the door sill.

(2) Remove the cowl side trim panel, the headliner trim molding and the A-pillar trim from the interior of the vehicle (Fig. 92).

(3) For 4-door vehicles, remove the retaining screws and remove the trim cover from the B-pillar (Fig. 93).

(4) Remove the retaining screws and serrated retainers, and remove the panel extension from the wheelhouse and quarter trim panels.

(5) For 2-door vehicles, remove the retaining screws and remove the trim cover from the B-pillar.

(6) For 4-door vehicles, remove the retaining screws and remove the trim cover from the C-pillar (Fig. 94).

INSTALLATION

(1) For 4-door vehicles, position the trim cover on the C-pillar and install the retaining screws. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(2) For 2-door vehicles, position the trim cover on the B-pillar and install the retaining screws. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(3) Position the quarter trim panel extension on the wheelhouse and quarter trim panels. Install the serrated retainers and retaining screws. Tighten the screws to 1 N·m (11 in. lbs.) torque.

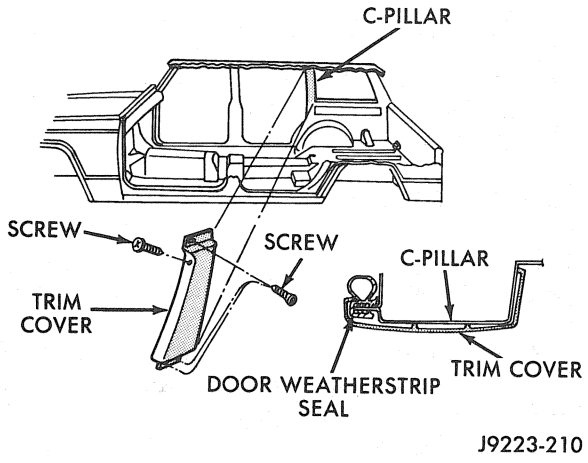


Fig. 94 C-Pillar Trim Cover—4-Door Vehicles

(4) For 4-door vehicles, position the trim cover on the B-pillar. Install the retaining screws and tighten to 1 N·m (11 in. lbs.) torque.

(5) Install the A-pillar trim, the headliner trim molding and the cowl side trim panel in the interior of the vehicle. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(6) Position the inner scuff plate.

QUARTER TRIM PANEL EXTENSION

REMOVAL

(1) Remove the retaining screws and the inner scuff plate from the door sill.

(2) Remove the retaining screws and serrated retainers, and remove the panel extension from the wheelhouse and quarter trim panels (Fig. 95).

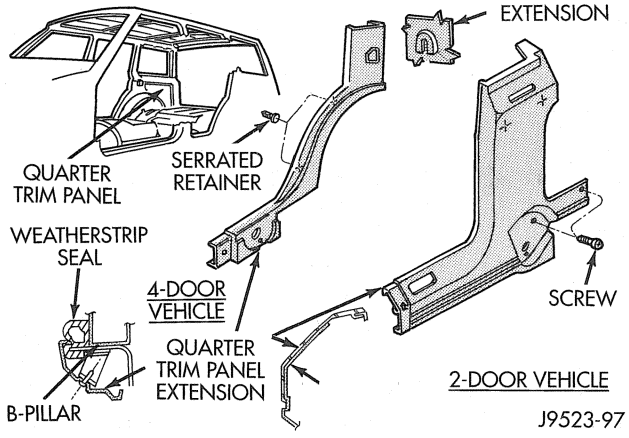


Fig. 95 Quarter Trim Panel Extension

INSTALLATION

(1) Position the quarter trim panel extension on the wheelhouse and quarter trim panels. Install the

REMOVAL AND INSTALLATION (Continued)

serrated retainers and retaining screws. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(2) Position the inner scuff plate on the door sill. Install the retaining screws and tighten to 1 N·m (11 in. lbs.) torque.

AIR EXHAUST GRILLE

REMOVAL

(1) Pry the bottom edge of the grille from the door opening panel.

(2) Pull downward and remove the grille from exhaust port in the door opening panel.

(3) Remove the screw that attaches the grille to door the opening panel (Fig. 96).

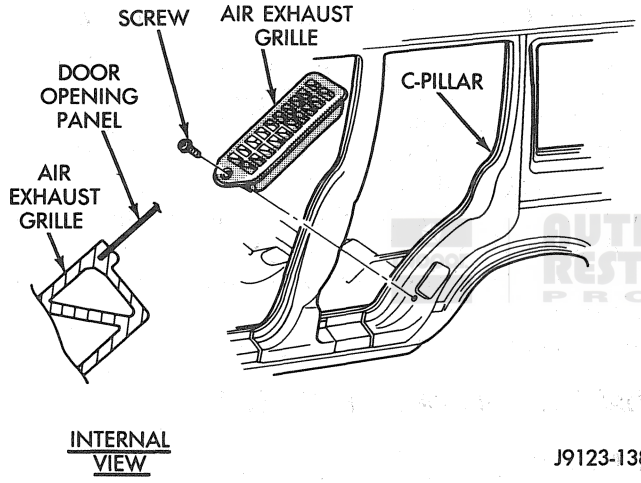


Fig. 96 Door Opening Air Exhaust Grille

INSTALLATION

(1) Position the slot located in the upper end of replacement grille at the exhaust port and insert edge in the slot.

(2) Push inward and seat the grille in the exhaust port.

(3) Install the screw to attach the grille to the door opening panel.

QUARTER AND WHEELHOUSE TRIM PANELS

REMOVAL

(1) Remove the retaining screws and the inner scuff plate from the door sill.

(2) Remove the retaining screws and serrated retainers, and remove the panel extension from the wheelhouse and quarter trim panels.

(3) Remove the retaining screws and the liftgate scuff plate from the carpet and cross sill (Fig. 97).

(4) Remove the retaining screws and the quarter trim panel from the quarter panel and wheelhouse trim panel (Fig. 98) and (Fig. 99).

(5) If necessary, remove the retaining screws and the tire stand-off from the left quarter trim panel.

(6) Remove the retaining screws and U-clip retainers, and remove the wheelhouse trim panel from the quarter panel.

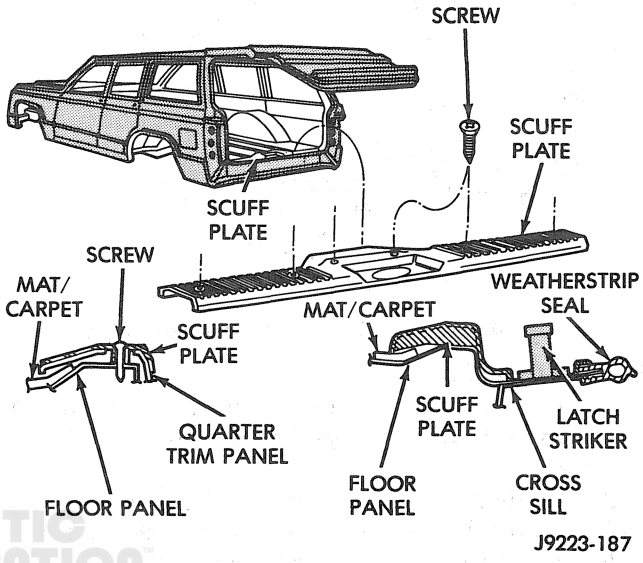


Fig. 97 Liftgate Scuff Plate

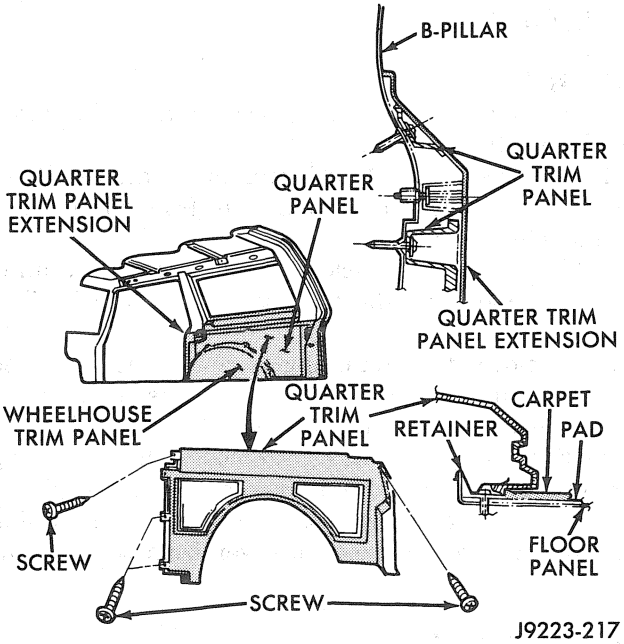


Fig. 98 Quarter Trim Panel—2-Door Vehicles

INSTALLATION

(1) Position the wheelhouse trim panel on the quarter panel and install the retaining screws and U-clip retainers. Tighten the screws to 1 N·m (11 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

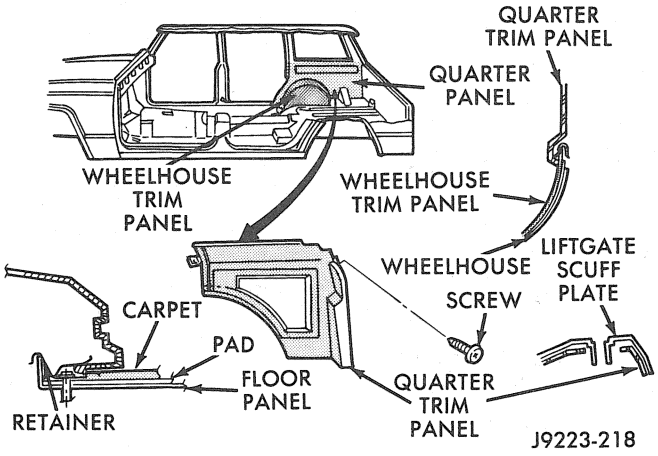


Fig. 99 Quarter Trim Panel—4-Door Vehicles

(2) If removed, install the tire stand-off on the left quarter trim panel. Tighten the retaining screws to 1 N·m (11 in. lbs.) torque.

(3) Position the quarter trim panel on the quarter panel and wheelhouse trim panel. Install and tighten the retaining screws to 1 N·m (11 in. lbs.) torque.

(4) Position scuff plate on the carpet and cross sill, and install the retaining screws.Tighten the scuff plate screws to 1 N·m (11 in. lbs.) torque.

(5) Position the quarter trim panel extension on the wheelhouse and quarter trim panels. Install the serrated retainers and retaining screws. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(6) Position the inner scuff plate on the door sill. Install the retaining screws and tighten to 1 N·m (11 in. lbs.) torque.

LIFTGATE PILLAR TRIM

REMOVAL

(1) Remove the retaining screws and the liftgate upper trim molding from the liftgate header.

(2) Remove upper trim molding screws.

(3) Remove the liftgate pillar trim screws (4dr vehicles) (Fig. 100).

(4) Remove the liftgate pillar trim screws and detach spring steel clips (2dr vehicles).

(5) Remove liftgate pillar trim.

INSTALLATION

(1) Position the liftgate trim on the liftgate pillar and install the screws.

(2) Install upper trim molding screws.

(3) Position the liftgate upper trim molding on vehicle and install the screws.

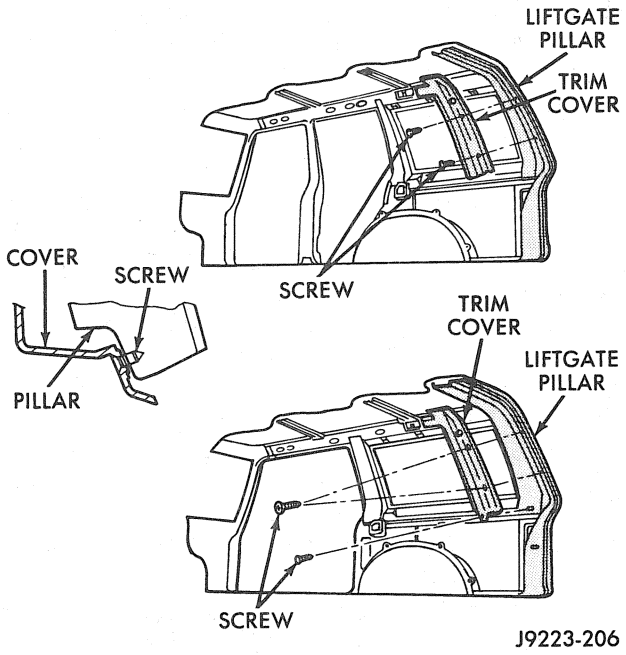


Fig. 100 Liftgate Pillar Trim

OUTER SCUFF PLATES

REMOVAL

(1) Remove the screws in the outer scuff plates (Fig. 101).

(2) When removing the liftgate scuff plate, remove the liftgate latch striker.

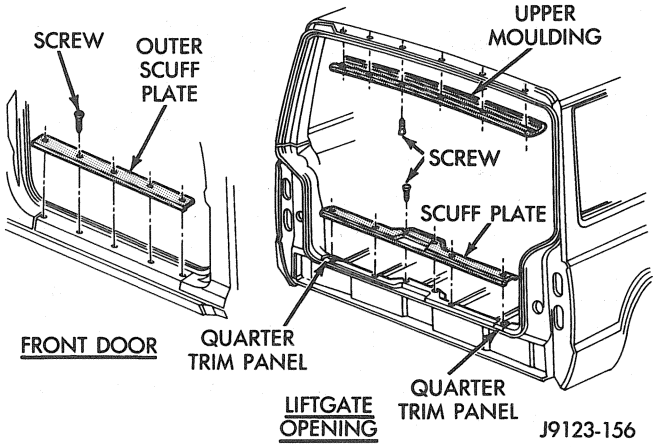


Fig. 101 Outer Scuff Plates

INSTALLATION

(1) If necessary, install liftgate latch striker.

(2) Install the screws in the outer scuff plates

FRONT SHOULDER BELT/BUCKLE

Inspect the front shoulder belts and buckles. Replace any belt that is either cut, frayed, torn or damaged in any way. Replace the shoulder belt if the retractor is damaged or inoperative.

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Slide the front seats all the way forward for access to the belt anchor bolt.

(2) Disconnect the belt wire harness connector (Fig. 102).

(3) Remove the anchor bolt cover.

(4) Remove the shoulder belt buckle anchor bolt with a Torx bit.

(5) Remove the shoulder belt buckle from the transmission tunnel.

(6) Remove the cap concealing the shoulder belt upper anchor bolt (Fig. 103) and (Fig. 104).

(7) Use a Torx bit to remove the upper anchor bolt. Remove the support/guide washer.

(8) Remove the inner scuff plate/trim panel from the door sill and remove the shoulder belt lower anchor bolt(s) with a Torx bit.

(9) Remove the shoulder belt and the retractor.

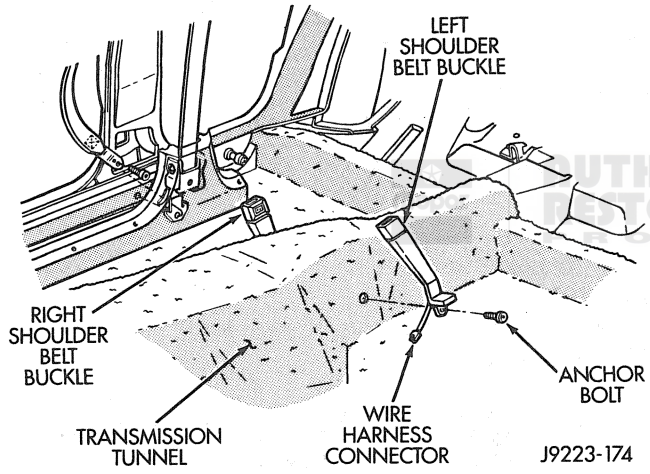


Fig. 102 Front Shoulder Belt Buckles

INSTALLATION

(1) Position the shoulder belt retractor in the shield and install the lower anchor bolt with a Torx bit.

(2) Position the support/guide washer and shoulder belt upper anchor plate on the trim panel. Install the upper anchor bolt with a Torx bit.

(3) Tighten the upper and lower anchor bolts to 41 N·m (30 ft. lbs.) torque.

(4) Install the door sill inner scuff plate/trim panel and install the cap over the upper anchor bolt.

(5) Install the shoulder belt buckle and anchor bolt. Connect the wire harness connectors. Tighten the buckle anchor bolt to 41 N·m (30 ft. lbs.) torque.

(6) Position the cover over the anchor bolt.

REAR SHOULDER/LAP BELT/BUCKLE

Inspect the rear shoulder/lap belts and buckles. Replace any belt that is either cut, frayed, torn or damaged in any way. Replace the shoulder belt if the retractor is damaged or inoperative.

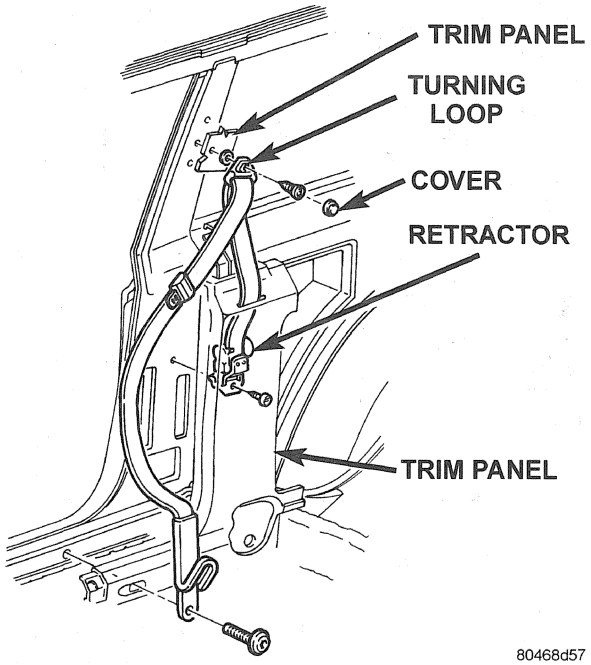


Fig. 103 Front Shoulder Belt—2-Door Vehicles

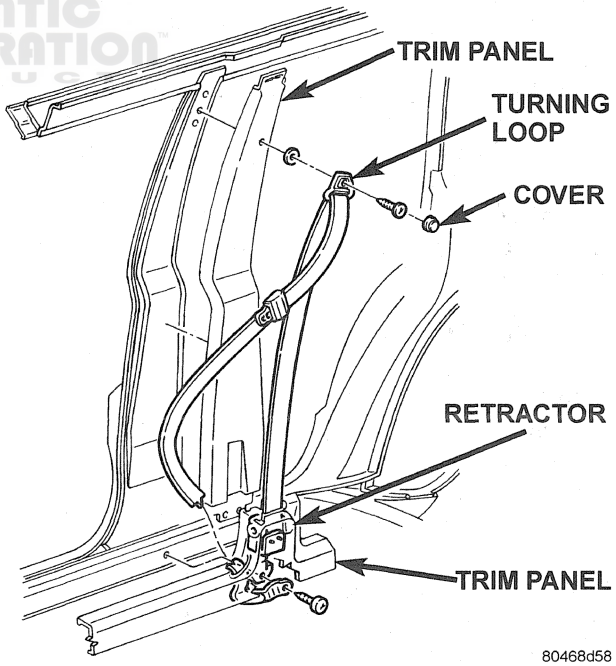


Fig. 104 Front Shoulder Belt—4-Door Vehicles

REMOVAL

(1) Pull the rear seat release strap and tilt the seat cushion forward.

(2) Remove the shoulder belt buckle and lap belt/buckle anchor plate bolts from the floor panel (Fig. 105).

(3) Remove the shoulder belt lower anchor bolt.

(4) Remove the quarter trim panel. If necessary, refer to the removal procedure.

REMOVAL AND INSTALLATION (Continued)

(5) Remove the shoulder belt upper anchor bolt.
(6) Remove the belt retractor support retaining screw from the rear quarter rail.
(7) Remove the retractor and shoulder belt from the trim panel.

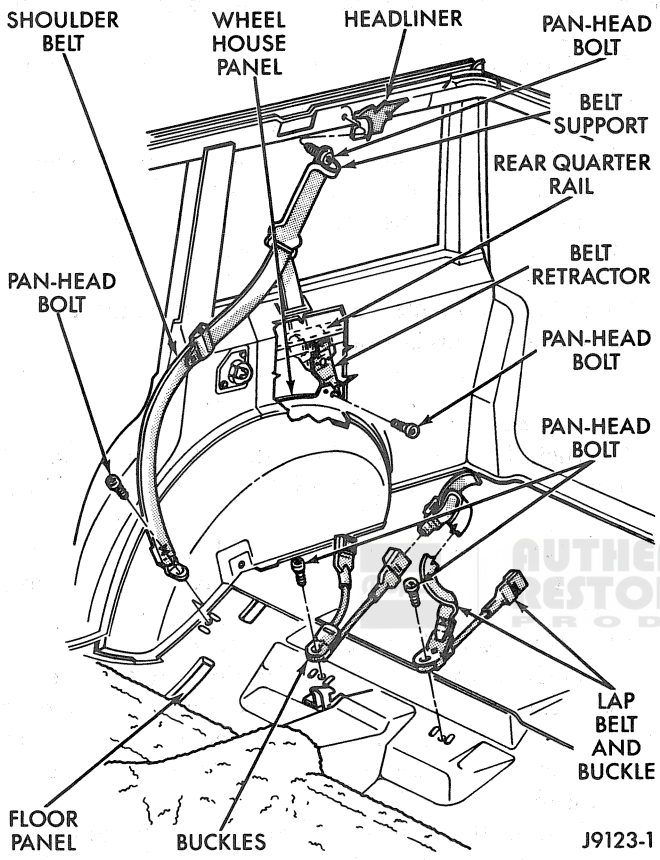


Fig. 105 Rear Seat Shoulder/Lap Belts and Buckles

INSTALLATION

(1) Position the shoulder belt buckle and the lap belt/buckle anchor plates on the floor panel.
(2) Install the anchor bolts. Tighten the bolts to 37 N·m (27 ft. lbs.) torque.
(3) Position the shoulder belt at the roof rail and install the upper anchor bolt. Tighten the bolt to 37 N·m (27 ft. lbs.) torque.
(4) Route the shoulder belt through the quarter trim panel slot. Install the retractor support on the rear quarter rail. Tighten the screw to 5 N·m (45 in. lbs.) torque.
(5) Install the quarter trim panel.
(6) Install the shoulder belt lower anchor bolt. Tighten the bolt to 37 N·m (27 ft. lbs.) torque.
(7) Return the rear seat cushion to the normal position and engage the latch.

BUCKET SEAT

REMOVAL

Bucket seat platforms are attached to the floor panel with bolts (Fig. 106).

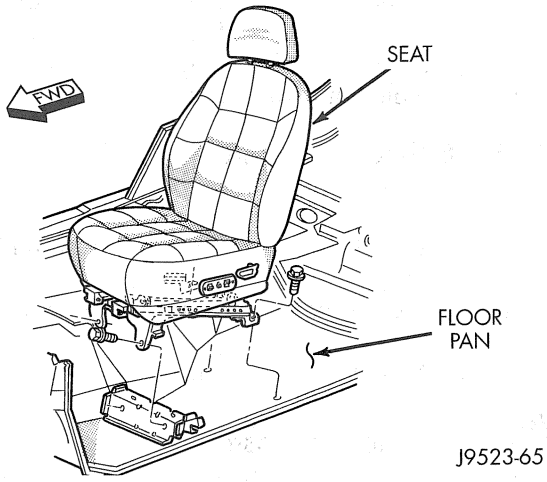


Fig. 106 Bucket Seat—Power Seat

(1) Remove seat frame bolts.
(2) For power seat, disconnect wire harness connector.
(3) Separate seat from floor panel.

INSTALLATION

(1) Position seat on floor panel.
(2) Install seat frame bolts. Tighten to 32 N·m (24 ft-lbs) torque.
(3) For power seats, connect wire harness connector.

MINI-FLOOR CONSOLE

REMOVAL

(1) Remove the transmission shift lever handle/knob. For vehicles with automatic transmissions, remove shift handle by pulling handle upward.
(2) For vehicles with a manual transmission, loosen the locknut and un-thread the shift knob from the shaft.
(3) Remove the automatic transmission and transfer case shift indicator bezel by prying upward to release them.
(4) Disconnect the lamp socket from the bezel.
(5) Remove the console retaining screws.
(6) Disconnect the wire harness connector.
(7) Remove the mini-console from the transmission tunnel.

INSTALLATION

(1) Position the mini-console on the transmission tunnel, connect the wire harness connector and

REMOVAL AND INSTALLATION (Continued)

install the retaining screws. Tighten the screws to 1 N·m (13 in. lbs.) torque.

(2) Position the shift indicator bezel at the console and connect the lamp socket to the bezel. Install the bezel in the console.

(3) Install the shift lever handle/knob. For automatic transmissions, push the handle downward until it is engaged. For manual transmissions, thread the knob onto the shaft and tighten the locknut.

PARKING BRAKE HANDLE COVER

REMOVAL

(1) Detach the rear of the cover from the base and pivot it upward (Fig. 107).

(2) Remove the retaining screws from the cover base.

(3) Remove the trim cover from the from the floor.

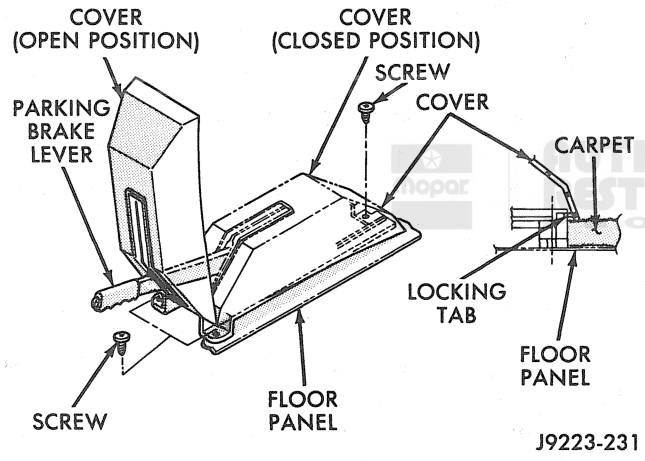


Fig. 107 Park Brake Cover With Mini-Console

INSTALLATION

(1) Position the cover on the floor and install the retaining screws.

(2) Pivot the cover to the closed position and engage the locking tab.

FULL FLOOR CONSOLE

REMOVAL

(1) Remove the transmission shift lever handle/knob. For automatic transmissions, pull the handle straight upward to remove it. For manual transmissions, loosen the locknut and un-thread the shift knob from the shaft.

(2) Remove the automatic transmission shift indicator bezel (Fig. 108). Remove the transfer case shift indicator bezel (if equipped) or cover plate from the console.

(3) If equipped, insert a thin-blade tool under the edge of the outside mirror remote control switch and pry outward to detach it from the console. Disconnect the wire harness connector from the switch (Fig. 109).

(4) Remove the cover retaining screws and remove the cover from the console.

(5) Remove the remainder of the console attaching screws from the brackets and disconnect the wire harness connector.

(6) Separate the console floor air duct from the air outlet duct.

(7) Remove the console and air duct from the floor.

(8) Separate the floor air duct from the console.

(9) Remove the retaining screws and detach the floor duct from the heater housing, if necessary.

(10) Remove the console support brackets.

NOTE: The brackets are attached directly to the floor panel below the carpet.

INSTALLATION

(1) Install the console support brackets, if removed. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(2) Attach the floor duct to the heater housing, if removed. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(3) Attach the air duct to the console.

(4) Position the console on the floor, attach the air duct to the air outlet duct, connect the wire harness connector and install the console retaining screws in the brackets. Tighten the screws to 1 N·m (11 in. lbs.) torque.

(5) Install the console cover and shift indicator bezels (or cover plate). Tighten the screws to 1 N·m (11 in. lbs.) torque.

(6) If equipped:

- Connect the wire harness connector to the outside mirror remote control switch.
- Insert the switch into the console hole.
- Push inward to engage the retaining clips.

(7) Install the shift lever handle/knob.

REAR SEAT CUSHION

REMOVAL

(1) Disengage the seat cushion at the rear by pulling upward on the release strap (Fig. 110).

(2) Tilt the seat cushion forward.

(3) Disengage the seat cushion latch with the release lever. Separate the right side latch and then the left side seat bracket from the floor anchor bolts, and remove the cushion from the vehicle (Fig. 111).

INSTALLATION

(1) Position the seat cushion in the vehicle.

(2) Insert the left pivot in the anchor grommet.

REMOVAL AND INSTALLATION (Continued)

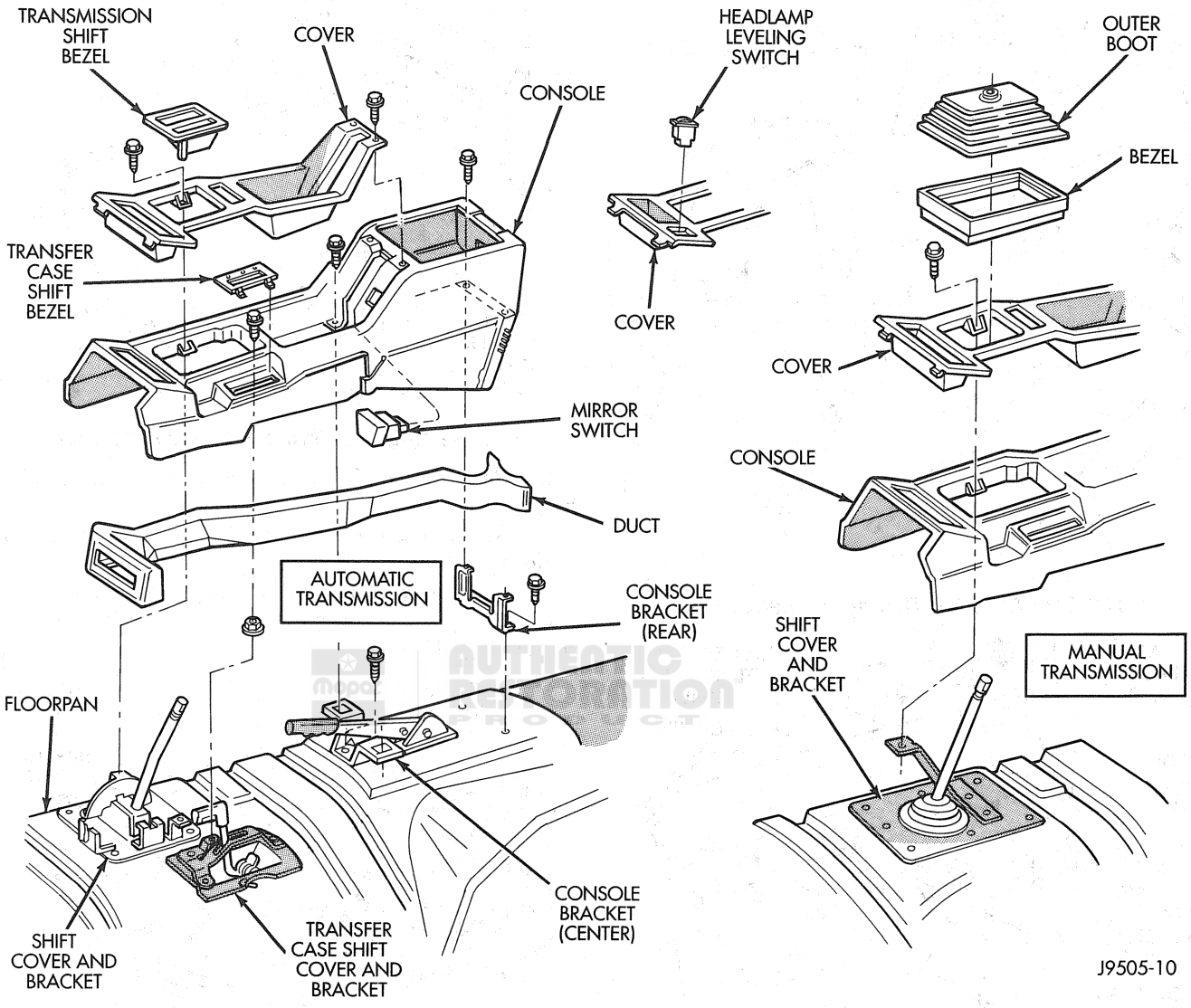


Fig. 108 Full Console

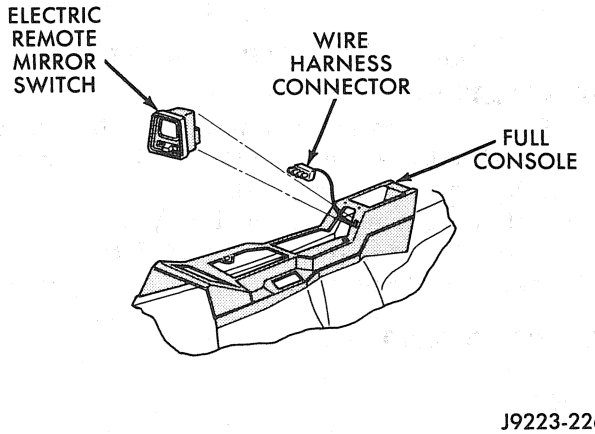


Fig. 109 Outside Mirror Remote Control Switch

(3) Force the right side latch onto the anchor bolt and pivot the seat cushion to the horizontal position.

(4) Lock the seat cushion in-place by pressing firmly on the center of the cushion until the latch engages.

REAR SEATBACK

REMOVAL

(1) Disengage the seat cushion at the rear by pulling upward on the release strap.

(2) Tilt the seat cushion forward.

(3) Remove the shoulder/lap belt buckles from the elastic straps.

(4) Release the seatback latch from the striker.

(5) Remove the pivot bolts and the washers from the wheelhouse panel anchors (Fig. 112).

(6) Tilt the seatback forward, lift it upward and remove it from the vehicle.

REMOVAL AND INSTALLATION (Continued)

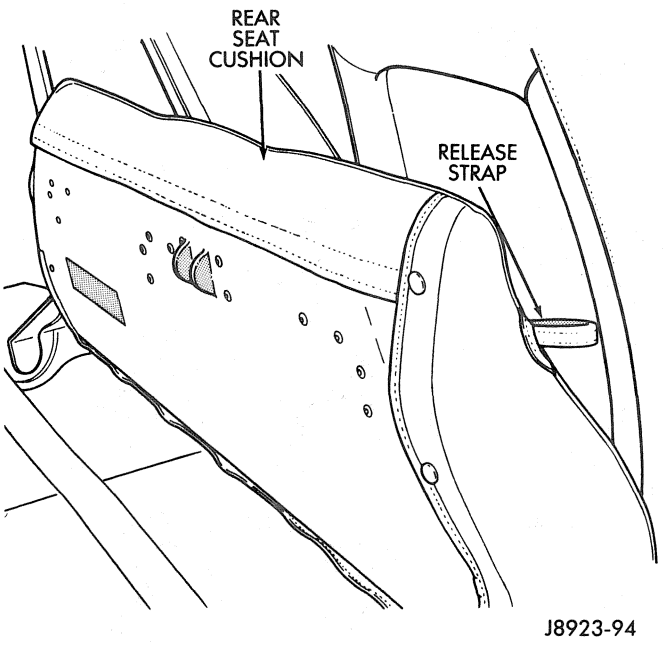


Fig. 110 Seat Cushion Disengagement At Rear

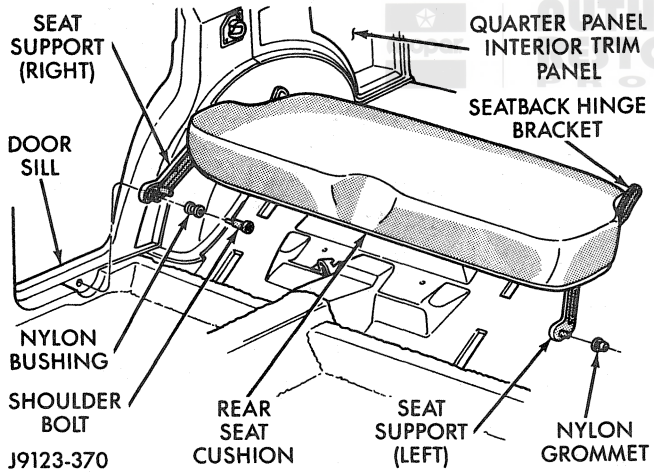


Fig. 111 Rear Seat Cushion Removal/Installation

INSTALLATION

(1) Position the seatback in the vehicle.

(2) Install the pivot bolts and the washer—right side only. Tighten the bolts with 45 N·m (33 ft. lbs.) torque.

(3) Engage the seatback latch with the striker.

(4) Insert the shoulder/lap belt buckles in the elastic straps.

(5) Pivot the seat cushion to the horizontal position and lock the it in-place by pressing firmly on the center of the cushion until the latch engages.

FRONT CARPET/MAT

REMOVAL

(1) Remove the door sill inner scuff plates.

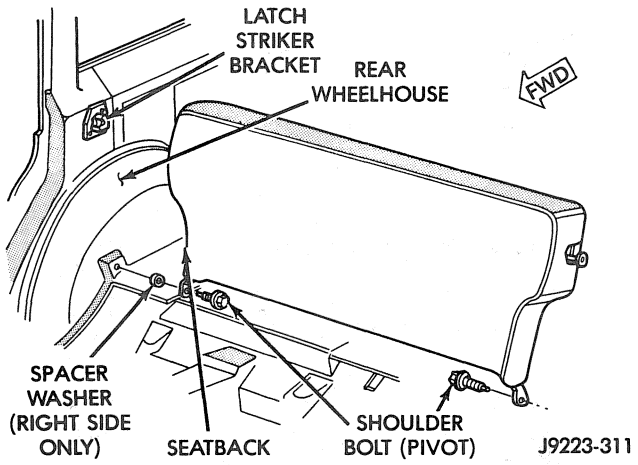


Fig. 112 Rear Seatback Removal/Installation

(2) Remove the front and rear seats (as applicable).

(3) As necessary, remove the trim panels and moldings.

(4) Remove all other interfering components.

(5) Remove the carpet and mat from the floor panel (Fig. 113).

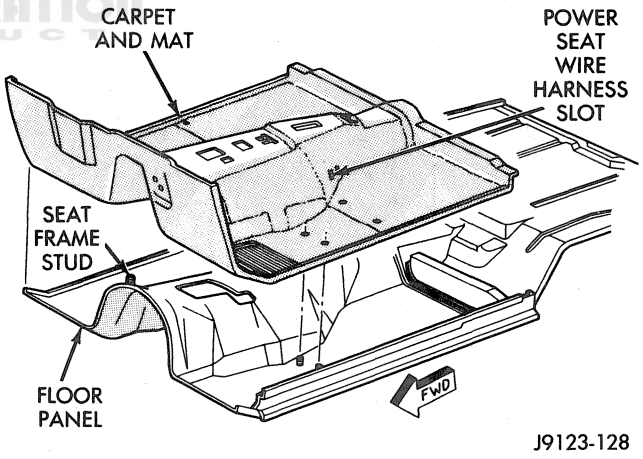


Fig. 113 Front Carpet and Mat

INSTALLATION

(1) Position the carpet and mat on the floor panel.

(2) Install all the components that were removed to facilitate carpet/mat removal.

(3) Install the trim panels and moldings.

(4) Install the door sill inner scuff plates.

(5) Install the front and rear seats (as applicable).

REAR CARPET/MAT

REMOVAL

(1) Remove the liftgate latch striker and scuff plate (Fig. 114).

(2) Drill-out the retaining rivet heads and remove the cargo tie-down footman loops from the carpet.

REMOVAL AND INSTALLATION (Continued)

(3) As necessary, remove the trim panels and moldings.

(4) Remove the all other interfering components.

(5) Remove the carpet and mat from the floor panel.

(6) If necessary, remove the skid strips from the carpet (Fig. 115).

(7) If necessary, remove the insulation from the wheelhouse (Fig. 116).

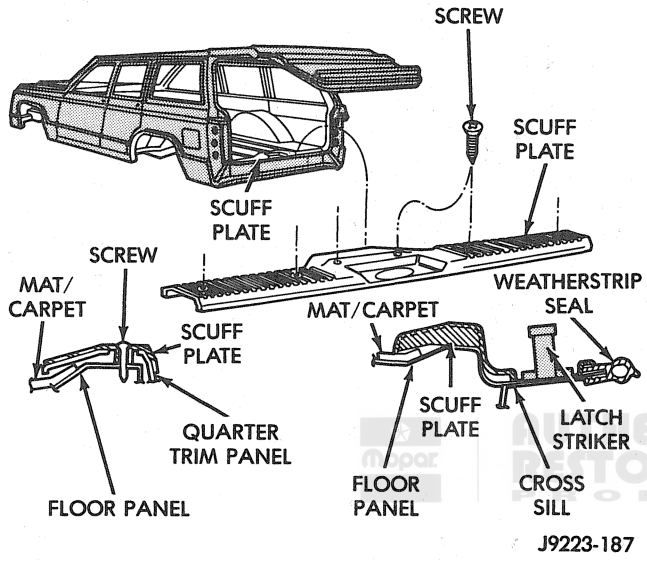


Fig. 114 Liftgate Latch Striker and Scuff Plate

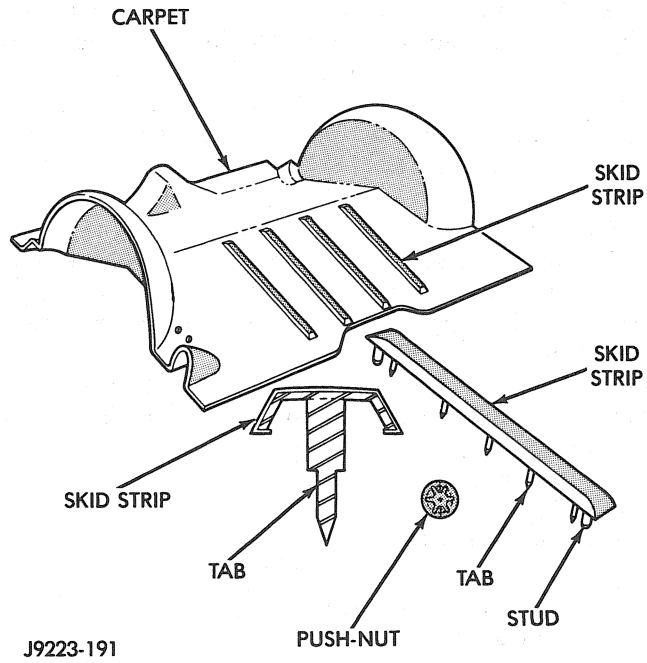


Fig. 115 Rear Carpet Skid Strips

INSTALLATION

(1) If removed, install the skid strips on the carpet.

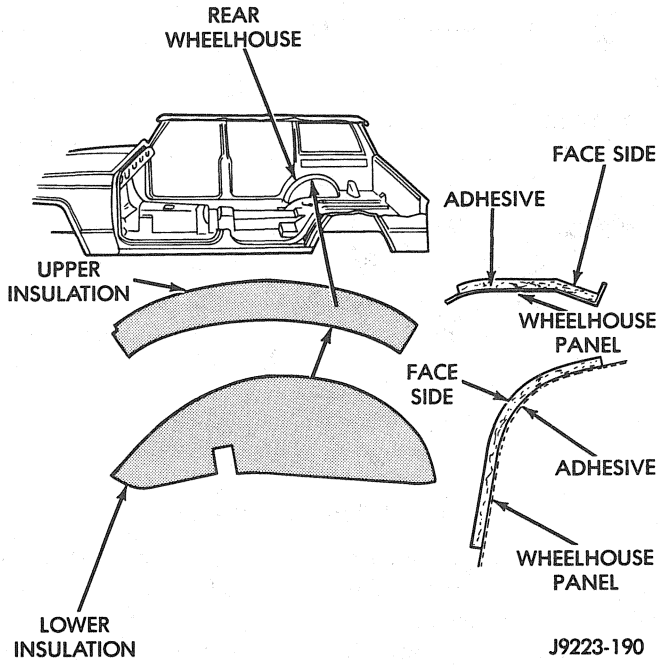


Fig. 116 Wheelhouse Insulation

(2) If removed, install the insulation on the wheelhouses.

(3) Position the mat on the floor panel.

(4) Position the carpet on the mat.

(5) Install all the components that were removed to facilitate carpet and mat removal.

(6) Install the trim panels and moldings.

(7) Install the cargo tie-down footman loops on the carpet with replacement rivets.

(8) Install the liftgate scuff plate and latch striker.

REARVIEW MIRROR

REMOVAL

(1) Loosen the mirror base setscrew (Fig. 117).

(2) Slide the mirror base upward and off the bracket.

INSTALLATION

(1) Position the mirror base at the bracket and slide it downward onto the support bracket.

(2) Tighten the setscrew securely.

REARVIEW MIRROR SUPPORT BRACKET

INSTALLATION

(1) Mark the position for the mirror bracket on the outside of the windshield glass with a wax pencil.

(2) Clean the bracket contact area on the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Final clean the glass with a paper dampened with alcohol.

REMOVAL AND INSTALLATION (Continued)

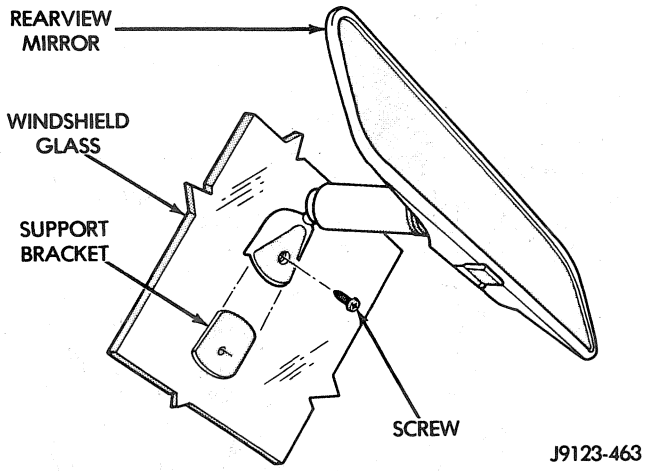


Fig. 117 Rearview Mirror

(3) Sand the surface on the support bracket with fine grit sandpaper. Wipe the bracket surface clean with a paper towel.

(4) Apply accelerator to the surface on the bracket according to the following instructions:

- Crush the vial to saturate the felt applicator.
- Remove the paper sleeve.
- Apply accelerator to the contact surface on the bracket.
- Allow the accelerator to dry for five minutes.
- Do not touch the bracket contact surface after the accelerator has been applied.

(5) Apply adhesive accelerator to the bracket contact surface on the windshield glass. Allow the accelerator to dry for one minute. Do not touch the glass contact surface after the accelerator has been applied.

(6) Install the bracket according to the following instructions:

- Apply one drop of adhesive at the center of the bracket contact surface on the windshield glass.
- Apply an even coat of adhesive to the contact surface on the bracket.
- Align the bracket with the marked position on the windshield glass.
- Press and hold the bracket in place for at least one minute.

NOTE: Verify that the mirror support bracket is correctly aligned because the adhesive will cure rapidly.

(7) Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.

(8) Allow the adhesive to cure for an additional 8-10 minutes before installing the mirror.

SUNVISORS

REMOVAL

(1) Remove the screws that attach the sunvisor arm support bracket to the headliner and the roof panel (Fig. 118).

(2) Detach the sunvisor from the support clip.

(3) Remove the sunvisor from the vehicle.

(4) Remove the retaining screw and support clip.

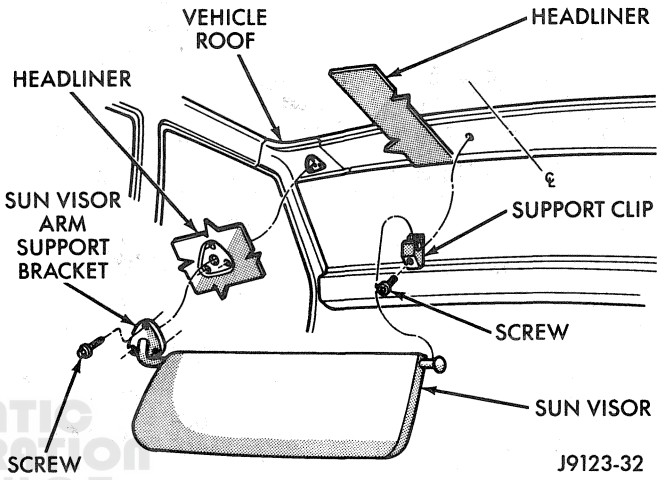


Fig. 118 Sunvisor Removal/Installation

INSTALLATION

(1) Install the support bracket and the retaining screw. Tighten the screw to 1 N·m (9 in. lbs.) torque.

(2) Position the sunvisor in the support clip and align the arm support bracket holes with the headliner holes.

(3) Install the screws that attach the sunvisor arm support bracket to the headliner and the roof panel. Tighten the screws to 4 N·m (35 in. lbs.) torque.

HEADLINER

The upper trim moldings and the headliner are attached to the roof rail with a combination of screws, velcro strips, clip retainers and rail retainers (Fig. 119).

To remove a headliner, all of the upper trim moldings must be removed from the perimeter of the headliner along with (as applicable):

- Assist handles.
- Sunvisors.
- Dome/cargo lamps.
- Overhead console.
- Keyless entry receiver module.
- Sound bar.
- All other attached/overlapping components.

Refer to the appropriate removal and installation procedure locate in this section or in Group 8, Electrical.

REMOVAL AND INSTALLATION (Continued)

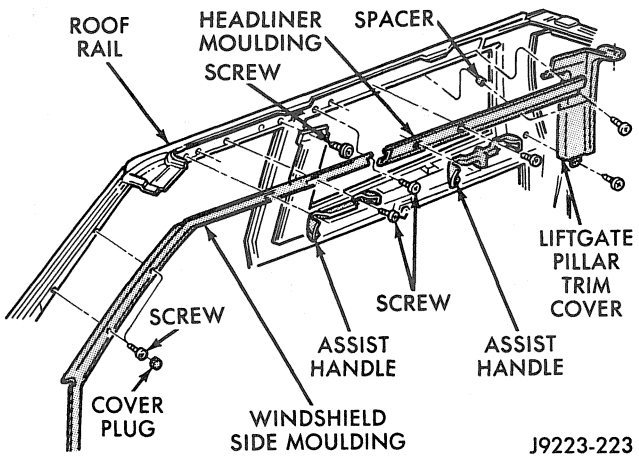


Fig. 119 Headliner Trim Moldings

REMOVAL

CAUTION: The headliner is a one-piece, molded component. It has limited flexibility and must not be bent during removal/installation.

(1) Remove the upper trim moldings from the perimeter of the headliner (Fig. 120).

(2) Ensure that all the retainer clips, screws and Velcro strips are disengaged before removing the headliner.

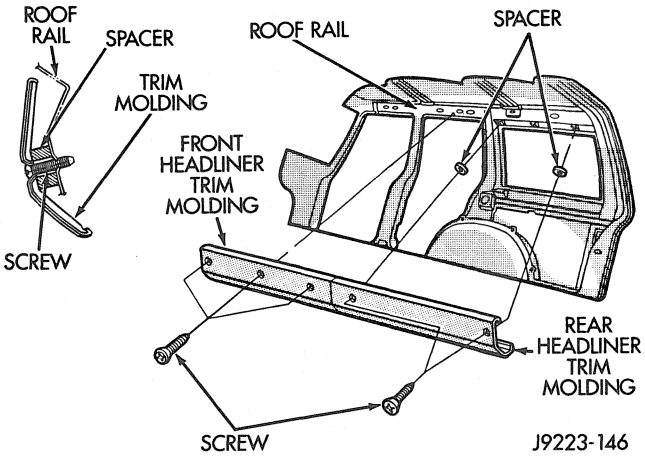


Fig. 120 Upper Trim Molding—4-Door

INSTALLATION

(1) When installing a headliner, ensure that the retainer clips and rails are installed (Fig. 121).

(2) Install the upper trim moldings around the perimeter of the headliner. Tighten the retaining screws to 1 N·m (11 in. lbs.) torque.

(3) As applicable, install:

- Assist handles.
- Sunvisors.
- Dome/cargo lamps.
- Overhead console.
- Keyless entry receiver module.
- Sound bar.
- All other attached/overlapping components.

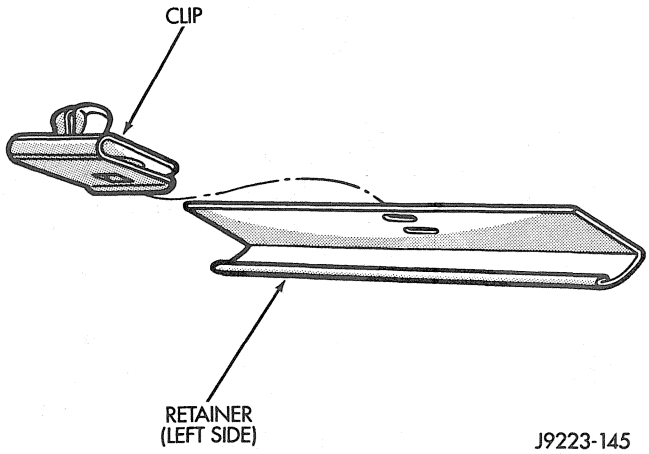


Fig. 121 Headliner Retainer Clip and Retainer Rail

LIFTGATE TRIM PANEL

REMOVAL

(1) Remove the screws that attach the liftgate trim panel upper sides to the liftgate.

(2) Use a trim stick to detach the panel retainers from the liftgate.

(3) Remove the trim panel from the liftgate.

INSTALLATION

(1) Position the trim panel on liftgate.

(2) Align the trim panel retainers with the holes in the liftgate inner panel and force the trim panel inward.

(3) Install the screws to attach the liftgate trim panel upper sides to the liftgate.

LIFTGATE

REMOVAL

WARNING: DO NOT DISCONNECT THE SUPPORT ROD CYLINDERS WITH THE LIFTGATE CLOSED. THE SUPPORT ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS. THIS COULD CAUSE DAMAGE AND/OR PERSONAL INJURY IF THEY ARE REMOVED WHILE PISTONS ARE COMPRESSED.

(1) Open the liftgate.

(2) Remove the liftgate trim panel (Fig. 122).

(3) Remove the retainer clips that secure the support rod cylinders to the ball studs (Fig. 123).

(4) Remove the support rod cylinders from the ball studs.

(5) Remove the screws and the wire harness trim cover from the liftgate header (Fig. 124).

REMOVAL AND INSTALLATION (Continued)

(6) Disconnect the connectors and remove the wire harness from the liftgate.
(7) Remove the hinge-to-liftgate screws.
(8) Remove the liftgate from the vehicle.

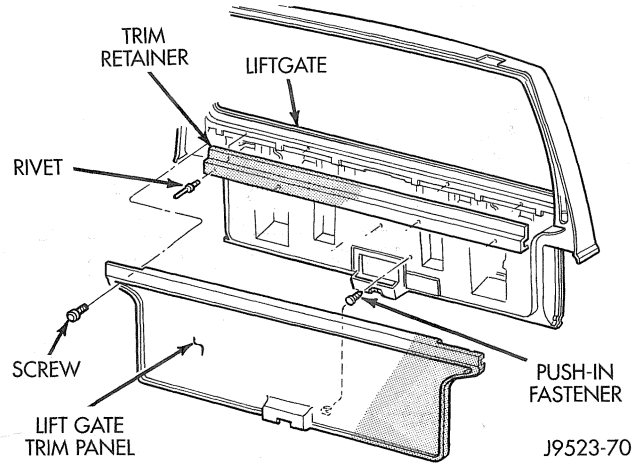


Fig. 122 Liftgate Trim Panel

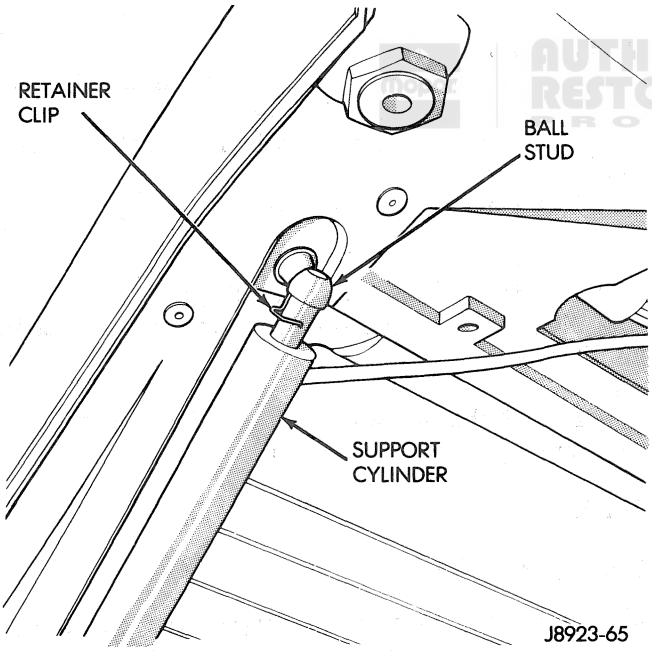


Fig. 123 Support Rod Retainer Clip

INSTALLATION

(1) Position and support the liftgate at the opening in the body and install the hinge-to-liftgate screws.
(2) Adjust the liftgate to fit properly in the body opening. Refer to Liftgate Adjustment.
(3) Tighten the hinge-to-liftgate screws to 9 N·m (7 ft-lbs) torque.
(4) Connect the liftgate rod cylinders to the ball studs and install the rod cylinder retainer clips.
(5) Insert and connect the wire harness connectors.

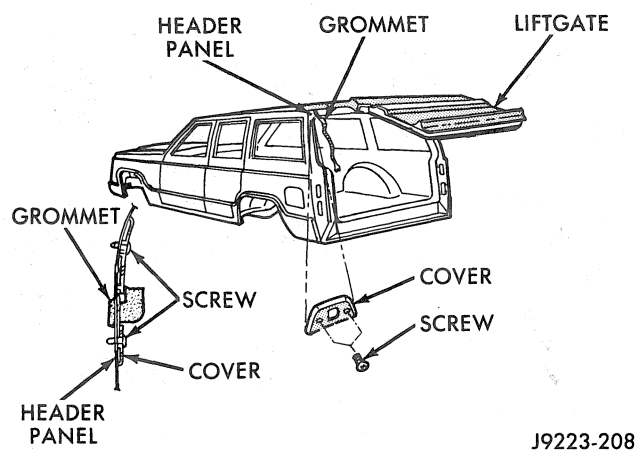


Fig. 124 Liftgate Wire Harness Trim Cover

(6) Position the wire harness trim cover on the header and install the screws. Tighten the screws to 1 N·m (11 in-lbs) torque.
(7) Install the trim panel.

LIFTGATE HINGE

REMOVAL

It is not necessary to remove the liftgate to replace one or both hinges.
(1) Remove the liftgate (headliner) upper trim molding.
(2) Remove the hinge-to-roof panel nuts (Fig. 125).
(3) Remove the hinge-to-liftgate screws and remove the hinge from the liftgate (Fig. 126).

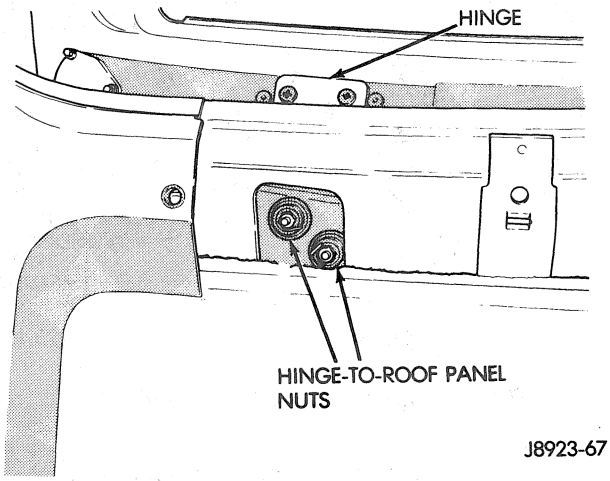


Fig. 125 Liftgate Hinge-To-Roof Panel Nuts

INSTALLATION

(1) Position the gaskets, shim and hinge on the liftgate and the roof panel (Fig. 127).
(2) Install and tighten hinge-to-roof panel nuts to 9 N·m (7 ft-lbs) torque.
(3) Install the liftgate-to-hinge screws. Tighten screws to 9 N·m (7 ft-lbs) torque.

REMOVAL AND INSTALLATION (Continued)

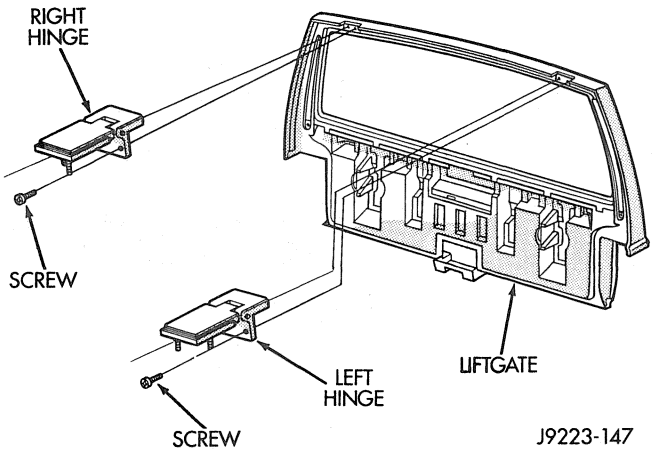


Fig. 126 Liftgate Hinges

(4) Install the liftgate (headliner) upper trim molding.

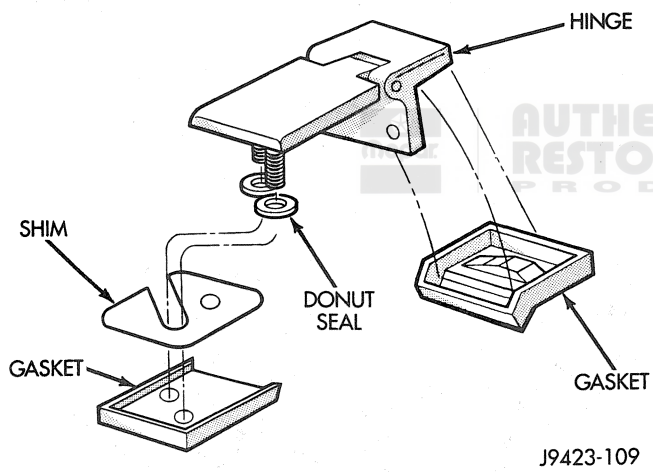


Fig. 127 Liftgate Hinge, Gaskets and Shim

LIFTGATE SUPPORT ROD CYLINDER

REMOVAL

WARNING: DO NOT REMOVE A SUPPORT ROD CYLINDER WITH THE LIFTGATE CLOSED. EACH SUPPORT ROD PISTON IS OPERATED BY HIGH PRESSURE GAS. IT CAN CAUSE DAMAGE AND/OR PERSONAL INJURY IF IT IS REMOVED WITH THE PISTON COMPRESSED. DO NOT ATTEMPT TO DISASSEMBLE OR REPAIR A SUPPORT ROD CYLINDER.

(1) Open the liftgate.
(2) Support the liftgate in the open position.
(3) Remove the clips that attach the support rod and cylinder to the ball studs (Fig. 128).
(4) Disconnect the support rod and cylinder from the ball studs and remove the cylinder from vehicle.

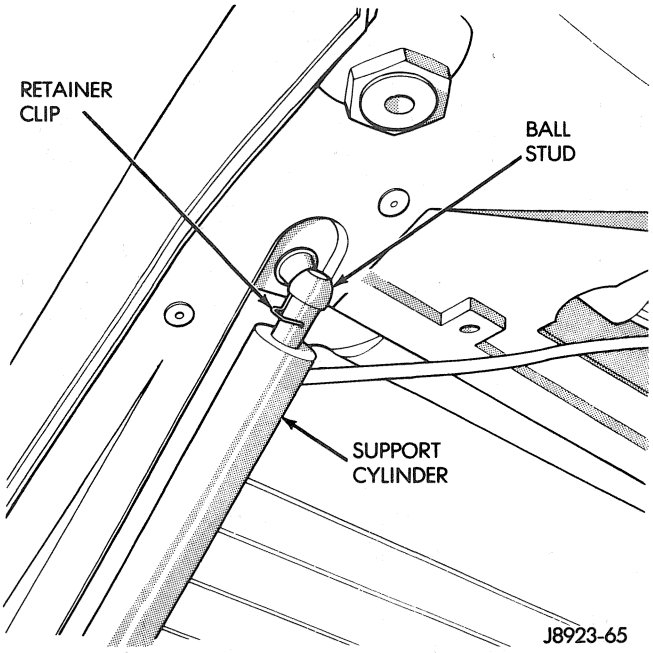


Fig. 128 Support Rod Retainer Clip

INSTALLATION

(1) Connect the replacement support rod and cylinder to the ball studs.
(2) Secure the support rod and cylinder to the ball studs with the retainer clips.
(3) Remove the support from the liftgate and test the operation of the support rod.

LIFTGATE SUPPORT ROD BALL STUD

REMOVAL

(1) Open the liftgate.
(2) Support the liftgate in the open position.
(3) Remove the retainer clip that attaches the support rod and cylinder to the ball stud.
(4) Disconnect the support rod from the ball stud.
(5) Remove the ball stud from the liftgate with a T-30 Torx-head socket wrench (Fig. 129).

INSTALLATION

(1) Install the replacement ball stud in the liftgate with a T-30 Torx-head socket wrench. Tighten the ball stud to 7 N·m (62 in-lbs) torque.
(2) Connect the support rod to the ball stud.
(3) Secure the support rod to the ball stud with the clip.
(4) Remove the support from the liftgate and test the operation of support rod.

LIFTGATE OUTSIDE HANDLE

The outside handle is incorporated in the liftgate lock cylinder. Refer to the Liftgate Lock Cylinder Removal/Installation procedure for service procedures.

REMOVAL AND INSTALLATION (Continued)

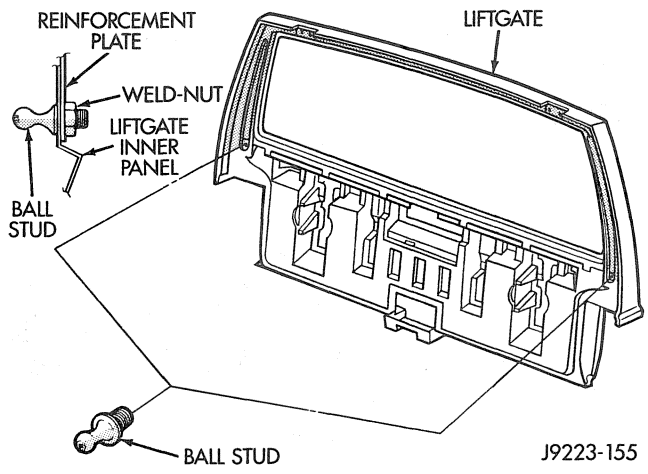


Fig. 129 Support Rod Ball Studs

LIFTGATE LOCK CYLINDER

REMOVAL

(1) Raise the liftgate and remove liftgate trim panel.

(2) Remove the lock cylinder retainer clip (Fig. 130).

(3) Remove the key lock cylinder.

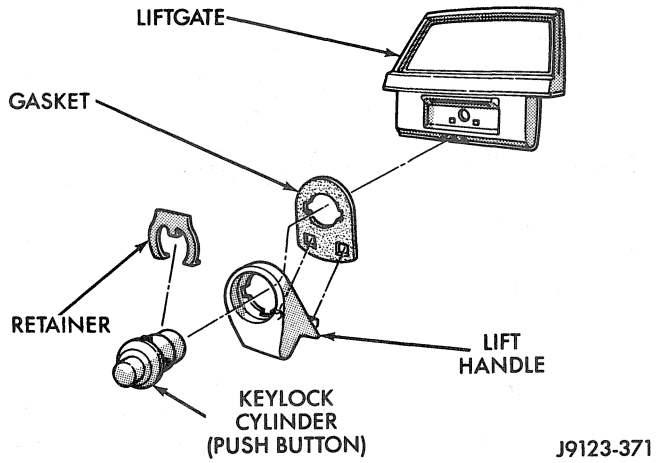


Fig. 130 Liftgate Lock Cylinder

INSTALLATION

(1) Position the lock cylinder in the liftgate.

(2) Secure the lock cylinder with the retainer clip.

(3) Install the liftgate trim panel.

LIFTGATE LATCH

REMOVAL

(1) Raise the liftgate and remove the trim panel.

(2) Remove the latch screws (Fig. 131).

(3) Disconnect the rod from the latch (Fig. 132).

(4) Remove the latch from the liftgate.

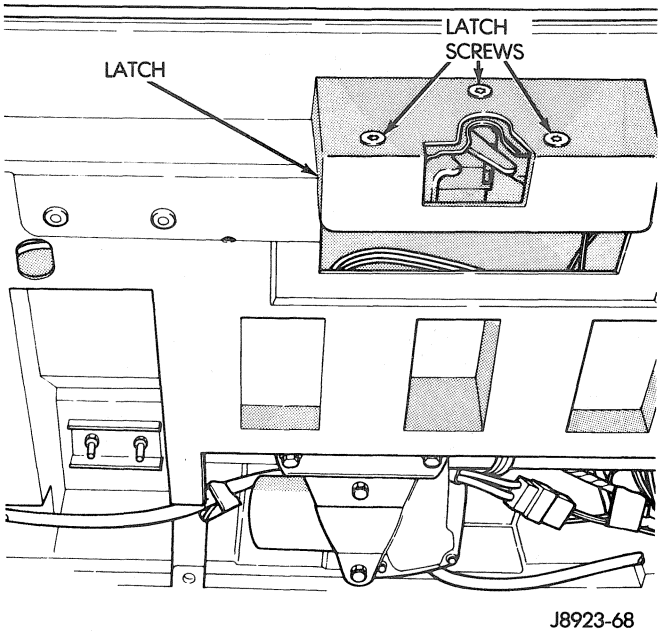


Fig. 131 Liftgate Latch Screws

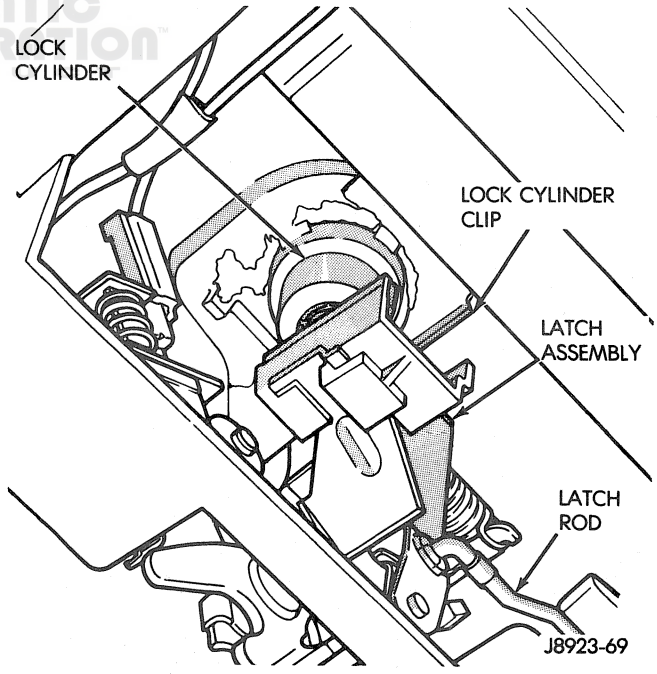


Fig. 132 Latch and Key Lock Cylinder

INSTALLATION

(1) Position the latch in the liftgate.

(2) Connect the latch rod.

(3) Install and tighten the latch screws to 12 N·m (110 in-lbs) torque.

(4) Install liftgate trim panel.

REMOVAL AND INSTALLATION (Continued)

LIFTGATE LATCH STRIKER

REMOVAL

(1) Remove nuts attaching striker to floor pan (Fig. 133).

(2) Separate striker from vehicle.

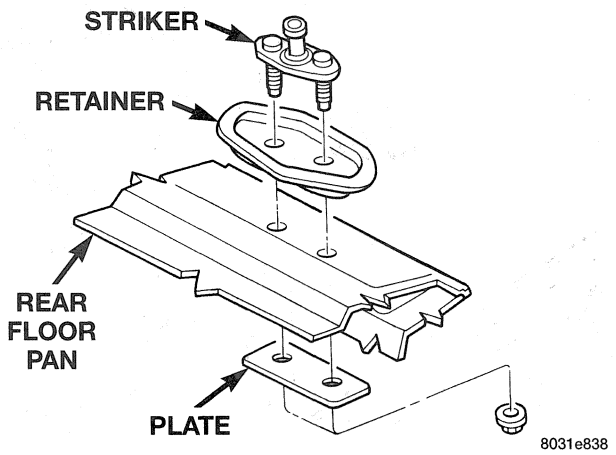


Fig. 133 Liftgagte Striker

INSTALLATION

(1) Position striker on vehicle.

(2) Install nuts. Tighten nuts to 16 N·m (22 ft. lbs.) torque.

LIFTGATE WEATHERSTRIP

REMOVAL

(1) Pull the seal away from the flange around the perimeter of liftgate opening and remove it.

(2) Clean the flange as necessary.

INSTALLATION

(1) Position weatherstrip seal in the opening with the left end of the seal at the opening centerline. Install the seal in a clockwise direction.

(2) Move to the left and mate the seal with the bottom-left flange (Fig. 134).

(3) Move upward and mate the seal with the left-side flange.

(4) Move to the right and mate the seal with the top-left roof flange.

(5) Seat the installed part of the seal with a roller. Move the roller from the left-bottom end of seal to the top-left half of the seal.

(6) Move to the right and mate the seal with the top-right roof flange.

(7) Move downward and mate the seal with the right-side flange.

(8) Move to the left and mate the seal with the bottom-right flange.

(9) Center and butt seal the ends together at the centerline.

(10) Seat the remaining part of the seal with a roller. Move the roller the from top-left half of the seal to the right-bottom end of the seal.

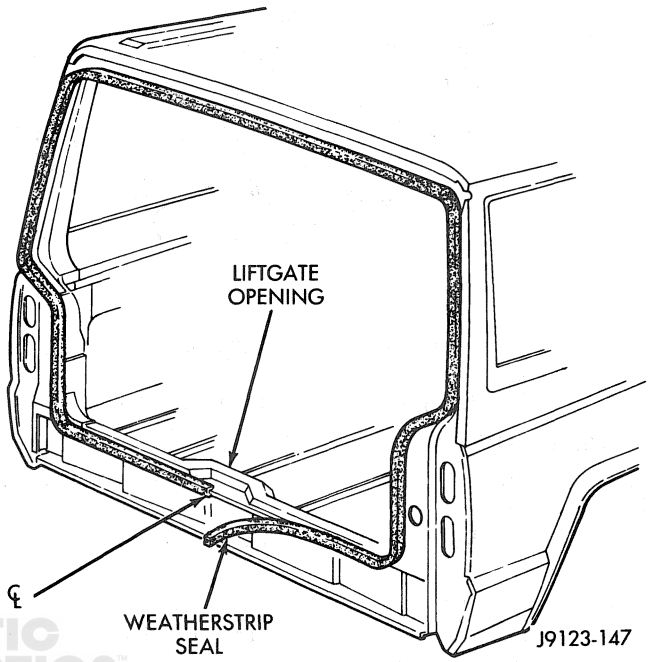


Fig. 134 Liftgate Weatherstrip Installation

REAR WHEELHOUSE FLARES AND LINERS

REMOVAL

(1) Remove the flare and liner lower screws (Fig. 135).

(2) Remove the nuts that attach the liner to the wheelhouse.

(3) Remove the liner from the wheelhouse.

(4) Remove the push-nuts that attach the flare retainers to the wheelhouse (Fig. 136).

(5) Remove the flare and retainers from the wheelhouse.

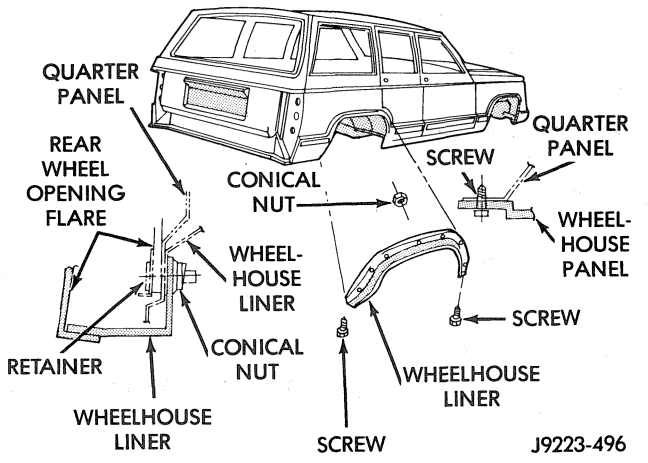


Fig. 135 Rear Wheelhouse Liner

REMOVAL AND INSTALLATION (Continued)

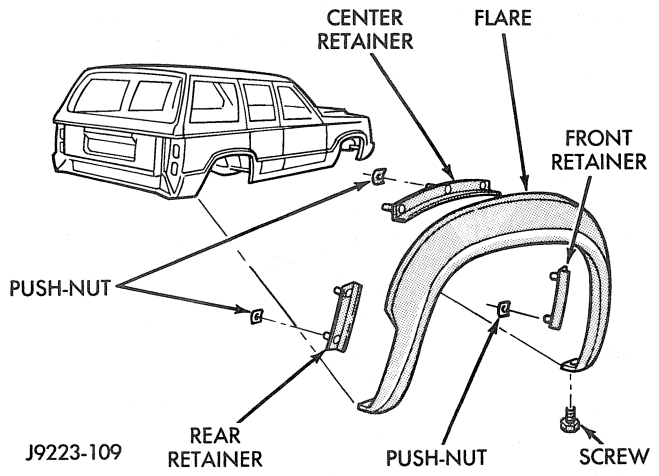


Fig. 136 Rear Wheel Opening Flare

INSTALLATION

(1) Position the flare and retainers at the wheelhouse.

(2) Install the push-nuts to attach the flare retainers to the wheelhouse.

(3) Position the liner in the wheelhouse.

(4) Install the nuts to attach the liner to the wheelhouse and flare retainers.

(5) Install the flare and liner lower screws. Tighten the screws to 1 N·m (13 in-lbs) torque.

QUARTER VENT WINDOW

REMOVAL

(1) Remove the vent window handle retaining pin and nut (Fig. 137).

(2) Remove the hinge-to-glass screws and remove the window glass. If glass adheres to the hinges, remove the glass by carefully pushing out hinge screw inserts.

INSTALLATION

(1) Position the vent window glass at the hinges and install the screws.

(2) Install the handle, pin and nut.

(3) Test the vent window for water leaks.

QUARTER WINDOW APPLIQUE

REMOVAL

(1) Remove nuts from inside vehicle (Fig. 138).

(2) Using a trim sick or equivalant, carefully pry the applique the from panel.

INSTALLATION

(1) Position the replacement applique the on panel and install the nuts.

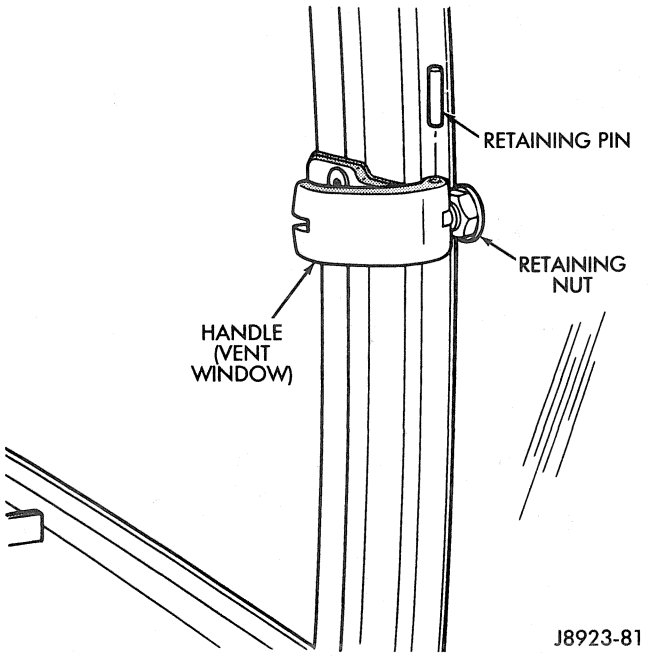


Fig. 137 Vent Window Handle Removal/Installation

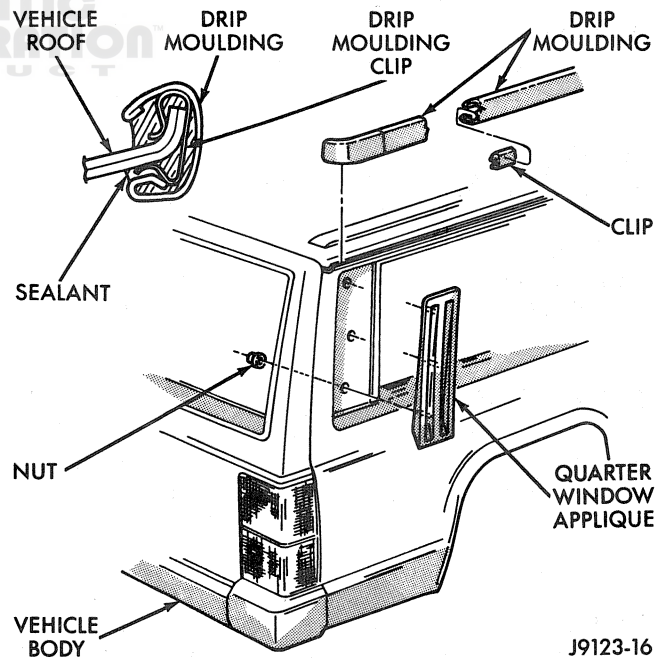


Fig. 138 Quarter Window Applique and Drip Molding

DRIP RAIL MOLDING

REMOVAL

(1) Pry the clips from the roof flange.

(2) Remove the clips and molding from the roof flange (Fig. 138).

(3) Remove the remaining sealant and clean the roof flange.

(1) Pry the clips from the roof flange.

REMOVAL AND INSTALLATION (Continued)

(2) Remove the clips and molding from the roof flange (Fig. 138).
(3) Remove the remaining sealant and clean the roof flange.

INSTALLATION

(1) Position the drip rail molding with clips at the roof flange and force the clips onto the roof flange.
(2) Apply sealant to the inner side of the molding to seal the roof flange.

LUGGAGE RACK

REMOVAL

(1) Remove the slide rail screws (Fig. 139).
(2) Remove the luggage rack from the roof.

NOTE: The skid strips are attached to the roof panel with adhesive.

(3) Loosen each skid strip with a heat gun.
(4) Lift one edge of each skid strip with a putty knife and peel it from the roof panel.
(5) Remove the original adhesive from the roof with an adhesive removal solution.
(6) If the original skid strips are installed, remove all the original adhesive from them.

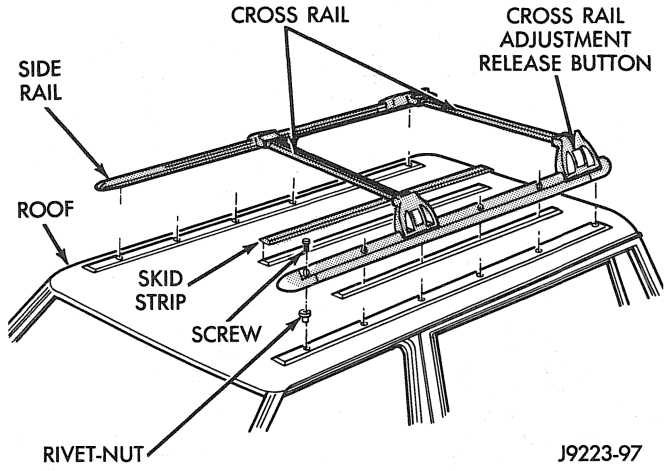


Fig. 139 Luggage Rack

INSTALLATION

(1) Install 3M 06379 double-sided tape, or an equivalent on skid strips.
(2) Remove the backing from the double-sided tape, align each skid strip on the roof, and position it on the roof panel.
(3) Verify that each skid strip is properly aligned.
(4) Press each skid strip onto the roof panel with a roller (or use hand pressure).

NOTE: To prevent water leaks, apply 3M Drip-Chek Sealant, or equivalent.

(5) Position the luggage rack on the roof with the screw holes aligned.
(6) Install and tighten the slide rail screws to 3 N·m (28 in-lbs) torque.

ADJUSTMENTS

HOOD

The hood bolt holes are elongated for fore and aft and side-to-side adjustment.
(1) If hood is low to the cowl panel, insert shims between the hinge and hood at the rear hinge bolts.
(2) Adjust the hood bumper (Fig. 140) in or out to provide proper hood-to-fender height alignment.
(3) Adjust the hood strikers (Fig. 141) with shims as necessary. Tighten the screws to 22 N·m (16 ft-lbs) torque after adjustment.
(4) Align each latch and striker so that the striker enters latch squarely.

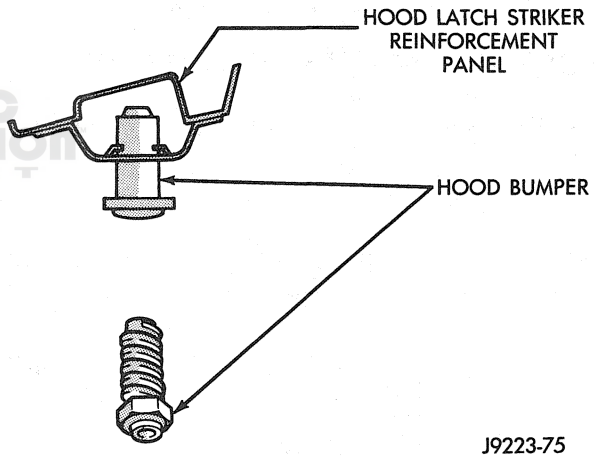


Fig. 140 Hood Bumper

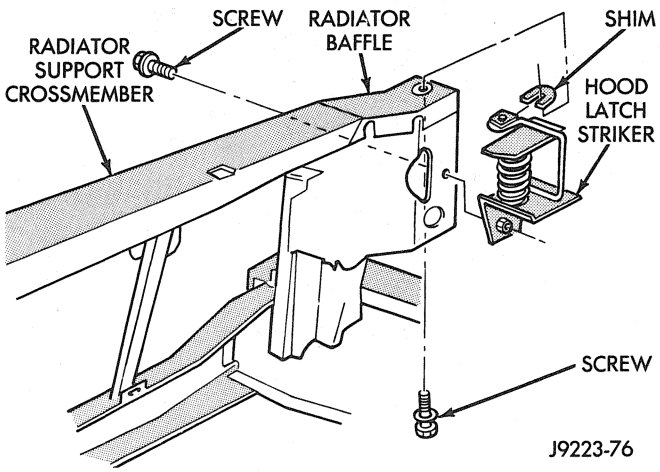


Fig. 141 Hood Latch Striker

ADJUSTMENTS (Continued)

DOOR

IN AND OUT—MINOR ADJUSTMENT

(1) Loosen the latch striker.

(2) Tap the latch striker inward if the door character line is outboard of the body character line or tap the latch striker outward if the door character line is inboard of the body character line.

(3) Inspect alignment. If correct, tighten striker with 71 N·m (52 ft. lbs.) torque.*

UP AND DOWN—MINOR ADJUSTMENT

(1) Loosen the latch striker.

(2) Tap the latch striker downward if the door character line is higher than the body character line or tap the latch striker upward if the door character line is lower than the body character line.

(3) Inspect alignment. If correct, tighten striker with 71 N·m (52 ft. lbs.) torque.*

* The center line of the striker anti-snag tab must be horizontal (plus or minus 6 mm).

ALIGNMENT MAJOR—ADJUSTMENT

Adjustment for alignment of the door is made by installing shims between hinge plates and door face (Fig. 142).

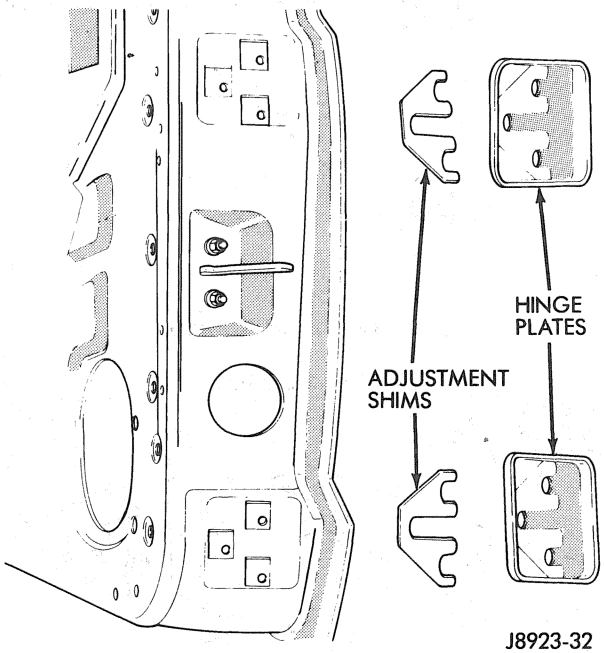


Fig. 142 Door Adjustment Shims

(1) If not loosened, loosen the door hinge bolts.

(2) Add or remove shims as necessary to obtain the best door fit.

(3) Tighten door hinge bolts to 35 N·m (26 ft-lbs) torque after adjustment is completed.

(4) Apply general purpose sealant around the door hinges/door face mating area.

DOOR LATCH ADJUSTMENT

(1) Remove the access hole plug from the latch face (Fig. 143).

(2) Insert a 5/32-inch wrench through the hole and into the latch release lever adjustment screw and loosen.

(3) Press and release the outside door handle latch release button several times.

(4) Release the button and tighten adjustment screw to 3 N·m (30 in-lbs) torque.

(5) Test the release handle button and key lock cylinder for proper latch release.

(6) Install the door waterdam and trim panel.

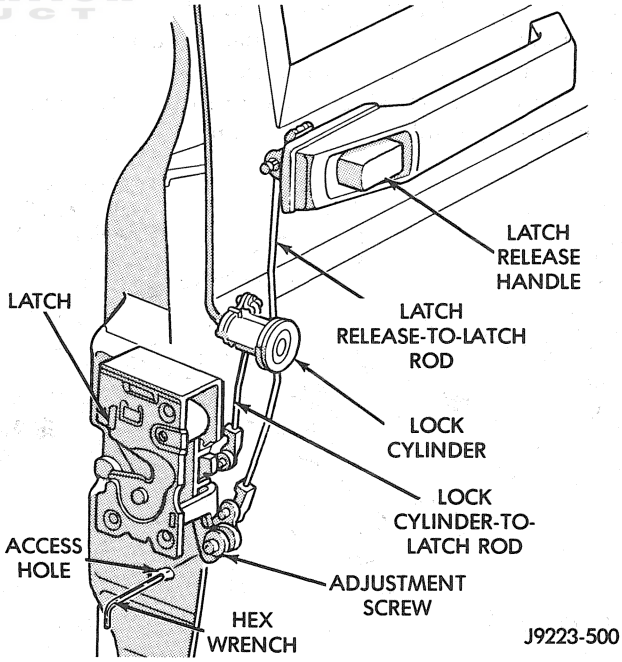


Fig. 143 Door Latch Adjustment

ADJUSTMENTS (Continued)

LIFTGATE

The position of the liftgate can be adjusted upward or downward, and inward or outward by the use of hinge shims. The liftgate stop bumpers must also be adjusted if liftgate hinges are adjusted. The inward/outward position of each stop bumper is adjusted by the use of shims

(1) To move the position of the liftgate inward or outward, remove or add shims between the hinge-halves and liftgate (Fig. 144).

(2) To move the position of the liftgate upward or downward, remove or add shims between the hinge-halves and roof panel.

(3) To move the position of liftgate stop bumpers inward or outward, remove or add shims between the stop bumper screws and anchors.

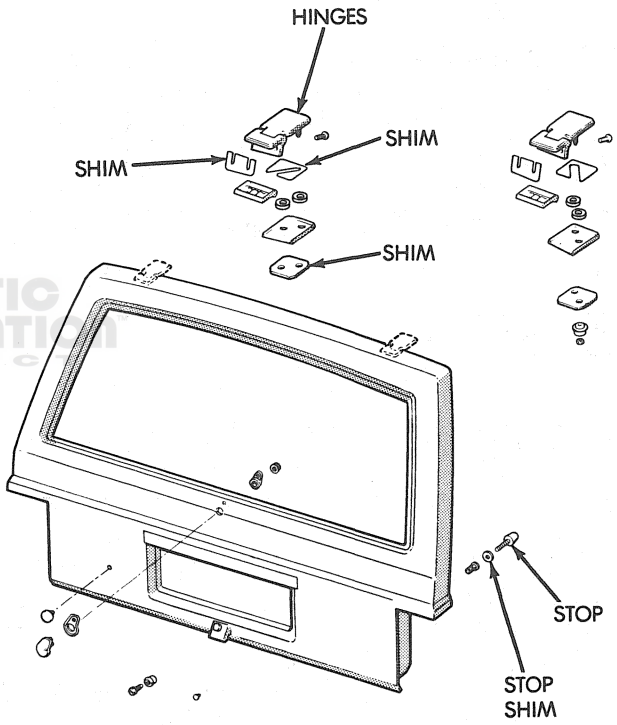


Fig. 144 Liftgate Adjustment Shims

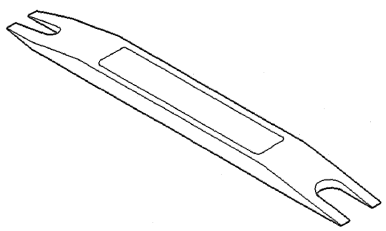
SPECIFICATIONS

BODY LUBRICANTS

COMPONENT	SERVICE INTERVAL	LUBRICANT
Door Latches	As Required	Multi-Purpose Grease NLGI GC-LB (Water Resistant) (1)
Hood Latch, Release Mechanism & Safety Latch	As Required (When Performing Other Underhood Service)	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Hood Hinges	As Required	Engine Oil
Seat Track & Release Mechanism	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Liftgate Hinge	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Liftgate Support Arms	As Required	Engine Oil
Liftgate Latches	As Required	White Spray Lubricant (3)
Liftgate Release Handle (Pivot & Slide Contact Surfaces)	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Window System Components	As Required	White Spray Lubricant (3)
Lock Cylinders	Twice A Year	Lock Cylinder Lubricant (4)
Parking Brake Mechanism	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (1)
1 = Mopar Wheel Bearing Grease (High Temp) 2 = Mopar Multi-Mileage Lubricant 3 = Mopar Spray White Lube 4 = Mopar Lock Cylinder Lubricant		

SPECIAL TOOLS

BODY



Remover, Moldings C-4829

HEATING AND AIR CONDITIONING

CONTENTS

	page
GENERAL INFORMATION	
HEATER AND AIR CONDITIONER CONTROLS	2
HEATER AND AIR CONDITIONER	1
SERVICE WARNINGS AND PRECAUTIONS	3
DESCRIPTION AND OPERATION	
BLOWER MOTOR RESISTOR	7
BLOWER MOTOR SWITCH	7
BLOWER MOTOR	7
COMPRESSOR CLUTCH RELAY	7
COMPRESSOR CLUTCH	7
COMPRESSOR	7
CONDENSER	8
EVAPORATOR COIL	8
EXPANSION VALVE	8
FILTER-DRIER	8
FIN SENSING CYCLING CLUTCH SWITCH	8
HIGH PRESSURE RELIEF VALVE	8
LOW/HIGH PRESSURE CUT-OFF SWITCH	8
REFRIGERANT LINES	9
REFRIGERANT OIL	9
REFRIGERANT SYSTEM SERVICE EQUIPMENT	9
REFRIGERANT SYSTEM SERVICE PORTS	9
REFRIGERANT SYSTEM SIGHT GLASS	10
REFRIGERANT	8
WATER VALVE	10
DIAGNOSIS AND TESTING	
A/C PERFORMANCE	10
BLOWER MOTOR RESISTOR	17
BLOWER MOTOR SWITCH	17
BLOWER MOTOR	17
COMPRESSOR CLUTCH COIL	18
COMPRESSOR CLUTCH RELAY	18
COMPRESSOR	17
EXPANSION VALVE	19
FIN SENSING CYCLING CLUTCH SWITCH	19
HEATER PERFORMANCE	12
HEATER-A/C CONTROLS	12
LOW/HIGH PRESSURE CUT-OFF SWITCH	19
REFRIGERANT SYSTEM LEAKS	20
REFRIGERANT SYSTEM SIGHT GLASS	19
VACUUM SYSTEM	16
SERVICE PROCEDURES	
REFRIGERANT OIL LEVEL	21
REFRIGERANT RECOVERY	20
REFRIGERANT SYSTEM CHARGE	21
REFRIGERANT SYSTEM EVACUATE	21
REMOVAL AND INSTALLATION	
BLOWER MOTOR RESISTOR	34
BLOWER MOTOR SWITCH	34
BLOWER MOTOR	33
COMPRESSOR CLUTCH	22
COMPRESSOR	21
CONDENSER	24
EVAPORATOR COIL	29
EVAPORATOR/BLOWER HOUSING	27
EXPANSION VALVE	26
FILTER-DRIER	26
FIN SENSING CYCLING CLUTCH SWITCH	29
HEAT/DEFROST/PANEL DOOR ACTUATORS	32
HEATER CORE	30
HEATER-A/C CONTROLS	30
HEATER-A/C HOUSING	27
RECIRCULATION AIR DOOR VACUUM ACTUATOR	33
TEMPERATURE CONTROL CABLE	33

GENERAL INFORMATION

HEATER AND AIR CONDITIONER

All vehicles are equipped with a common heater-A/C housing assembly. The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel. On heater-only systems, the evaporator coil is omitted.

The heater and optional air conditioner are blend-air type systems. In a blend-air system, a blend-air door controls the amount of fresh air (or cooled air from the evaporator on models with air conditioning) is allowed to flow over the heater core. A temperature control lever on the heater-A/C control panel determines discharge air temperature by moving a cable, which operates the blend-air door. This allows manual control of the output air temperature. Vacuum

GENERAL INFORMATION (Continued)

motors are used to actuate and position the remaining doors in the system. All models use a vacuum-actuated water valve to control whether engine coolant flows through, or by-passes, the heater core.

The air conditioner for all models is designed for the use of non-CFC, R-134a, refrigerant. This air conditioning system uses an expansion valve to meter refrigerant flow to the evaporator coil.

Both the heater-only and the heater-A/C housings consist of two basic parts:

- Blower and air inlet unit
- Air distribution unit

These units may be removed separately from under the instrument panel for service.

HEATER AND AIR CONDITIONER CONTROLS

Both the heater and heater-A/C systems use a combination of mechanical, electrical, and vacuum controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the Owner's Manual for more information on the suggested operation and use of these controls.

TEMPERATURE CONTROL LEVER

A temperature control lever actuates a cable that positions the blend air door in the heater-A/C housing to provide a variety of output air temperatures, from Cool to Warm. The temperature control lever controls the discharge air temperature in all modes, except when the mode control switch lever is in the Off position. In the Off position the vacuum-operated water valve is closed, preventing engine coolant from circulating in the heater core.

BLOWER MOTOR SWITCH

Multiple blower motor speeds are provided through the toggle-type blower motor switch and the blower motor resistors. When the ignition switch is in the On position, and the heater or heater-A/C mode control switch lever is in any position except Off, power is supplied to the blower motor switches. The blower motor can only be turned off by selecting Off with the mode control switch lever. Refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams for circuit descriptions and diagrams.

MODE CONTROL SWITCH

The vacuum and electrical heater and heater-A/C system modes are controlled by a mode control switch. Heater-only units use a 5-position switch, while heater-A/C units use a 7-position switch. The vacuum portion of the switch controls the water valve and all doors in the unit except the temperature control (blend air) door. The electrical portion of the switch controls the compressor clutch (if equipped), and the blower motor switch operation. Following are descriptions of the vacuum and electrical logic for each mode.

OFF

On heater-only models, all doors and the water valve are closed. The blower motor electrical circuit is open.

On models with air conditioning, the recirculation air door is closed to outside air, and open to recirculating air. The mode (panel) door is in the A/C position. The heat/defrost door is in the defrost position. The vacuum water valve is closed, preventing the flow of engine coolant through the heater core. No air flows through the unit and the compressor is idle because the blower and compressor clutch electrical circuits are open.

MAX (A/C)

This mode is only available on models with the optional air conditioner. When the mode lever is in this position, the compressor clutch and blower electrical circuits are closed. Air from inside the vehicle is recirculated through the system and discharged through the A/C (panel) outlets. A portion of the air bleeds through the floor outlets. This mode should only be used to rapidly cool down the vehicle in exceptionally hot and humid weather. The temperature control lever should be placed in the full Cool position, for best results. The water valve remains closed when the temperature control lever is in the full Cool position.

NORM (A/C)

This mode is only available on models with the optional air conditioner. When the mode lever is in this position, the compressor clutch and blower electrical circuits are closed. Outside air is circulated through the system and discharged through the A/C (panel) outlets. A portion of the air bleeds through the floor outlets. The water valve opens when the temperature control lever is moved about 1/2-inch towards the right (Warm) position. This allows reheat or temperature modulation of the cold air from the evaporator.

BI-LEVEL

When the mode lever is in this position, the compressor clutch (if equipped) and blower electrical circuits are closed. Outside air is circulated through the system and discharged through the A/C (panel) and floor outlets. The water valve opens when the temperature control lever is moved about 1/2-inch towards the right (Warm) position. This allows reheat or temperature modulation of the cold air from the evaporator.

GENERAL INFORMATION (Continued)

VENT

When the mode lever is in this position, the compressor clutch electrical circuit (if equipped) is open, and the blower electrical circuit is closed. Outside air is circulated through the system and discharged through the A/C (panel) outlets. On vehicles with air conditioning, a portion of the air bleeds through the floor outlets. The water valve opens when the temperature control lever is moved about 1/2-inch towards the right (Warm) position. This allows reheat or temperature modulation of the cold air from the evaporator.

HEAT

In this mode, outside air flows through the unit. The panel door is closed, the floor door is open, and a small amount of air bleeds through the defroster outlets. The water valve is open. The blower electrical circuit is closed, and the compressor clutch circuit (if equipped) is open.

DEFROST

In this mode, outside air flows through the unit. The panel door is closed, the defrost door is open. On vehicles with air conditioning, a small amount of air bleeds through the floor outlets. The compressor clutch circuit (if equipped) and blower electrical circuits are closed in the defrost mode.

SERVICE WARNINGS AND PRECAUTIONS

WARNING: THE AIR CONDITIONING SYSTEM CONTAINS REFRIGERANT UNDER HIGH PRESSURE. SEVERE PERSONAL INJURY MAY RESULT FROM IMPROPER SERVICE PROCEDURES. REPAIRS SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

- **AVOID BREATHING THE REFRIGERANT AND REFRIGERANT OIL VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE, AND/OR THROAT. WEAR EYE PROTECTION WHEN SERVICING THE AIR CONDITIONING REFRIGERANT SYSTEM. SERIOUS EYE INJURY CAN RESULT FROM DIRECT CONTACT WITH THE REFRIGERANT. IF EYE CONTACT IS MADE, SEEK MEDICAL ATTENTION IMMEDIATELY.**
- **DO NOT EXPOSE THE REFRIGERANT TO OPEN FLAME. POISONOUS GAS IS CREATED WHEN REFRIGERANT IS BURNED. AN ELECTRONIC LEAK DETECTOR IS RECOMMENDED.**
- **IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE THE WORK AREA BEFORE RESUMING SERVICE. LARGE AMOUNTS OF REFRIGERANT RELEASED IN A CLOSED WORK AREA WILL DISPLACE THE OXYGEN AND CAUSE SUFFOCATION.**
- **THE EVAPORATION RATE OF R-134a REFRIGERANT AT AVERAGE TEMPERATURE AND ALTITUDE IS EXTREMELY HIGH. AS A RESULT, ANYTHING THAT COMES IN CONTACT WITH THE REFRIGERANT WILL FREEZE. ALWAYS PROTECT THE SKIN OR DELICATE OBJECTS FROM DIRECT CONTACT WITH THE REFRIGERANT.**
- **THE R-134a SERVICE EQUIPMENT OR THE VEHICLE REFRIGERANT SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR AND R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS, AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.**

CAUTION: Liquid refrigerant is corrosive to metal surfaces. Follow the operating instructions supplied with equipment being used.

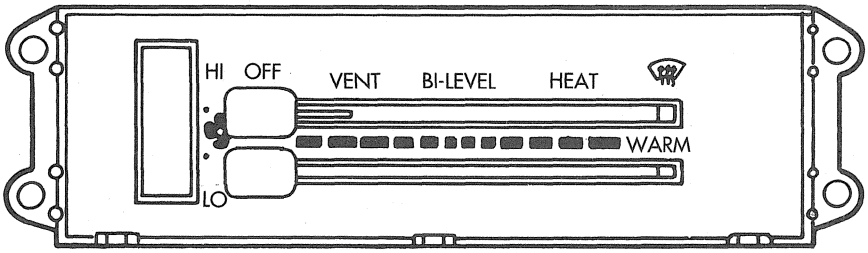
- **Never add R-12 to a refrigerant system designed to use R-134a. Damage to the system will result.**
- **R-12 refrigerant oil must not be mixed with the R-134a refrigerant oil. They are not compatible.**
- **Do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.**
- **Do not over-charge the refrigerant system. This will cause excessive compressor head pressure and can cause noise and system failure.**

In addition to the warnings and cautions listed above, the following precautions must also be observed whenever servicing the air conditioning system:

- Recover the refrigerant before opening any fitting or connection. Open the fittings with caution even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.
- The refrigerant system must always be evacuated before charging.
- Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. This will prevent contamination in the system.
- Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.
- Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug.
- Before connecting an open refrigerant fitting, always install a new seal or gasket. Coat the fitting and seal with clean refrigerant oil before connecting.

GENERAL INFORMATION (Continued)

HEATER CONTROL UNIT

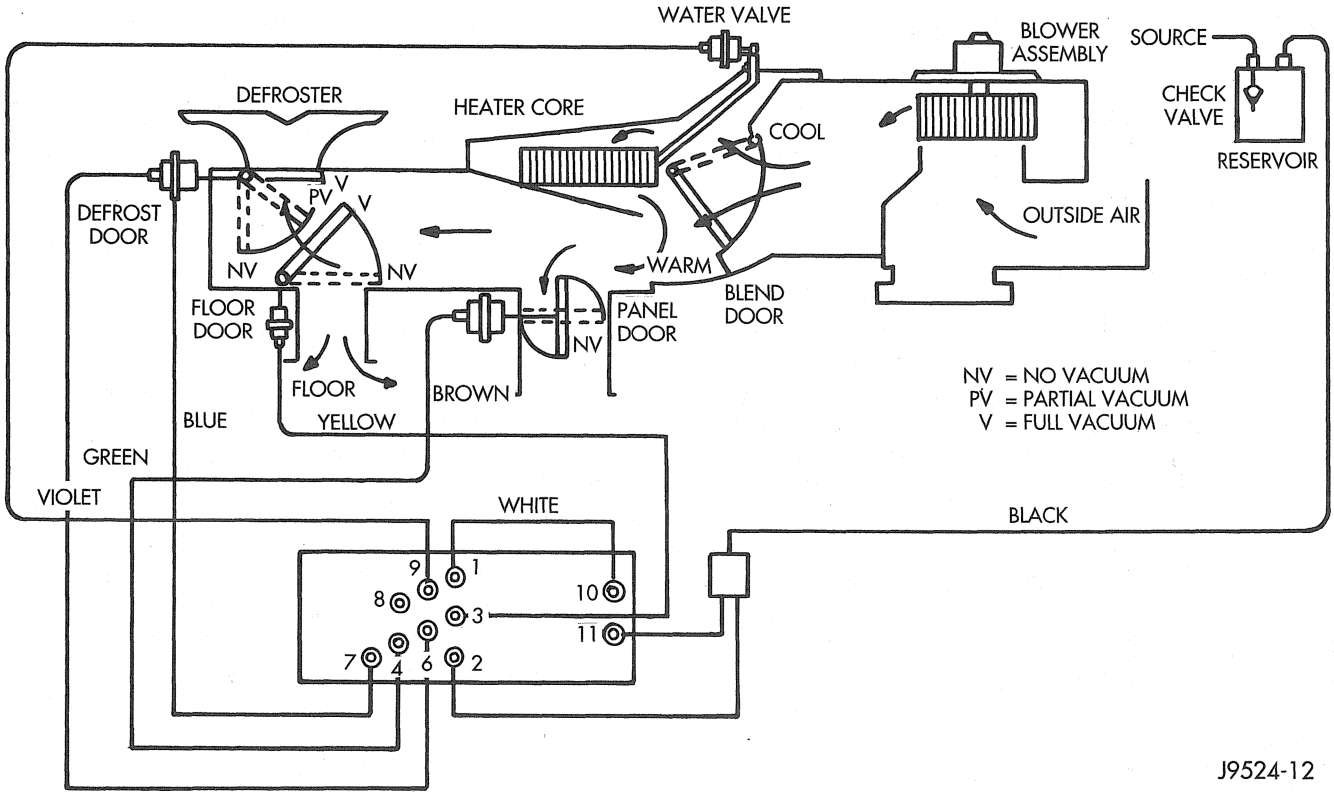


HEATER SYSTEM OPERATION

Mode Lever Position	Air Discharge	Blower Speeds	Panel Door	Floor Door	Defrost Door	Water Valve
Off	Closed	None	Closed	Closed	Closed	Closed
Vent	Panel Registers	4	Open	Closed	Closed	Closed
Bi-Level	Panel Registers and Floor	4	Open	Open	Closed	Open (1)
Heat	Floor With Def. Bleed	4	Closed	Open	Bleed	Open (1)
	Defroster	4	Closed	Closed	Open	Open (1)

(1) WATER VALVE CLOSES IN FULL "COOL" TEMPERATURE LEVER POSITION.

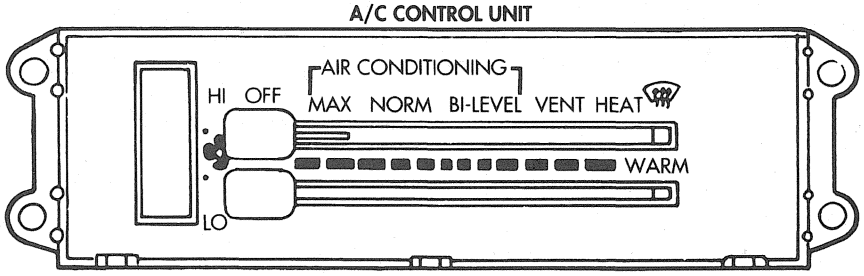
HEATER CONTROL SYSTEM VACUUM SCHEMATIC



Heater System Schematic

GENERAL INFORMATION (Continued)

A/C CONTROL UNIT

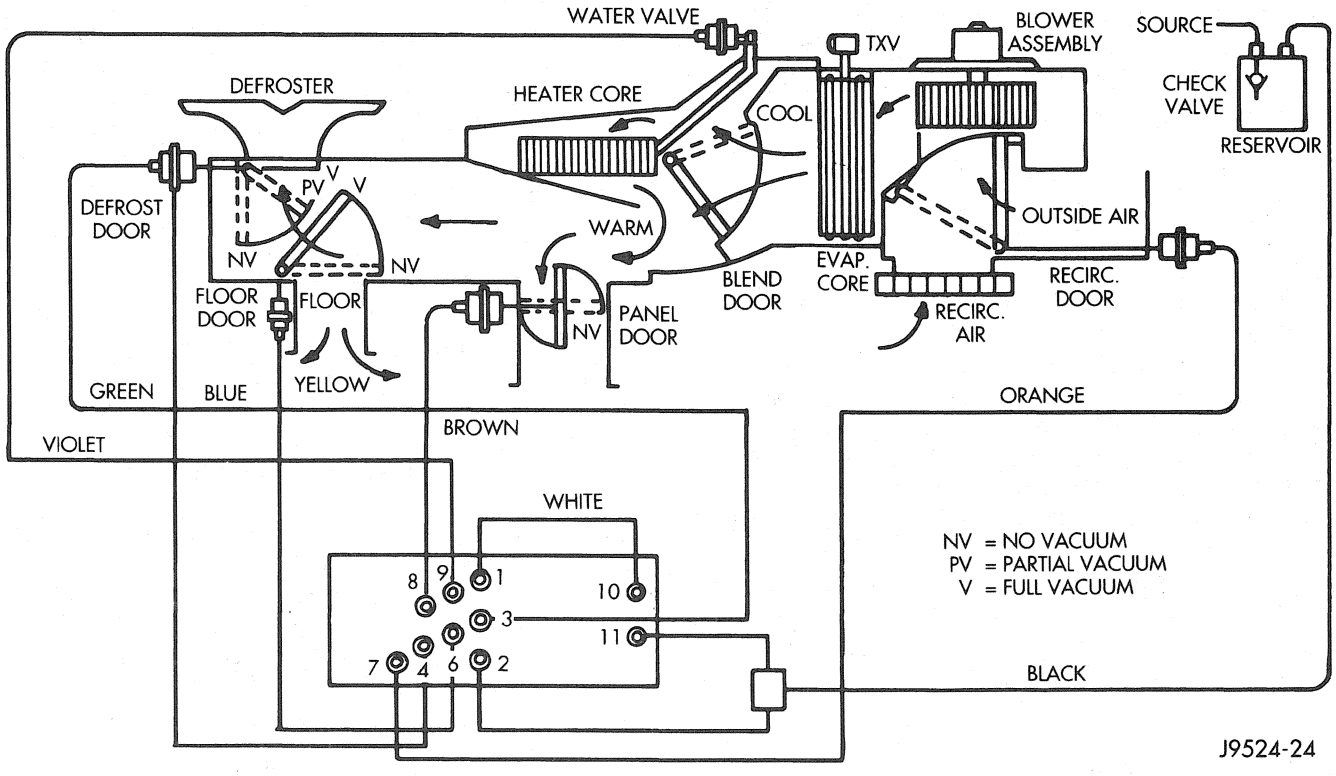


A/C SYSTEM OPERATION

Mode Lever Position	Air Discharge	Blower Speeds	Recirc. Door	Panel Door	Floor Door	Defrost Door	A/C Cmp.	Water Valve
Off	Closed	None	Recirc.	Open	Indeter-minate	Open	Off	Closed
Max A/C	Panel Registers With Floor Bleed	4	Recirc.	Open	Bleed	Closed	On	Open (1)
Norm A/C	Panel Registers With Floor Bleed	4	Outside	Open	Bleed	Closed	On	Open (1)
Bi-Level	Panel Registers and Floor	4	Outside	Open	Open	Closed	On	Open (1)
Vent	Panel Registers With Floor Bleed	4	Outside	Open	Bleed	Closed	Off	Open (1)
Heat	Floor With Def. Bleed	4	Outside	Closed	Open	Bleed	Off	Open (1)
	Def. With Floor Bleed	4	Outside	Closed	Bleed	Open	On	Open (1)

(1) WATER VALVE CLOSES IN FULL "COOL" TEMPERATURE LEVER POSITION.

AIR CONDITIONING CONTROL SYSTEM VACUUM SCHEMATIC



Air Conditioner System Schematic

GENERAL INFORMATION (Continued)

- Do not remove the sealing caps from a replacement component until ready to install it.
- When installing a refrigerant line, avoid sharp bends. Position the lines away from the exhaust, or any sharp edges which may chafe the line.
- Tighten fittings only to the specified torque. The aluminum fittings used in the refrigerant system will not tolerate over-tightening.
- When disconnecting a fitting, use a wrench on both halves of the fitting. This will prevent twisting of the refrigerant lines or tubes.
- Refrigerant oil will absorb moisture from the atmosphere, if left uncapped. Do not open a container of oil until you are ready to use it. Install the cap immediately after using. Store the oil only in a clean moisture-free container.
- Keep service tools and the work area clean. Contamination of the refrigerant system through careless work habits must be avoided.

COOLING SYSTEM REQUIREMENTS

To maintain the performance level of the heating-air conditioning system, the engine cooling system must be properly maintained.

The use of a bug screen is not recommended. Any obstructions in front of the radiator or condenser will reduce the performance of the air conditioning and engine cooling systems.

COOLANT PRECAUTIONS

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASED COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO A FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY.

- **WASH THE SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL.**
- **KEEP OUT OF THE REACH OF CHILDREN AND PETS.**
- **DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE. PERSONAL INJURY MAY RESULT.**
- **DO NOT STORE ENGINE COOLANT IN OPEN OR UNMARKED CONTAINERS.**
- **HOT ENGINE COOLANT CAN CAUSE SEVERE BURNS. DO NOT OPEN THE RADIATOR DRAIN COCK WHEN THE COOLING SYSTEM IS HOT AND PRESSURIZED. ALLOW THE COOLANT TO DECREASE TO ROOM TEMPERATURE BEFORE STARTING REPAIR OPERATIONS.**

The engine cooling system is designed to develop internal pressures of 97 to 124 kPa (14 to 18 psi). Allow the vehicle 15 minutes to cool down, or until a safe temperature and pressure are attained, before opening the cooling system. Refer to Group 7 - Cooling System for more information.

REFRIGERANT HOSES/TUBES PRECAUTIONS

Kinks or sharp bends in the refrigerant tubing or hoses will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 mm (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.

There are two types of refrigerant fittings:

- All fittings with O-rings need to be coated with refrigerant oil before installation. Use only O-rings approved for use with R-134a refrigerant. Failure to do so may result in a leak.
- Unified plumbing connections with aluminum gaskets cannot be serviced with O-rings. The gaskets are not reusable and new gaskets do not require lubrication before installing.

Using the proper wrenches when making a connection is very important. Improper wrenches or improper use of the wrenches can damage the fittings. Always use two wrenches when loosening or tightening tube fittings. Use one wrench to hold the stationary part while loosening or tightening with the other wrench.

The refrigerant must be recovered completely before opening any fitting or connection. Open the fittings with caution, even after the refrigerant has been recovered. If any pressure is noticed as a fitting is loosened, tighten the fitting and recover the system again.

Do not discharge refrigerant into the atmosphere. Use an R-134a refrigerant recovery/recycling device that meets SAE Standard J2210.

The refrigerant system will remain chemically stable as long as pure, moisture-free R-134a refrigerant oil is used. Dirt, moisture, or air can upset this chemical stability. Operational troubles or serious damage can occur if foreign material is present in the refrigerant system.

When it is necessary to open the refrigerant system, have everything needed to service the system ready. The system should not be left open any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are ready to be used.

All tools, including the refrigerant recycling equipment, the manifold gauge set, and test hoses should

GENERAL INFORMATION (Continued)

be kept clean and dry. All tools and equipment must be designed for R-134a refrigerant.

DESCRIPTION AND OPERATION

BLOWER MOTOR

The blower motor is mounted in the blower and air inlet unit, which is attached to the dash panel beneath the instrument panel. The blower motor can be removed from the engine compartment side of the dash panel.

The blower motor will only operate when the ignition switch is in the On position, and the heater-A/C mode control switch is in any position, except Off. Blower motor speed is controlled by the blower motor switch and resistor. The blower motor circuit is protected by a fuse in the fuseblock module.

The blower motor cannot be repaired and, if faulty, must be replaced.

BLOWER MOTOR RESISTOR

The blower motor resistor is mounted to the bottom of the air distribution unit, under the instrument panel. It can be accessed by removing the vacuum motor cover.

The resistor has multiple resistor wires, each of which reduce the current flow to the blower motor, to change the blower motor speed. The blower motor switch directs the current through the correct resistor wire, or directly to the blower motor, depending upon the selected speed.

The blower motor resistor cannot be repaired and, if faulty, must be replaced.

BLOWER MOTOR SWITCH

The heater, or heater-A/C, blower motor is controlled by a toggle switch, mounted in the heater-A/C control panel. The switch allows selection of four blower motor speeds, but can only be turned off by selecting the Off position with the heater-A/C mode control switch.

The blower motor switch receives ignition-switched power from a fuse in the fuseblock module. The switch directs current to the blower motor resistor, or directly to the blower motor, as required to control the blower motor speed.

The blower motor switch cannot be repaired and, if faulty, must be replaced.

COMPRESSOR

The air conditioning system uses a Sanden SD7H15 fixed displacement compressor on all models. A label identifying the use of R-134a refrigerant is located on the compressor. The purpose of the compressor is to compress the low-pressure refrigerant vapor from the evaporator into a high-pressure, high-temperature vapor. The compressor is serviced only as an assembly.

COMPRESSOR CLUTCH

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 1). The electromagnetic coil and pulley are retained on the compressor with snap rings. The clutch plate is mounted on the compressor shaft and secured with a nut.

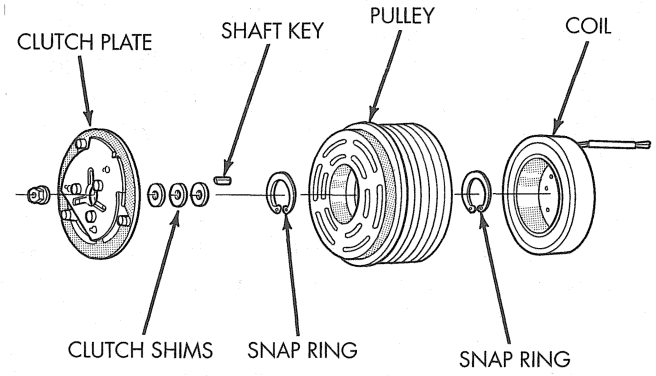


Fig. 1 Compressor Clutch

These components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt. When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the compressor shaft. When the coil is not energized, the pulley free-wheels on the clutch hub bearing, which is part of the pulley. The compressor clutch and coil are the only serviced parts on the compressor.

The compressor clutch is controlled by several components: the heater-A/C mode control switch, the low/high pressure cut-off switch, the fin sensing cycling clutch switch, the compressor clutch relay, and the Powertrain Control Module (PCM). The PCM may delay compressor clutch engagement for up to 30 seconds. Refer to Group 14 - Fuel System for more information on the PCM controls.

COMPRESSOR CLUTCH RELAY

The compressor clutch relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The compressor clutch relay is a electro-mechanical device that switches current to the compressor clutch coil when the Powertrain Control Module (PCM) grounds the coil side of the relay. The PCM responds

DESCRIPTION AND OPERATION (Continued)

to inputs from the heater-A/C mode control switch, the low/high pressure cut-off switch, and the fin sensing cycling clutch switch.

The compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

CONDENSER

The condenser is located in front of the engine cooling radiator. It is a heat exchanger that allows the high-pressure refrigerant gas to give up its heat to the air passing over the condenser fins. This causes the refrigerant gas to condense into a high-pressure liquid refrigerant. The condenser is serviced only as an assembly.

EVAPORATOR COIL

The evaporator coil is located in the A/C housing, under the instrument panel. Refrigerant enters the evaporator as a low-temperature, low-pressure liquid. As air passes over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to become a low-pressure gas before it leaves the evaporator.

The evaporator coil cannot be repaired and, if faulty, it must be replaced.

EXPANSION VALVE

The expansion valve ("H" valve) is used to meter refrigerant into the evaporator coil in accordance with cooling requirements. High-pressure liquid refrigerant passes through the expansion valve orifice, converting it into a low-pressure liquid, before it enters the evaporator coil. A temperature sensor in the expansion valve control head monitors the temperature of the refrigerant leaving the evaporator coil, and adjusts the orifice size to let the proper amount of refrigerant into the evaporator coil, to meet the cooling requirements.

The expansion valve is located at the point where the refrigerant lines join the evaporator coil on the engine compartment side of the dash panel. The valve cannot be adjusted or repaired and, if faulty, must be replaced.

FILTER-DRIER

High-pressure liquid refrigerant from the condenser flows into the filter-drier. A drying agent, called a desiccant, is used to remove any traces of moisture from the refrigerant system. The filter-drier performs a filtering action to prevent foreign material in the refrigerant from contaminating the expansion valve. In addition, during periods of high demand air conditioner operation, the filter-drier acts as a reservoir to store surplus refrigerant.

The filter-drier also incorporates a sight glass for visual diagnosis of the refrigerant system. The filter-drier is located in the engine compartment. The filter-drier cannot be repaired and, if faulty, must be replaced.

FIN SENSING CYCLING CLUTCH SWITCH

The fin sensing cycling clutch switch uses a thermistor probe in a capillary tube inserted into the evaporator coil fins to monitor evaporator temperature. It signals the powertrain control module to cycle the compressor clutch on and off, to control the evaporator temperature. Controlling evaporator temperature prevents condensate water on the evaporator fins from freezing and obstructing air conditioning system air flow. The switch is a sealed unit and cannot be adjusted or repaired. If faulty, the switch must be replaced.

HIGH PRESSURE RELIEF VALVE

The high pressure relief valve is located on the filter-drier. The valve is used to prevent excessive system pressure. The valve vents the system when a pressure of 3445 to 4135 kPa (500 to 600 psi), and above, is reached. This prevents damage to the compressor and other system components due to condenser air flow being restricted or an over-charge of refrigerant. The valve closes with a minimum pressure of 2756 kPa (400 psi).

The high pressure relief valve vents only enough refrigerant to reduce system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the system. If the valve vents refrigerant, it does not mean the valve is faulty. The valve is part of the filter-drier assembly and must not be removed or otherwise disturbed.

LOW/HIGH PRESSURE CUT-OFF SWITCH

The combined low pressure/high pressure cut-off switch is located on the filter-drier, and is wired in series with the compressor clutch coil. When the refrigerant system pressure drops below 193 kPa (28 psi), or rises above 3100 to 3375 kPa (450 to 490 psi), the switch interrupts the power to the compressor clutch coil, disengaging the compressor clutch. The switch is a factory-calibrated unit. No attempt should be made to adjust or repair the switch. If the switch is faulty, it must be replaced.

REFRIGERANT

The refrigerant used in this air conditioning system, R-134a, is a non-toxic, non-flammable, clear and colorless, liquefied gas. R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning

DESCRIPTION AND OPERATION (Continued)

system. Even a small amount of R-12, added to a R-134a refrigerant system, will cause compressor failure, refrigerant oil sludge, or poor air conditioning system performance.

The refrigerant system service ports have been designed to ensure that the system is not accidentally filled with the wrong refrigerant (R-12).

REFRIGERANT LINES

The refrigerant lines are used to carry the refrigerant between the various air conditioning system components. A barrier hose design is used for the air conditioning system on this vehicle. The ends of the refrigerant hoses are made from light-weight aluminum, and use braze-less fittings. The refrigerant lines and hoses cannot be repaired and, if faulty, must be replaced.

REFRIGERANT OIL

The oil used in the SD7H15 compressor is a polyalkylene glycol, synthetic (SP-20 PAG), wax-free refrigerant oil. Use only refrigerant oil of the same type to service the system. Refrigerant oil will absorb any moisture it comes in contact with, even moisture in the air. The oil container should be kept tightly capped until it is ready to be used. Then, cap the oil immediately after using, to prevent contamination.

REFRIGERANT SYSTEM SERVICE EQUIPMENT

WARNING: EYE PROTECTION MUST BE WORN WHEN SERVICING AN AIR CONDITIONING REFRIGERANT SYSTEM. TURN OFF (ROTATE CLOCKWISE) ALL VALVES ON THE EQUIPMENT BEING USED, BEFORE PROCEEDING WITH THIS OPERATION. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY.

When servicing the air conditioning system, a refrigerant charging station and a recovery/recycling device for R-134a must be used. This device must meet SAE Standard J2210. Contact an automotive service equipment supplier for refrigerant charging and recycling/recovering equipment. Refer to the operating instructions provided with the equipment for proper operation.

A manifold gauge set may be needed with some charging and/or recovery/recycling devices (Fig. 2). The service hoses on the gauge set being used should have manual (turn wheel), or automatic, back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

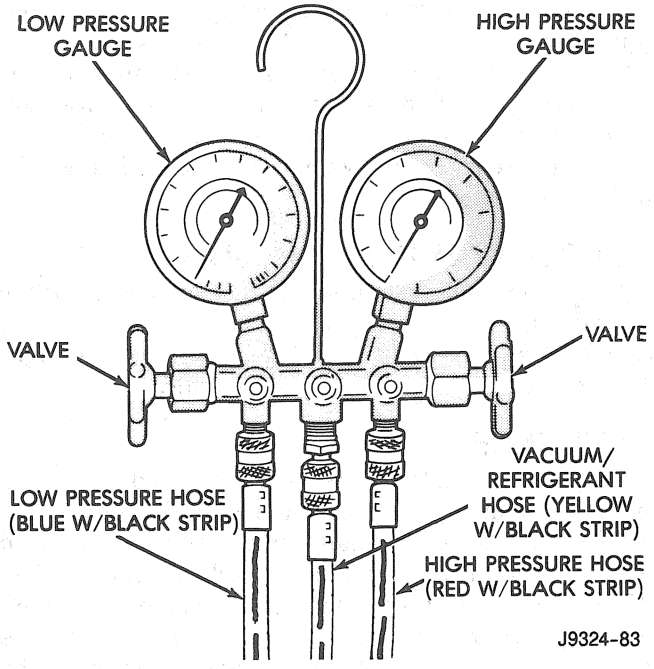


Fig. 2 Manifold Gauge Set

MANIFOLD GAUGE SET CONNECTIONS

CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

LOW PRESSURE GAUGE HOSE

The low pressure hose (Blue with Black stripe) attaches to the suction service port. This port is located at the right front of the engine compartment in the suction line.

HIGH PRESSURE GAUGE HOSE

The high pressure hose (Red with Black stripe) attaches to the discharge service port. This port is located on the discharge line between the compressor and the condenser.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE

The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

REFRIGERANT SYSTEM SERVICE PORTS

The service ports are used to charge, recover/recycle, evacuate, and test the air conditioning refrigerant system. Unique service port coupler sizes are used on the R-134a system, to ensure that the system is not accidentally contaminated by the use of

DESCRIPTION AND OPERATION (Continued)

the wrong refrigerant (R-12), or refrigerant service equipment.

The high pressure service port is located on the compressor manifold or plumbing. The low pressure service port is located on the suction line. After ser vicing the refrigerant system, always re-install the service port caps.

REFRIGERANT SYSTEM SIGHT GLASS

The refrigerant system sight glass on the top of the filter-drier is provided as a diagnostic tool. It allows visual observation of the refrigerant flow. The sight glass serves as a refrigerant level indicator.

WATER VALVE

A vacuum-actuated water valve is used to control engine coolant flow to the heater core. When vacuum is applied, the valve opens and coolant is directed through the heater core and back to the engine. When the water valve is closed (no vacuum applied), coolant flow bypasses the heater core back to the engine. Vacuum to the water valve is controlled by the heater-A/C mode control switch. The water valve cannot be repaired and, if faulty, must be replaced.

DIAGNOSIS AND TESTING

A/C PERFORMANCE

The air conditioning system is designed to provide the passenger compartment with low temperature and low humidity air. The evaporator, located in the heater-A/C housing behind the instrument panel, is cooled to temperatures near the freezing point. As warm damp air passes over the fins in the evaporator, the air is cooled and the moisture is removed as it condenses on the fins. During periods of high heat and humidity, an air conditioning system will be more effective in the Max (A/C) mode. With the mode control switch set in the Max (A/C) position, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, the air conditioning system performance levels improve.

Humidity has an important bearing on the temperature of the air delivered to the vehicle's interior. It is important to understand the effect that humidity has on the performance of the system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator's fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. High humidity greatly reduces the evaporator's ability to lower the temperature of the air.

Evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. However, an owner may expect too much from their air conditioning system on humid days. A performance test is the best way to determine whether the system is performing up to standard. This test also provides valuable clues to the possible cause of trouble with the air conditioning system.

Air temperature in the test room must be 21°C (70°F) minimum for this test.

(1) Connect a tachometer and a manifold gauge set.

(2) Set the heater-A/C mode control switch to Max A/C, the temperature control lever on full Cool, and the blower on High speed.

(3) Start the engine and adjust the idle to 1,000 rpm, with the compressor clutch engaged.

(4) The engine should be at operating temperature. The doors, windows, and hood should be closed.

(5) Insert a thermometer in the left center A/C (panel) outlet. Operate the engine for five minutes. The compressor clutch may cycle, depending upon ambient temperature.

(6) After five minutes, note the discharge air temperature. If the compressor clutch cycles, take the reading before the clutch disengages.

(7) Open the hood and disconnect the vacuum line going to the heater water control valve. Observe the valve arm for movement, as the line is disconnected. If it does not move, refer to the diagnosis for the Vacuum System in this group. Plug the disconnected vacuum line, to prevent vacuum leakage.

(8) Operate the air conditioning system for two more minutes. Then, take the discharge air temperature reading again. If the temperature increased by more than 3°C (5°F), check the temperature control (blend air) door cable for correct adjustment and operation. When the increase is more than 3°C (5°F), compare the discharge air temperature, suction pressure, and discharge pressure with the Performance Temperature Chart (Fig. 3). Connect the vacuum line at the water valve.

(9) If the discharge air temperature fails to meet the specifications in the Performance Temperature Chart, see the diagnosis charts for more test information.

DIAGNOSIS AND TESTING (Continued)

Ambient Temperature	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
Air Temperature At Center Panel Outlet	2- 7°C (36-44°F)	3- 8°C (38-46°F)	6- 12°C (42-53°F)	9- 16°C (48-60°F)	12- 20°C (54-68°F)
Evaporator Inlet Pressure At Charge Port	124 207 kPag	138 241 kPag	152 269 kPag	172 296 kPag	179 324 kPag
	18 30 psi	20 35 psi	22 39 psi	25 43 psi	26 47 psi
Compressor Discharge Pressure	1034 1516 kPag	1103 1620 kPag	1516 2136 kPag	1723 2205 kPag	1379 2344 kPag
	150 220 psi	160 235 psi	220 310 psi	250 320 psi	280 340 psi

J9424-48

Fig. 3 Performance Temperature Chart

Mopar AUTHENTIC RESTORATION PRODUCT

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW SIDE AND HIGH SIDE PRESSURE LOW	1. System refrigerant low. 2. Expansion valve is restricted.	1. Evacuate, leak test and charge system. 2. Replace the expansion valve.
LOW SIDE PRESSURE HIGH AND HIGH SIDE PRESSURE LOW	1. Internal leak in the compressor. 2. Cylinder head gasket is leaking. 3. Drive belt slipping.	1. Replace the compressor. 2. Replace the compressor. 3. Adjust the belt tension.
LOW SIDE AND HIGH SIDE PRESSURE HIGH	1. Condenser fins obstructed. 2. Air in the system. 3. Expansion valve is defective. 4. Loose or worn fan belt. 5. Refrigerant system overcharged.	1. Clean condenser fins. 2. Evacuate, leak test and charge system. 3. Replace the expansion valve. 4. Adjust or replace belt. 5. Recover refrigerant and recharge.
LOW SIDE PRESSURE LOW AND HIGH SIDE PRESSURE HIGH	1. Expansion valve is defective. 2. Restriction in refrigerant hose. 3. Restriction in receiver/drier. 4. Restriction in condenser.	1. Replace the expansion valve. 2. Check hoses for kinks and replace if necessary. 3. Replace receiver/drier. 4. Replace condenser.
LOW SIDE AND HIGH SIDE PRESSURES NORMAL INADEQUATE COOLING	1. Air in the system. 2. Excessive oil in system.	1. Evacuate, leak test and charge system. 2. Discharge and drain oil. Restore proper oil level. Evacuate, leak test and charge system.

J9524-10

Pressure Diagnosis

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
COMPRESSOR NOISE	1. Broken valve or piston ring. 2. Refrigerant system overcharged. 3. Incorrect oil level. 4. Loose or worn fan belt.	1. Replace compressor. 2. Evacuate, leak test and charge system. 3. Discharge and drain oil. Restore proper oil level. Evacuate, leak test and charge system. 4. Adjust or replace belt.
EXCESSIVE VIBRATION	1. Incorrect belt tension. 2. Clutch loose. 3. Refrigerant system overcharged. 4. Pulley is misaligned.	1. Adjust belt tension. 2. Tighten clutch. 3. Recover refrigerant and recharge. 4. Align pulley.
CONDENSATION LEAKING INSIDE VEHICLE	1. Evaporator drain plugged or kinked.	1. Clean drain hose and check for proper installation.
FROZEN EVAPORATOR COIL	1. Faulty thermostat on YJ vehicle. 2. Faulty fin sensing cycling clutch switch XJ vehicle.	1. Check for proper installation and adjustment. Replace if necessary. 2. Check for proper installation. Replace if necessary.

J9524-11

Performance Diagnosis

HEATER PERFORMANCE

Possible causes of insufficient heater output, or a lack of temperature control, include:

- Obstructed heater outlets
- Insufficient vacuum supply to the water control valve, or a faulty valve
- Insufficient engine coolant level
- Faulty thermostat
- Blend-air (temperature control) door misdirected, or binding
- Blend-air (temperature control) door control cable out of adjustment
- Plugged or obstructed heater hose, or heater core.

HEATER-A/C CONTROLS

Satisfactory heater and air conditioner performance depends upon proper operation, and adjustment, of all operating controls and refrigeration system components. For circuit descriptions and diagrams, refer to 8W-42 -Air Conditioning/Heater in Group 8W - Wiring Diagrams. These inspections, tests, and adjustments should be used to locate the cause of a malfunction.

Operation must be tested as described in the following sequence:

(1) Inspect the condition, routing, and installation of the temperature control cable. See Removal and Installation in this group for more information.

(2) Inspect and adjust the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(3) Start the engine and adjust the engine speed to 1,300 rpm.

(4) On vehicles with air conditioning, move the temperature control lever to the extreme left (Cool) position, and set the mode control switch in the Bi-Level position. The outside (recirculation) air door should be open to outside air. If not OK, see the Vacuum System tests in this group.

(5) Open the vehicle windows. Test the blower motor operation in all speeds. If not OK, see the diagnosis for the blower motor components in this group. Leave the blower motor switch in the High speed position.

(6) On vehicles with air conditioning, the compressor should be running, and the air conditioning system in operation. If not OK, see the diagnosis for the refrigerant system. If the refrigerant system is OK, see the diagnosis for the compressor clutch components and circuits in this group.

(7) Check the mode control switch operation. The heater and air conditioner system should respond as shown in the System Schematic charts. Reduce the engine speed to normal idle. The vacuum will be high at low idle, and the vacuum actuators should respond quickly. If not OK, see the Vacuum System tests in this group.

(8) If the vacuum tests and the electrical component and circuit tests reveal no problems, disassemble the heater-A/C housing and air distribution duct to inspect for mechanical misalignment or binding of doors.

DIAGNOSIS AND TESTING (Continued)

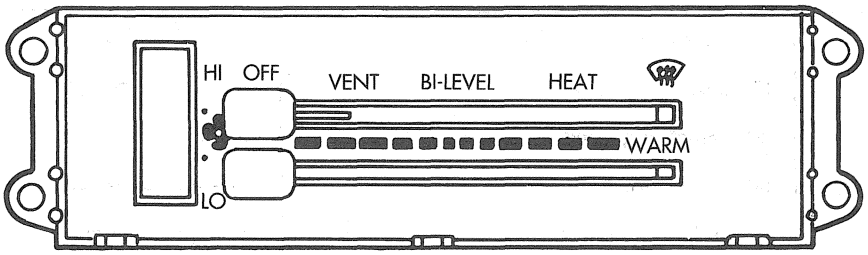
CONDITION	POSSIBLE CAUSE	CORRECTION
BLOWER MOTOR WILL NOT TURN AT ANY SPEED	(1) Blown fuse.	(1) Replace fuse.
	(2) Loose connection.	(2) Inspect and tighten.
	(3) Defective ground.	(3) Clean and tighten.
	(4) Faulty switch.	(4) Replace switch.
	(5) Faulty motor.	(5) Replace motor.
	(6) Faulty resistor.	(6) Replace resistor.
BLOWER MOTOR TURNS AT ONE SPEED ONLY	(1) Faulty switch.	(1) Replace switch.
	(2) Faulty resistor.	(2) Replace resistor.
BLOWER MOTOR TURNS BUT DOES NOT CIRCULATE AIR	(1) Intake blocked.	(1) Clean intake.
	(2) Fan not secured to the motor shaft..	(2) Tighten securely.
	(3) Outside air mode door inoperative.	(3) a. Check and replace outside air door vacuum motor, if necessary. b. Check and repair vacuum controls, as required.
HEATER WILL NOT HEAT	(1) Coolant does not reach proper temperature.	(1) Check and replace thermostat if necessary.
	(2) Heater core blocked internally.	(2) Flush or replace core if necessary.
	(3) Heater core air-bound.	(3) Purge air from core.
	(4) Blend-air door not in proper position.	(4) Adjust cable.
HEATER WILL NOT DEFROST	(1) Control cable adjustment incorrect or vacuum motor inoperative.	(1) Adjust control cable or replace vacuum motor.
	(2) Defroster hose damaged or duct seal leakage.	(2) Replace defroster hose or correct duct seal.

J9124-49

Heater System Diagnosis

DIAGNOSIS AND TESTING (Continued)

HEATER CONTROL UNIT

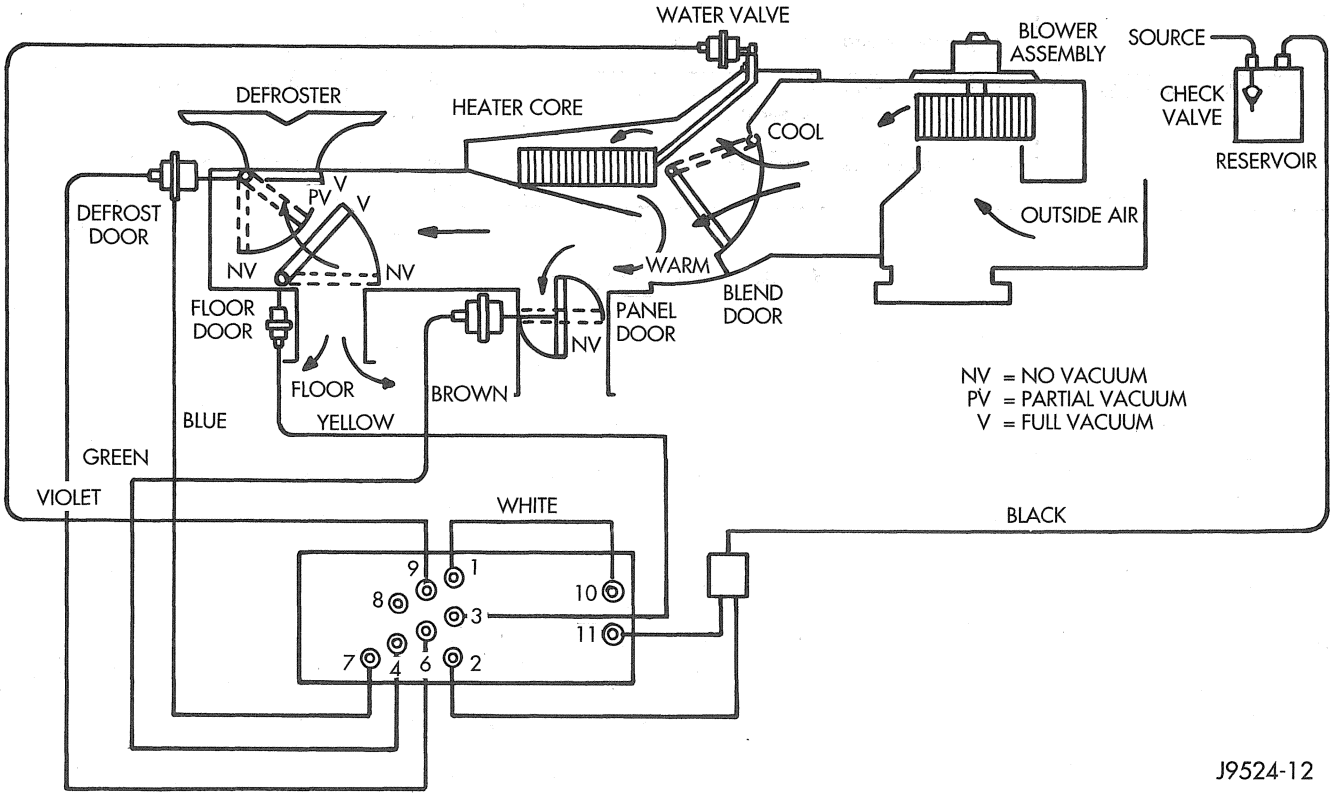


HEATER SYSTEM OPERATION

Mode Lever Position	Air Discharge	Blower Speeds	Panel Door	Floor Door	Defrost Door	Water Valve
Off	Closed	None	Closed	Closed	Closed	Closed
Vent	Panel Registers	4	Open	Closed	Closed	Closed
Bi-Level	Panel Registers and Floor	4	Open	Open	Closed	Open (1)
Heat	Floor With Def. Bleed	4	Closed	Open	Bleed	Open (1)
	Defroster	4	Closed	Closed	Open	Open (1)

(1) WATER VALVE CLOSES IN FULL "COOL" TEMPERATURE LEVER POSITION.

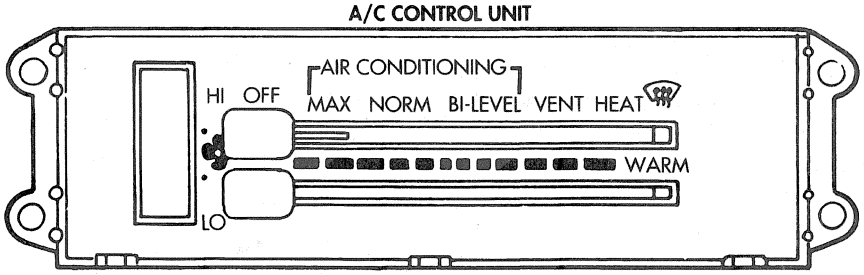
HEATER CONTROL SYSTEM VACUUM SCHEMATIC



Heater System Schematic

DIAGNOSIS AND TESTING (Continued)

A/C CONTROL UNIT

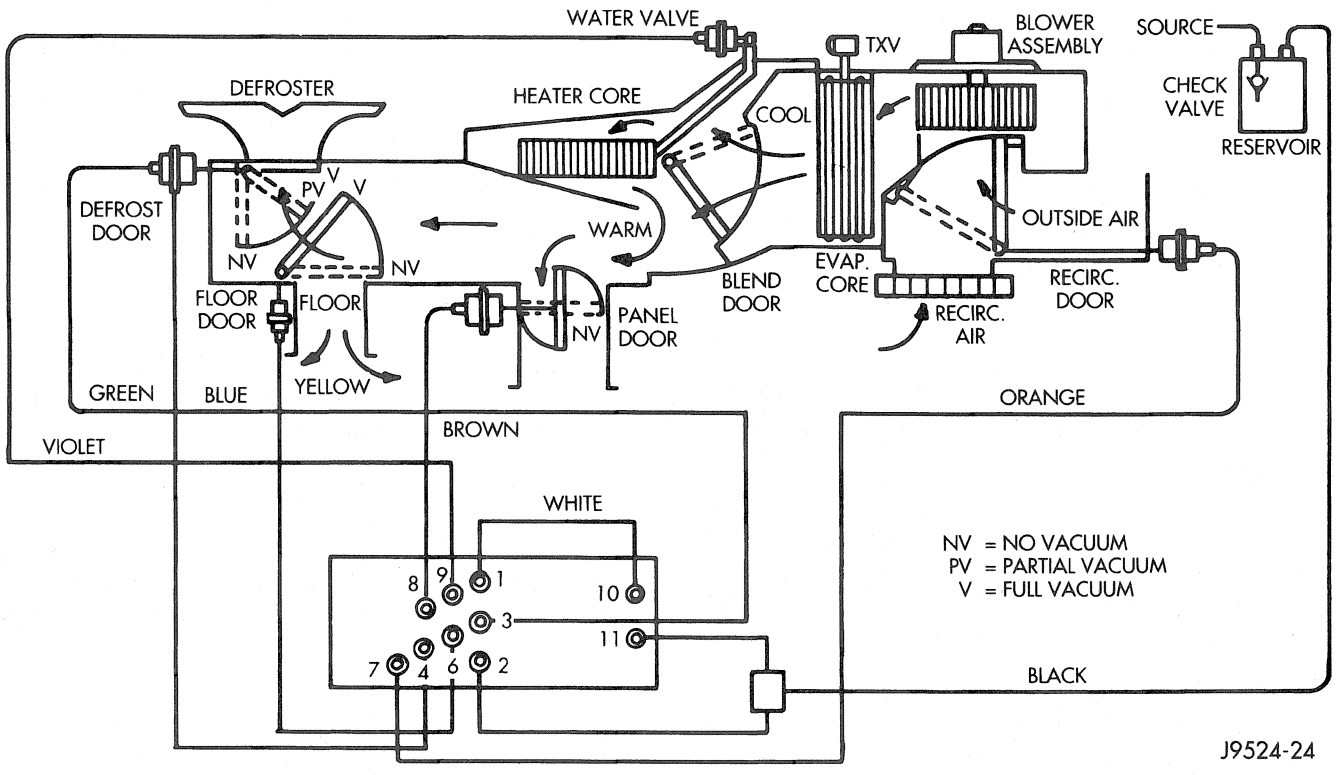


A/C SYSTEM OPERATION

Mode Lever Position	Air Discharge	Blower Speeds	Recirc. Door	Panel Door	Floor Door	Defrost Door	A/C Cmp.	Water Valve
Off	Closed	None	Recirc.	Open	Indeter-minate	Open	Off	Closed
Max A/C	Panel Registers With Floor Bleed	4	Recirc.	Open	Bleed	Closed	On	Open (1)
Norm A/C	Panel Registers With Floor Bleed	4	Outside	Open	Bleed	Closed	On	Open (1)
Bi-Level	Panel Registers and Floor	4	Outside	Open	Open	Closed	On	Open (1)
Vent	Panel Registers With Floor Bleed	4	Outside	Open	Bleed	Closed	Off	Open (1)
Heat	Floor With Def. Bleed	4	Outside	Closed	Open	Bleed	Off	Open (1)
	Def. With Floor Bleed	4	Outside	Closed	Bleed	Open	On	Open (1)

(1) WATER VALVE CLOSES IN FULL "COOL" TEMPERATURE LEVER POSITION.

AIR CONDITIONING CONTROL SYSTEM VACUUM SCHEMATIC



Air Conditioner System Schematic

DIAGNOSIS AND TESTING (Continued)

VACUUM SYSTEM

Vacuum control is used to operate the mode doors in the heater and heater-A/C housings. Testing of the heater and heater-A/C mode control switch operation will determine if the vacuum, electrical, and mechanical controls are functioning. However, it is possible that a vacuum control system that operates perfectly at engine idle (high engine vacuum) may not function properly at high engine speeds or loads (low engine vacuum). This can be caused by leaks in the vacuum system, or a faulty vacuum check valve.

A vacuum system test will help to identify the source of poor vacuum system performance, or vacuum system leaks. Before starting this test, stop the engine and make certain that the problem isn't a disconnected vacuum source tube at the engine intake manifold or the vacuum reservoir.

Use an adjustable vacuum test set (Special Tool C-3707) and a suitable vacuum pump to test the heater-A/C vacuum control system. With a finger placed over the end of the vacuum test hose probe (Fig. 4), adjust the bleed valve on the test set gauge to obtain a vacuum of exactly 27 kPa (8 in. Hg.). Release and block the end of the probe several times to verify that the vacuum reading returns to the exact 27 kPa (8 in. Hg.) setting. Otherwise, a false reading will be obtained during testing.

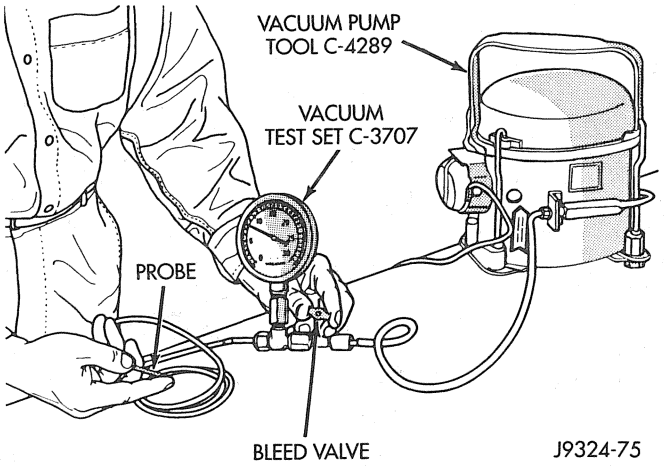


Fig. 4 Adjust Vacuum Test Bleed Valve

ONE-WAY CHECK VALVE

(1) Disconnect the heater-A/C vacuum supply (black) tube in the engine compartment. This tube passes through an opening in the dash panel.

(2) Remove the one-way vacuum check valve. The valve is located on the (black) vacuum supply hose at the intake manifold.

(3) Connect the test set vacuum supply hose to the heater side of the valve. When connected to this side of the check valve, no vacuum should pass and the test set gauge should return to the 27 kPa (8 in. Hg.) setting. If OK, go to step Step 4. If not OK, replace the faulty valve.

(4) Connect the test set vacuum supply hose to the engine vacuum side of the valve. When connected to this side of the check valve, vacuum should flow through the valve without restriction. If not OK, replace the faulty valve.

HEATER-A/C CONTROLS

(1) Connect the test set vacuum probe to the heater-A/C vacuum supply (black) hose in the engine compartment. Position the test set gauge so that it can be viewed from the passenger compartment.

(2) Place the heater-A/C mode control selector in each mode, one at a time, and pause after each selection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each selection is made. If not OK, a component or vacuum line in the selected mode's circuit has a vacuum leak. See the procedure in Locating Vacuum Leaks.

CAUTION: Do not use lubricant on the switch ports or in the holes in the plug, as lubricant will ruin the vacuum valve in the switch. A drop of clean water in the connector plug holes will help the connector slide onto the switch ports.

LOCATING VACUUM LEAKS

(1) Disconnect the vacuum connector from the back of the heater-A/C mode control switch on the control panel.

(2) Connect the test set vacuum hose probe to each port in the vacuum harness connector, one at a time, and pause after each connection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty mode control switch. If not OK, go to step Step 3.

(3) Determine the vacuum line color of the vacuum circuit that is leaking. To determine the vacuum line colors, refer to the Heater or Air Conditioner System Schematic charts.

(4) Disconnect and plug the vacuum line from the component (fitting, actuator, valve, switch, or reservoir) on the other end of the leaking circuit. Instrument panel disassembly or removal may be necessary to gain access to some components.

(5) Connect the test set hose or probe to the open end of the leaking circuit. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty disconnected component. If not OK, go to Step 6.

(6) To locate a leak in a vacuum line, leave one end of the line plugged and connect the test set hose or probe to the other end. Run your fingers slowly along the line while watching the test set gauge. The

DIAGNOSIS AND TESTING (Continued)

vacuum reading will fluctuate when your fingers contact the source of the leak. To repair the vacuum line, cut out the leaking section of the line. Then, insert the loose ends of the line into a suitable length of 3mm (1/8-inch) inside diameter rubber hose.

BLOWER MOTOR

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. Possible causes of an inoperative blower motor include:

- Faulty fuse
- Faulty blower motor ground circuit wiring or connectors
- Faulty blower motor resistor
- Faulty blower motor switch
- Faulty heater-A/C mode control switch
- Faulty blower motor feed circuit wiring or connectors
- Faulty blower motor.

Possible causes of the blower motor not operating in all speeds include:

- Faulty fuse
- Faulty blower motor switch
- Faulty blower motor resistor
- Faulty blower motor circuit wiring or connectors.

VIBRATION

Possible causes of blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Blower wheel out of balance or bent
- Blower motor faulty.

NOISE

To verify that the blower is the source of the noise, disconnect the blower motor connector and operate the heater-A/C system. If the noise goes away, possible causes include:

- Foreign material in the heater-A/C housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower motor faulty.

BLOWER MOTOR RESISTOR

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

To test the blower motor resistor, unplug the resistor connector. Each blower motor switch input terminal on the resistor must have continuity to the resistor output terminal, which is connected to the circuit going to the blower motor. If the blower motor resistor continuity does not check OK, replace the faulty resistor.

BLOWER MOTOR SWITCH

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) Turn the ignition switch to the On position and check for battery voltage at the fuse in the fuseblock module. If OK, go to Step 2. If not OK, replace the faulty fuse.

(2) Remove the heater-A/C control bezel and control unit from the instrument panel. Check for battery voltage at both of the high blower motor driver circuit cavities of the heater-A/C mode control switch connector. If OK, go to Step 3. If not OK, repair the open circuit(s) to the fuseblock module as required.

(3) Select any one of the heater-A/C mode control positions except Off to turn the system on. Check for battery voltage at the A/C-heater control switch signal circuit cavity of the blower motor switch connector. If OK, go to Step 4. If not OK, replace the faulty heater-A/C mode control switch.

(4) Check for battery voltage at each of the remaining blower motor switch connector cavities as you move the switch to each blower motor speed position. Voltage should be present in each cavity at only one switch position. If OK, see the diagnosis for the blower motor resistor. If not OK, replace the faulty blower motor switch.

COMPRESSOR

When investigating an air conditioning related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, in gear or neutral, engine temperature, and any other special condition.

Noises that develop during air conditioning operation can often be misleading. For example: What sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering, generator or air pump). Improper drive belt tension can cause a misleading noise when the compressor is engaged. The noise may not occur when the compressor is disengaged.

Drive belt(s) are speed sensitive. At different engine speeds and depending upon belt tension, belt(s) can develop noises that are mistaken for a compressor noise.

(1) Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Switch the compressor on and off several times to clearly identify the compressor noise. Listen to the compressor clutch while engaged and disengaged.

(2) To duplicate a high-ambient temperature condition (high head pressure), restrict the air flow through the condenser. Install a manifold gauge set

DIAGNOSIS AND TESTING (Continued)

to make sure that the discharge pressure does not exceed 2070 kPa (300 psi).

(3) Tighten all compressor mounting bolts, the clutch mounting nut, the clutch coil mounting screws and the compressor drive belt to the correct specifications.

(4) Check the refrigerant hoses for rubbing or interference, which can cause unusual noises.

(5) Check the refrigerant system charge. See Charging Refrigerant System in this group.

(6) Check the compressor noise as in Step 1.

(7) If the noise still exists, loosen the compressor mounting bolts and tighten again. Repeat Step 1.

(8) If the noise continues, replace the compressor and repeat Step 1.

COMPRESSOR CLUTCH COIL

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. The battery must be fully-charged before performing the following tests. Refer to Group 8A - Battery for more information.

(1) Connect an ammeter (0-10 ampere scale) in series with the clutch coil terminal. Use a voltmeter (0-20 volt scale) with clip-type leads for measuring the voltage across the battery and the compressor clutch coil.

(2) With the heater-A/C mode control switch in any A/C mode, and the blower motor switch in its lowest speed position, start the engine and run it at normal idle.

(3) The compressor clutch coil voltage should read within two volts of the battery voltage. If there is voltage at the clutch coil, but the reading is not within two volts of the battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as required. If there is no voltage reading at the clutch coil, refer to the Powertrain Diagnostic Procedures manual for testing of the compressor clutch circuit. The following components must be checked and repaired as required before you can complete testing of the clutch coil:

- Fuses in the fuseblock module and the power distribution center
- Heater-A/C mode control switch
- Compressor clutch relay
- Fin sensing cycling clutch switch
- Low/high pressure cut-off switch
- Powertrain control module.

(4) The compressor clutch coil is acceptable if the current draw measured at the clutch coil is 2.0 to 3.7 amperes with electrical system voltage at 11.5 to 12.5 volts. This should only be checked with the work area temperature at 21°C (70°F). If system voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until the system voltage drops below 12.5 volts.

(a) If the clutch coil current reading is 5 amperes or more, the coil is shorted and should be replaced.

(b) If the clutch coil current reading is zero, the coil is open and should be replaced.

COMPRESSOR CLUTCH RELAY

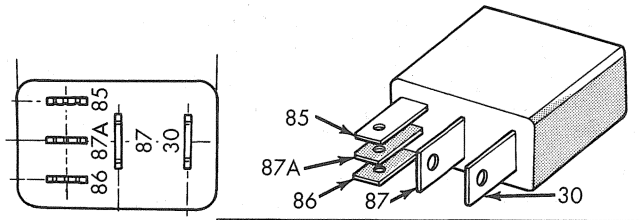
For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

The compressor clutch relay is located in the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location. Remove the relay from the PDC to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75±5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Circuit Test in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Compressor Clutch Relay

CIRCUIT TEST

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) The relay common feed terminal cavity (30) is connected to fused battery feed. There should be battery voltage at this cavity at all times. If OK, go to Step 2. If not OK, repair the open circuit to the PDC as required.

(2) The relay normally closed terminal (87A) is not used in this application. Go to Step 3.

DIAGNOSIS AND TESTING (Continued)

(3) The relay normally open terminal cavity (87) is connected to the compressor clutch coil. There should be continuity between this cavity and the A/C compressor clutch relay output circuit cavity of the compressor clutch coil connector. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) The coil battery terminal cavity (86) is connected to fused ignition switch output. There should be battery voltage at this cavity with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the fuseblock module as required.

(5) The coil ground terminal cavity (85) is switched to ground through the Powertrain Control Module (PCM). There should be continuity between this cavity and the A/C compressor clutch relay control circuit cavity of the PCM connector C (gray) at all times. If not OK, repair the open circuit as required.

FIN SENSING CYCLING CLUTCH SWITCH

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. Use a volt/ohmmeter to test the switch. Verify that the refrigerant system has the correct refrigerant charge. Check that the low/high pressure cut-off switch is functional, and confirm that the compressor clutch is operational before testing the cycling clutch switch.

(1) Turn the ignition switch and the heater-A/C mode control switch to the On position. Check for battery voltage at the A/C select signal circuit cavity of the fin sensing cycling clutch switch connector. If OK, go to Step 2. If not OK, repair the open circuit to the heater-A/C mode control switch as required.

(2) Turn the ignition switch to the Off position. Check for continuity between the ground circuit cavity of the cycling clutch switch connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the circuit to ground as required.

(3) With the ambient temperature between 20°C-30°C (68°F- 90°F), start the engine and run the air conditioning system. The clutch should cycle on and off two to three times per minute. If the clutch fails to cycle at this rate in these temperatures, replace the faulty cycling clutch switch.

NOTE: If the ambient temperature is above 32°C (90°F) the clutch may stay engaged and not cycle due to the high heat load. This condition is normal.

LOW/HIGH PRESSURE CUT-OFF SWITCH

(1) Verify that the refrigerant system has the correct refrigerant charge.

(2) Turn the ignition switch to the On position. Set the heater-A/C mode control switch in the Max A/C position, and turn the blower motor switch to the High position.

(3) Check for continuity between the low/high pressure switch terminals. There should be continuity. If OK, repair the circuits to the powertrain control module and the clutch cycling switch as required. If not OK, replace the faulty switch.

EXPANSION VALVE

Tests must be made at an ambient temperature of 21-29°C (70-85°F).

(1) Close the windows and operate the engine at 1,000 rpm. Set the air conditioning controls to Max A/C, blower motor on High speed, and the temperature control lever in the Warm position (extreme right). Disconnect and plug the water valve vacuum hose in the engine compartment. Disconnect the fin sensing cycling clutch switch connector. Attach a manifold gauge set.

(2) Operate the air conditioning system for at least five minutes to stabilize the system, and to provide sufficient reheat to load the evaporator. The pressure at the discharge service port should reach 966-1656 kPa (140-240 psi). If this head pressure cannot be obtained, check the refrigerant system charge level.

WARNING: EXTREME CARE MUST BE USED WHEN HANDLING LIQUID CARBON DIOXIDE (CO^2), AS SKIN INJURY CAN OCCUR. PROTECTIVE GLOVES SHOULD BE WORN.

(3) Apply liquid carbon dioxide (CO^2) to the expansion valve control head (completely cover the head) for a minimum of 30 seconds. Observe the manifold gauge set. The evaporator suction pressure must drop to below 50 kPa (7.25 psi). If this reading is not obtained, the valve is faulty and must be replaced.

(4) Remove the liquid carbon dioxide (CO^2) from the control head. Observe the manifold gauge set. The evaporator suction pressure must increase to a minimum of 262 kPa (38 psi), and then stabilize to a pressure of 172-240 kPa (25-35 psi). If these readings are not obtained, the valve is faulty and must be replaced.

(5) Set the engine speed at 1,000 rpm and the blower motor on High speed. The suction pressure should be 138-207 kPa (20-30 psi). If the discharge pressure is higher than 1656 kPa (240 psi), check for a restricted discharge line. Also check the engine cooling system for overheating, air trapped in the system, or a faulty radiator/condenser fan or drive. If the discharge pressure is less than 966 kPa (140 psi), check the compressor gaskets and discharge reeds.

REFRIGERANT SYSTEM SIGHT GLASS

The sight glass is a refrigerant level indicator (Fig. 5). To check the refrigerant level, clean the sight glass and start the vehicle engine. Set the air conditioning control to Max A/C, the blower motor switch

DIAGNOSIS AND TESTING (Continued)

on High speed, and the temperature control lever in the full left (Cool) position. The room temperature should be at least 21°C (70°F). After operating the system for a few minutes under these conditions, check the sight glass.

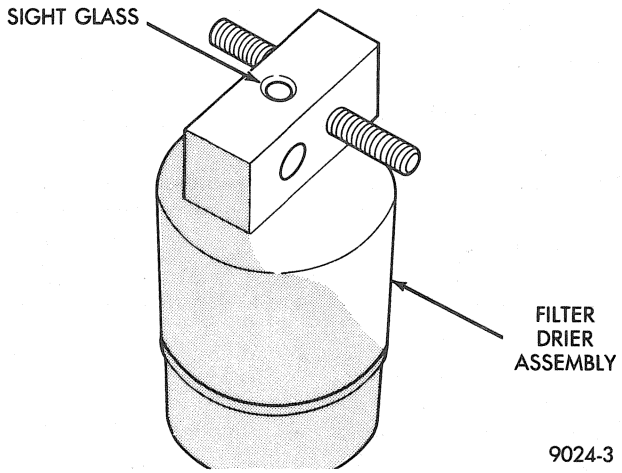


Fig. 5 Filter-Drier - Typical

(1) If the sight glass is clear, the compressor clutch is engaged, the compressor discharge line is warm, and the compressor inlet line is cool; the refrigerant system has a full charge.

(2) If the sight glass is clear, the compressor clutch is engaged, and there is no temperature difference between the compressor inlet and discharge lines; the refrigerant system is empty, or nearly empty. Connect a pressure gauge to the compressor discharge port. If the gauge reads less than 207 kPa (30 psi) the low/high pressure cut-out switch has failed.

(3) If the sight glass is clear and the compressor clutch is disengaged; the clutch coil or the clutch control circuit is faulty. Perform the low/high pressure cut-off switch test to determine if the clutch circuit is open because of a low refrigerant system charge.

(4) If the sight glass shows foam or bubbles, the system could be low on refrigerant. Some bubbles may appear in the sight glass when the room temperature is above 43°C (110°F) or below 21°C (70°F).

(5) Adjust the engine speed to 1,300 rpm and set the blower motor switch on High speed. Then block the air flow through the condenser to increase the compressor discharge pressure to 1522-1724 kPa (225-250 psi). If the sight glass still shows bubbles or foam, see A/C Performance in this group for diagnosis.

REFRIGERANT SYSTEM LEAKS

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE LEAK TESTING THE SYSTEM.

If the air conditioning system is not cooling properly, determine if the refrigerant system is fully-charged. See A/C Performance in this group. If the refrigerant system is low or empty, a leak at a line, fitting, or component seal is likely. Fittings, lines, or components that appear to be oily indicate a possible refrigerant leak. To detect a leak in the refrigerant system, perform one of the following procedures:

SYSTEM EMPTY

(1) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group.

(2) Connect and dispense 0.283 kPa (0.6 lbs. or 10 oz.) of R-134a refrigerant into the evacuated refrigerant system. See Refrigerant System Charge in this group.

(3) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(4) With the engine not running, use a electronic R-134a leak detector and search for leaks. Move the leak detector probe slowly along the bottom side of all lines and fittings, because R-134a is heavier than air.

(5) To inspect the evaporator core for leaks, insert the leak detector probe into the center panel outlet. Set the blower motor switch to Low speed and the mode control switch in the Max A/C mode.

SYSTEM LOW

(1) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(2) Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run with the air conditioning system on for five minutes.

(3) With the engine not running, use a electronic R-134a leak detector and search for leaks. Move the leak detector probe slowly along the bottom side of all lines and fittings, because R-134a is heavier than air.

(4) To inspect the evaporator core for leaks, insert the leak detector probe into the center panel outlet. Set the blower motor switch to Low speed and the mode control switch in the Max A/C mode.

SERVICE PROCEDURES

REFRIGERANT RECOVERY

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE RECOVERING REFRIGERANT.

R-134a refrigerant is a hydrofluorocarbon (HFC) that does not contain chlorine. A R-134a refrigerant recovery/recycling station that meets SAE Standard

SERVICE PROCEDURES (Continued)

J2210 must be used to recover the refrigerant. Refer to the operating instructions provided with the equipment for proper operation.

REFRIGERANT SYSTEM EVACUATE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE EVACUATING THE SYSTEM.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be charged. Moisture and air mixed with the refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Evacuating will boil the moisture out of the refrigerant system at near room temperature. To evacuate the refrigerant system, use the following procedure:

(1) Connect a suitable charging station and manifold gauge set to the vehicle.

(2) Open the low and high side valves and start the vacuum pump. When the suction gauge reads 88 kPa (26 in. Hg.) vacuum or greater, close all of the valves and turn off the vacuum pump. If the system fails to reach the specified vacuum, the system has a leak that must be corrected. If the system maintains the specified vacuum for five minutes, restart the vacuum pump. Then open the suction and discharge valves and evacuate an additional ten minutes.

(3) Close all of the valves. Turn off and disconnect the vacuum pump.

(4) The refrigerant system is now ready to be charged with refrigerant.

REFRIGERANT SYSTEM CHARGE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE CHARGING THE REFRIGERANT SYSTEM.

After the system has been tested for leaks and evacuated, a refrigerant charge can be injected into the system. See Refrigerant Charge Capacity for the proper amount of the refrigerant charge. Charge the system using a recovery/recycling/charging station approved for R-134a refrigerant. This device must meet SAE Standard J2210. Refer to the instructions provided with the equipment for proper operation.

REFRIGERANT CHARGE CAPACITY

The R-134a system charge capacity is 0.9 kg (32 ozs.).

REFRIGERANT OIL LEVEL

When an air conditioning system is assembled at the factory, all components (except the compressor) are refrigerant oil free. After the system has been charged and operated, the oil in the compressor is dispersed through the refrigerant system. The filter-drier, evaporator, condenser, and compressor will retain a significant amount of oil.

It is important to have the correct amount of oil in the refrigerant system. This will ensure proper lubrication of the compressor. Too little oil will result in damage to the compressor. Too much oil will reduce the cooling capacity of the system.

It will not be necessary to check oil level in the compressor or to add oil, unless there has been an oil loss. This may be due to a rupture or leak from a refrigerant line, a compressor shaft seal, an evaporator, or a condenser. If a rupture occurs, add 1 ounce of oil to the system after the repair has been made. Oil loss at a leak point will be evident by the presence of a wet, shiny surface around the leak.

Add an additional 30 ml (1 fluid oz.) of refrigerant oil when a filter-drier, evaporator, or condenser is replaced. When a compressor is replaced, the oil must be drained from the old compressor and measured. Drain all the oil from the new compressor, then fill the new compressor with the same amount of oil that was drained out of the old compressor.

REMOVAL AND INSTALLATION

COMPRESSOR

The compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch or clutch coil, the engine, the cylinder head, or the generator.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect the battery negative cable.

(2) Loosen and remove the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(3) Disconnect the compressor clutch coil wiring.

(4) Recover the refrigerant from the refrigerant system as described in this group.

(5) Remove the refrigerant lines from the compressor. Install plugs in, or tape over, all of the open refrigerant fittings.

(6) Remove the compressor mounting bolts, and lift the compressor from the mounting bracket (Fig. 6) or (Fig. 7).

REMOVAL AND INSTALLATION (Continued)

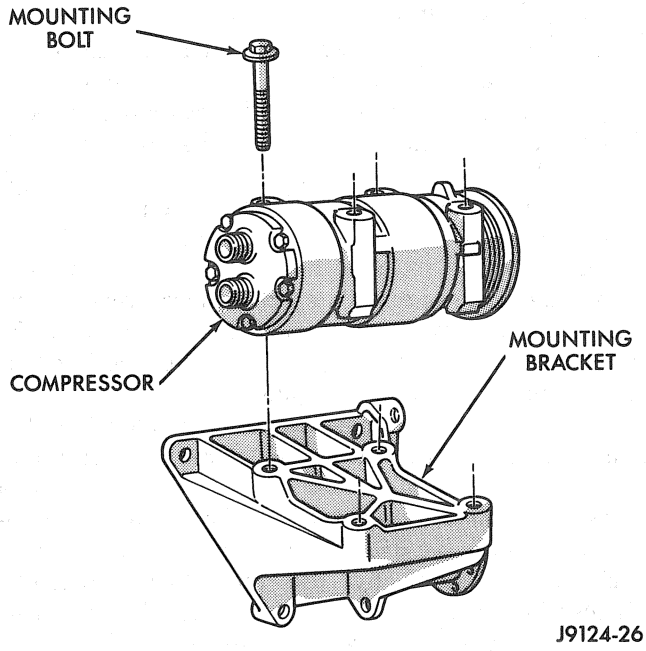


Fig. 6 Compressor and Mounting Bracket -LHD

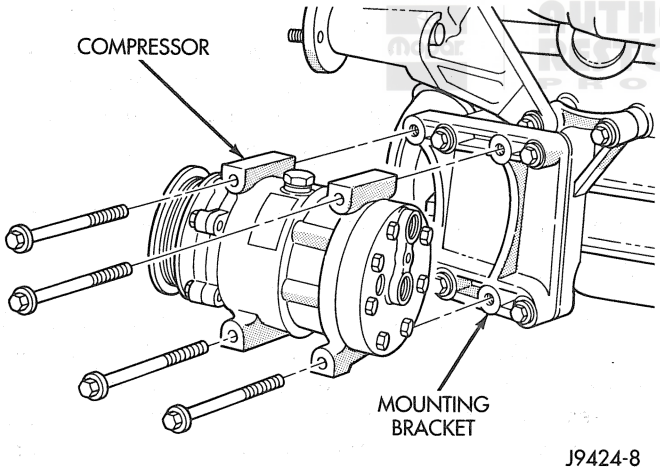


Fig. 7 Compressor and Mounting Bracket -RHD

INSTALLATION

NOTE: If a replacement compressor is being installed, be certain to check the oil level. See Refrigerant Oil Level in this group.

(1) If the compressor mounting bracket was removed, install the bracket to the engine. Tighten the mounting bolts to 27 N·m (20 ft. lbs.).

(2) Install the compressor on the mounting bracket. Tighten the bolts to 27 N·m (20 ft. lbs.).

(3) Remove the tape or plugs from all of the refrigerant fittings, and install the refrigerant lines on the compressor.

(4) Install the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(5) Connect the compressor clutch coil wiring.

(6) Connect the battery negative cable.

(7) Evacuate and charge the refrigerant system as described in this group.

COMPRESSOR CLUTCH

The refrigerant system can remain fully-charged during compressor clutch, pulley, or coil replacement. The compressor clutch can be serviced in the vehicle.

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(3) Remove the compressor mounting bolts and lift the compressor from the mounting bracket. Support the compressor to work on clutch.

(4) Insert the two pins of the spanner wrench (Special Tool C-4489) into the holes of the clutch plate. Hold the clutch plate stationary and remove the hex nut (Fig. 8).

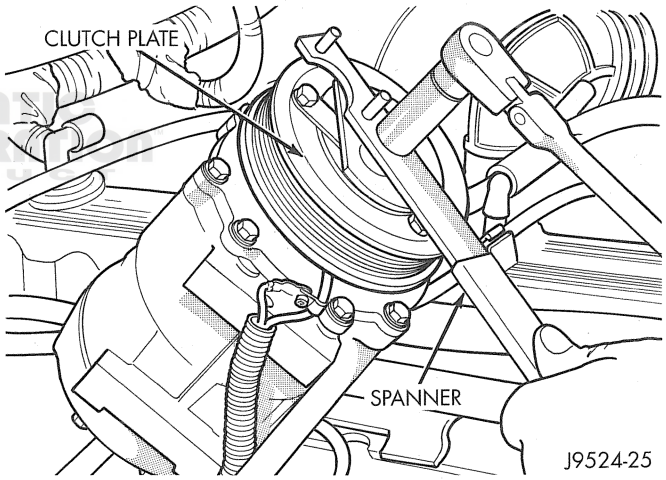


Fig. 8 Clutch Nut Remove

(5) Remove the clutch plate with a puller (Special Tool C-6461) (Fig. 9).

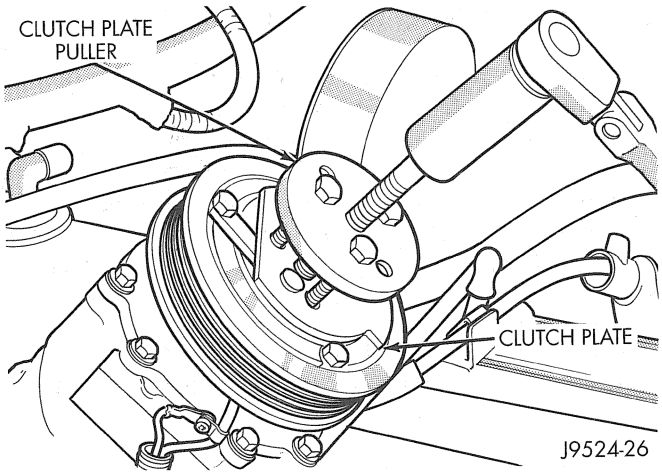


Fig. 9 Clutch Plate Remove

REMOVAL AND INSTALLATION (Continued)

(6) Remove the compressor shaft key and the clutch shims.

(7) Remove the external front housing snap ring with snap ring pliers (Fig. 10).

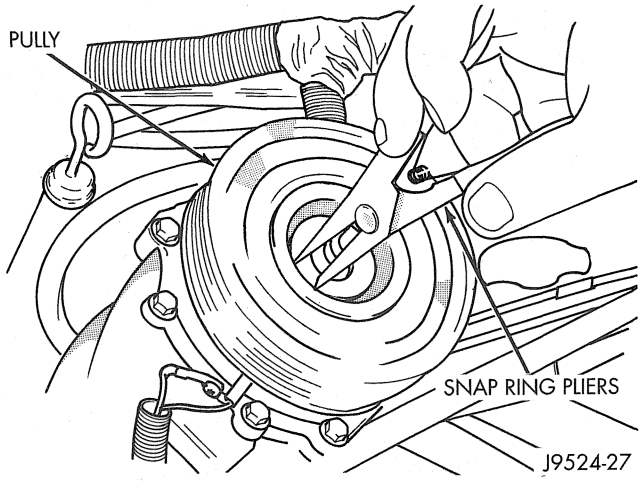


Fig. 10 External Snap Ring Remove

(8) Install the lip of the rotor puller (Special Tool C-6141-1) into the snap ring groove exposed in the previous step, and install the shaft protector (Special Tool C-6141-2) (Fig. 11).

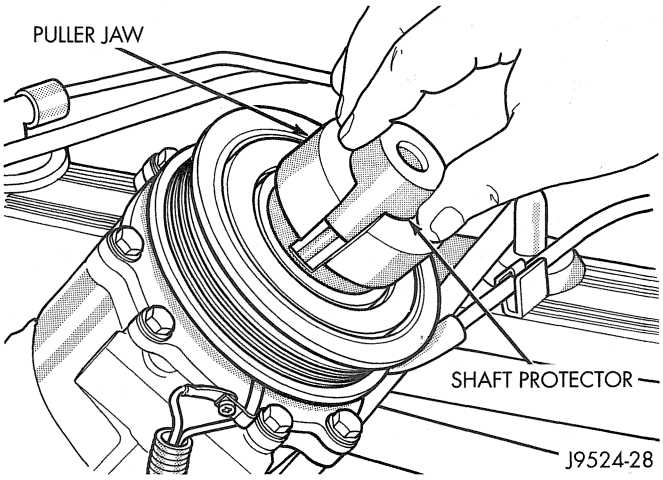


Fig. 11 Shaft Protector and Puller

(9) Install the puller through-bolts (Special Tool C-6461) through the puller flange and into the jaws of the rotor puller and tighten (Fig. 12). Turn the puller center bolt clockwise until the rotor pulley is free.

(10) Remove the screw and retainer from the clutch coil lead wire on the compressor front housing (Fig. 13).

(11) Remove the snap ring from the compressor hub and remove the clutch field coil (Fig. 14).

INSTALLATION

(1) Install the clutch field coil and snap ring.

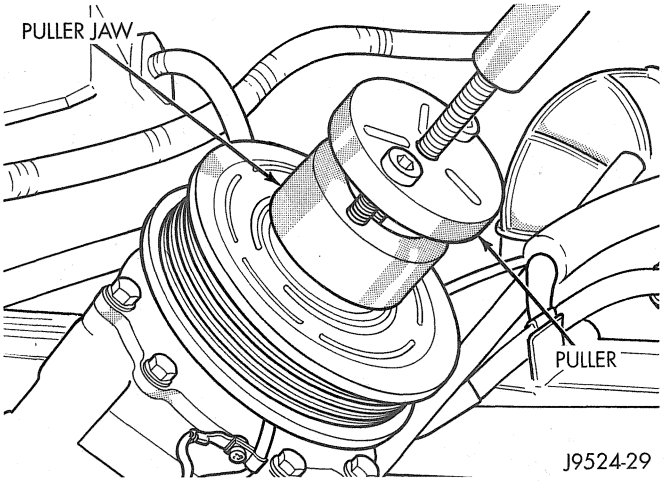


Fig. 12 Install Puller Plate

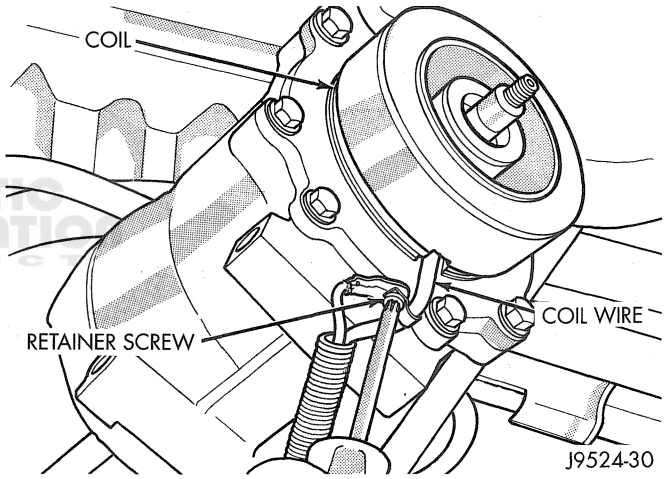


Fig. 13 Clutch Coil Lead Wire

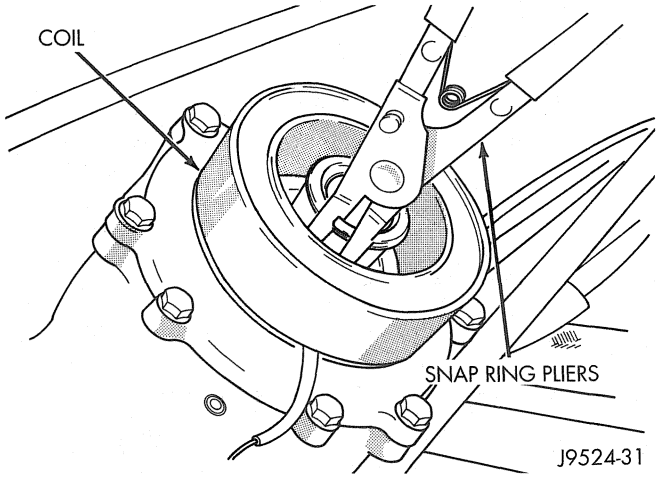


Fig. 14 Clutch Field Coil Snap Ring Remove

(2) Install the clutch coil wire lead retaining clip on the compressor front housing and tighten the retaining screw.

REMOVAL AND INSTALLATION (Continued)

(3) Align the rotor assembly squarely on the front compressor housing hub.

(4) Install the pulley bearing assembly with the installer (Special Tool C-6871) (Fig. 15). Thread the installer on the shaft, then turn the nut until the pulley assembly is seated.

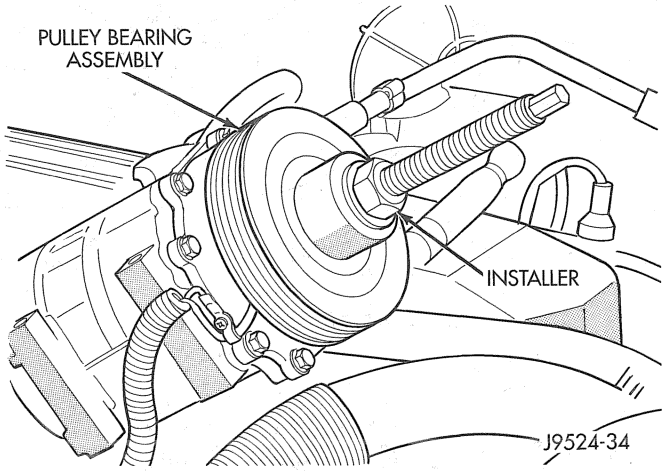


Fig. 15 Clutch Pulley Install

(5) Install the external front snap ring with snap ring pliers.

(6) Install the compressor shaft key and the original clutch shims on the compressor shaft.

(7) Install the clutch plate with the driver (Special Tool C-6463) (Fig. 16). Install the shaft hex nut and tighten to 14.4 N·m (10.5 ft. lbs.).

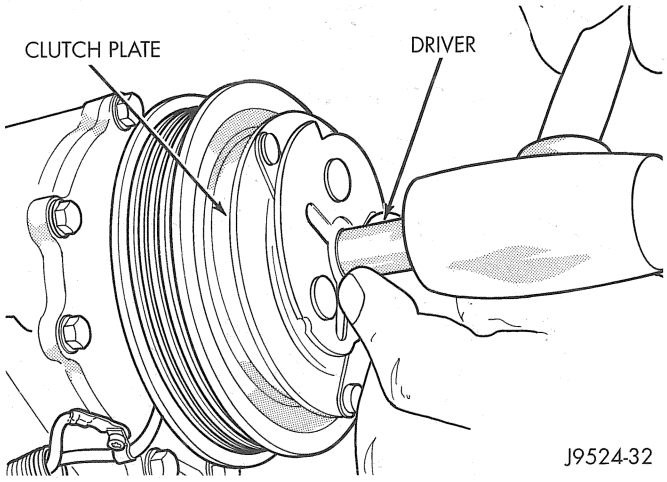


Fig. 16 Clutch Plate Driver

(8) Check the clutch air gap with a feeler gauge (Fig. 17). If the air gap does not meet the specification, add or subtract shims as required. The air gap specification is 0.41-0.79 mm (0.016-0.031 inch). If the air gap is not consistent around the circumference of the clutch, lightly pry up at the minimum variations. Lightly tap down at the points of maximum variation.

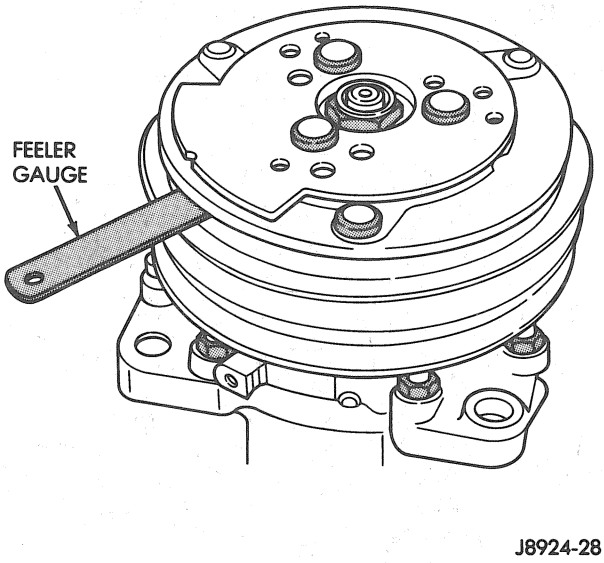


Fig. 17 Check Clutch Air Gap

NOTE: The air gap is determined by the spacer shims. When installing an original, or a new clutch assembly, try the original shims first. When installing a new clutch onto a compressor that previously did not have a clutch, use 0.040, 0.020, and 0.005 shims from the clutch hardware package that is provided with the new clutch.

(9) Reverse the remaining removal procedures to complete the installation.

CONDENSER

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

2.5L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.

(2) Drain the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

(3) Disconnect the fan shroud and the radiator hoses.

(4) Disconnect the automatic transmission cooler lines, if equipped.

(5) Recover the refrigerant from the refrigerant system as described in this group.

(6) Disconnect the refrigerant lines from the condenser. Either install plugs in, or tape over, all of the open refrigerant fittings.

(7) Unplug the wire harness from the low/high pressure cut-off switch (Fig. 18).

(8) Remove the radiator and the condenser as a unit. Refer to Group 7 - Cooling System for the procedures.

REMOVAL AND INSTALLATION (Continued)

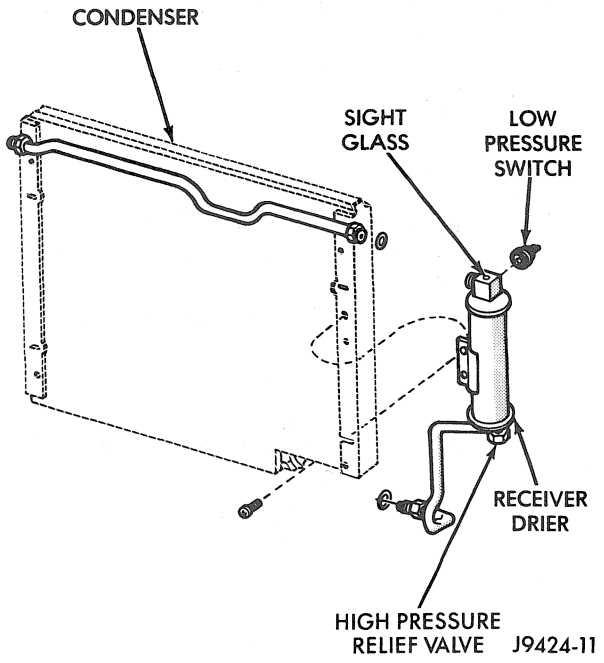


Fig. 18 Condenser/Filter-Drier - 2.5L Engine (LHD)

(9) Remove the retaining bolts, and separate the condenser from the radiator.

(10) Remove the filter-drier from the condenser. Install plugs in, or tape over, all open refrigerant fittings.

INSTALLATION

Add 30 ml (1 fluid oz.) of refrigerant oil to the refrigerant system, if the condenser or filter-drier is replaced.

(1) Remove the plugs or tape from the filter-drier fittings. Install the filter-drier onto the condenser.

(2) Install the condenser to the radiator. Tighten the retaining bolts.

(3) Install the radiator and condenser as a unit. Refer to Group 7 - Cooling System for the procedures.

(4) Plug the wire harness into the low/high pressure cut-off switch.

(5) Remove the plugs or tape from the refrigerant fittings. Connect the refrigerant lines to the condenser.

(6) Connect the automatic transmission cooler lines, if equipped.

(7) Connect the fan shroud and the radiator hoses.

(8) Connect the battery negative cable.

(9) Fill the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

(10) Evacuate and charge the refrigerant system as described in this group.

4.0L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.

(2) Recover the refrigerant from the refrigerant system as described in this group.

(3) Remove the upper radiator support crossmember.

(4) Remove the fan shroud and remove the electric fan from the radiator (Fig. 19). Refer to Group 7 - Cooling System for the procedures.

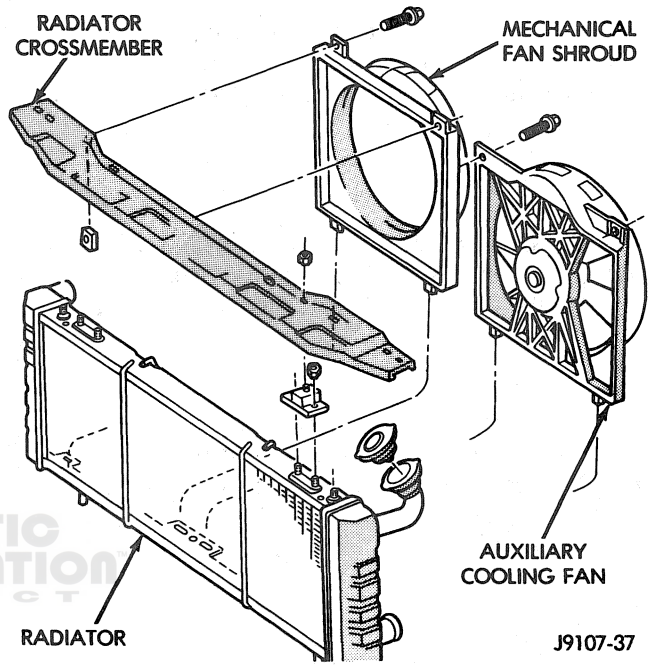


Fig. 19 Fan and Shroud - 4.0L Engine

(5) Remove the mechanical fan and drive from the water pump. Refer to Group 7 - Cooling System for the procedures.

(6) Remove the air cleaner assembly. Refer to Group 14 - Fuel System for the procedures.

(7) Remove the grille panel.

(8) Remove the brackets holding the condenser to the radiator.

(9) Carefully lift the radiator and move it toward the engine.

(10) Remove the refrigerant line brackets from the condenser, and disconnect the refrigerant lines. Install plugs in, or tape over, all of the open refrigerant fittings.

(11) Remove the condenser.

INSTALLATION

Add 30 ml (1 fluid oz.) of refrigerant oil to the refrigerant system, if the condenser is replaced.

(1) Install the condenser to the radiator, and install the unit in the vehicle.

(2) Unplug the refrigerant fittings. Connect the refrigerant lines to the condenser.

(3) Install the mechanical fan and drive on the water pump. Refer to Group 7 - Cooling System for the procedures.

REMOVAL AND INSTALLATION (Continued)

(4) Install the upper radiator support crossmember.
(5) Connect the fan shroud and electric fan to the radiator. Refer to Group 7 - Cooling System for the procedures.
(6) Connect the automatic transmission cooler lines, if equipped.
(7) Connect the battery negative cable.
(8) Fill the engine cooling system. Refer to Group 7 - Cooling System for the procedures.
(9) Evacuate and charge the refrigerant system as described in this group.

FILTER-DRIER

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

2.5L ENGINE

The filter-drier is removed with the condenser for this engine application. See Condenser in this group for the filter-drier removal and installation procedures.

4.0L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.
(2) Recover the refrigerant from the refrigerant system as described in this group.
(3) Disconnect the refrigerant lines from the filter-drier (Fig. 20). Install plugs in, or tape over, all of the open refrigerant fittings.

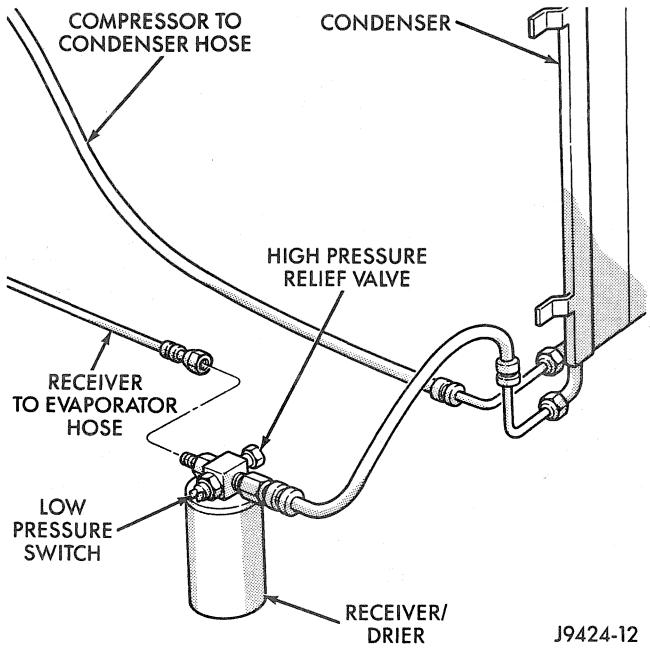


Fig. 20 Condenser and Filter-Drier - 4.0L Engine (LHD)

(4) Unplug the wire harness from the low/high pressure cut-off switch.
(5) Remove the nut attaching the filter-drier to the side sill weld stud.
(6) Remove the filter-drier.

INSTALLATION

Add 30 ml (1 fluid oz.) of refrigerant oil to the refrigerant system, if the filter-drier is being replaced.
(1) Install the filter-drier to the side sill weld stud and tighten the mounting nut.
(2) Plug the wire harness into the low/high pressure cut-off switch.
(3) Unplug the opened refrigerant fittings. Connect the refrigerant lines to the filter-drier.
(4) Connect the battery negative cable.
(5) Evacuate and charge the refrigerant system as described in this group.

EXPANSION VALVE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Recover the refrigerant from the refrigerant system as described in this group.
(2) Remove the engine coolant bottle and bracket.
(3) Disconnect the refrigerant lines from the expansion valve (Fig. 21). Install plugs in, or tape over, all of the open refrigerant fittings.

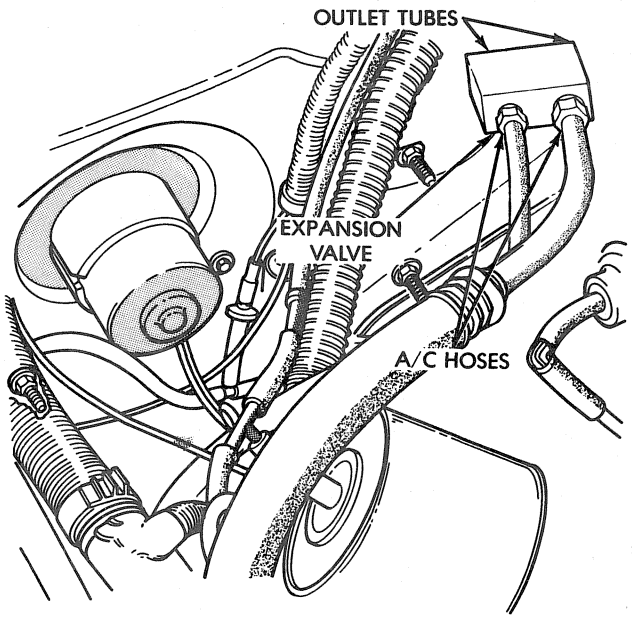


Fig. 21 Expansion Valve

REMOVAL AND INSTALLATION (Continued)

(4) Disconnect the expansion valve from the evaporator coil inlet and outlet tubes, and remove the expansion valve. Install plugs in, or tape over, all of the open refrigerant fittings.

INSTALLATION

(1) Remove the plugs from the refrigerant fittings. Install the expansion valve to the evaporator coil inlet and outlet tubes.
(2) Connect the refrigerant lines to the expansion valve.
(3) Install the engine coolant bottle and bracket.
(4) Evacuate and charge the refrigerant system as described in this group.

HEATER-A/C HOUSING

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect the battery negative cable.
(2) Drain the engine cooling system. Refer to Group 7 - Cooling System for the procedures.
(3) Remove the center console. Refer to Group 23 - Body Components for the procedures.
(4) Remove the instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures.
(5) Remove the heater hoses.
(6) If the vehicle has air conditioning, recover the refrigerant from the refrigerant system as described in this group. Disconnect the refrigerant lines at the expansion valve. Install plugs in, or tape over, all of the open refrigerant fittings.
(7) Remove the heater/evaporator housing side cover.
(8) Remove the heater core.
(9) Remove the defroster duct.
(10) Disconnect the vacuum hoses from the heater core housing vacuum motors.
(11) Remove the housing retaining nuts in the engine compartment. Remove the heater housing.

INSTALLATION

(1) Install the heater housing retaining nuts in the engine compartment.
(2) Install the vacuum hoses.
(3) Install the defroster duct.
(4) Install the heater core.
(5) Install the heater/evaporator housing side cover.
(6) Install the heater hoses.
(7) If the vehicle has air conditioning, unplug the refrigerant fittings and install the refrigerant lines to the expansion valve. Evacuate and charge the refrigerant system as described in this group.
(8) Install the instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures.
(9) Install the center console. Refer to Group 23 - Body Components for the procedures.
(10) Connect the battery negative cable.
(11) Fill the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

EVAPORATOR/BLOWER HOUSING

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect the battery negative cable.
(2) If the vehicle has air conditioning, recover the refrigerant from the refrigerant system as described in this group. Disconnect the refrigerant lines at the expansion valve. Install plugs in, or tape over, all of the open refrigerant fittings.
(3) Disconnect the blower motor wires and the blower vent tube.
(4) Remove the center console. Refer to Group 23 - Body Components for the procedures.
(5) Remove the lower instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures.
(6) Disconnect the electrical connections at the blower motor resistors and the fin sensing cycling clutch switch. Disconnect the vacuum hose at the vacuum motor (Fig. 22).

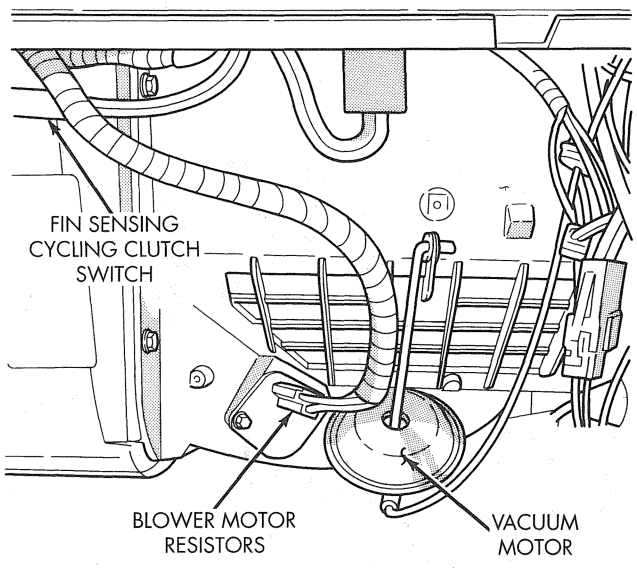


Fig. 22 Evaporator/Blower Housing Components

REMOVAL AND INSTALLATION (Continued)

(7) Cut the plastic retaining strap that holds the evaporator/blower housing to the heater-A/C housing (Fig. 23).

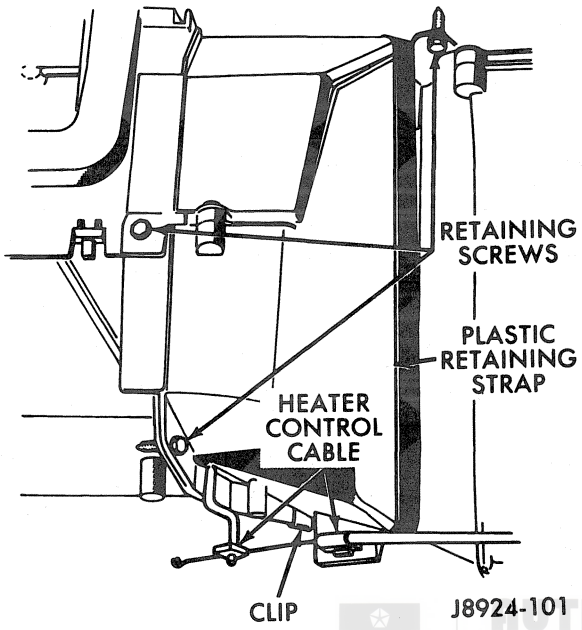


Fig. 23 Evaporator/Blower Housing

(8) Disconnect and remove the temperature control cable.

(9) Remove the clip at the rear of the blower housing flange, and remove the retaining screws.

(10) Remove the housing attaching nuts from the engine compartment side of the dash panel (Fig. 24). Remove the evaporator condensate drain tube.

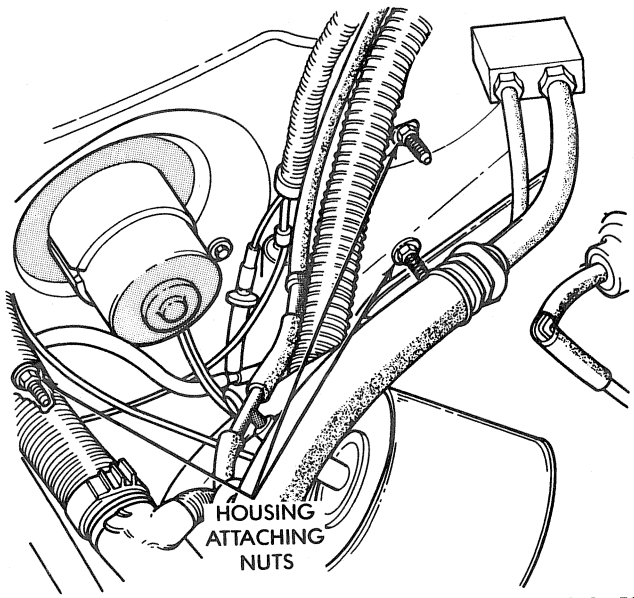


Fig. 24 Evaporator/Blower Housing Mounting

(11) Remove the passenger's cowl side trim panel, and remove the instrument panel support bolt.

(12) To disengage the housing studs from the dash panel, gently pull out on the passenger's side. Then rotate the housing downward and toward the rear of the vehicle. Remove the evaporator/blower housing.

INSTALLATION

(1) Position the evaporator/blower housing in the vehicle. Be sure to line up the housings using the alignment tabs, (Fig. 25) and (Fig. 26).

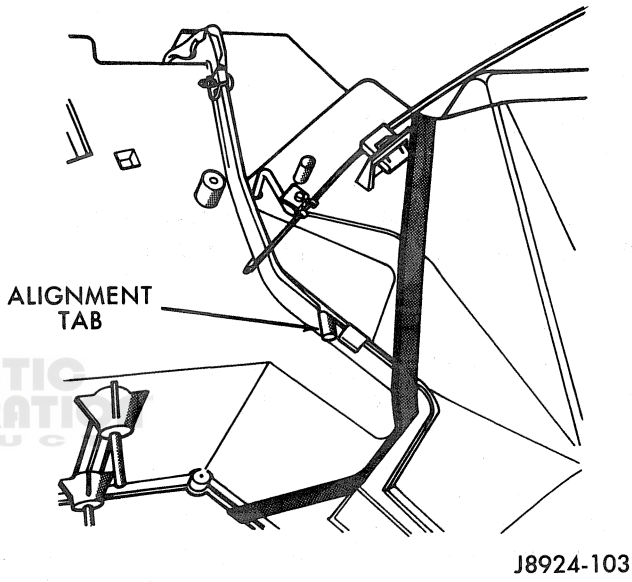


Fig. 25 Evaporator Housing Alignment Tab

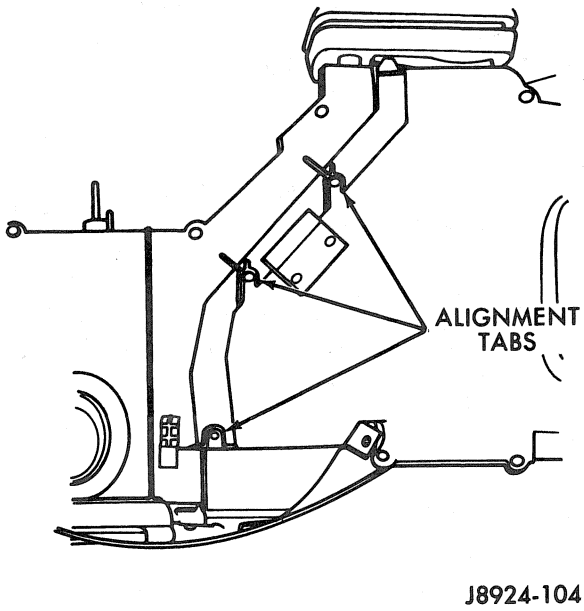


Fig. 26 Evaporator Housing Alignment Tabs

(2) Install the housing retaining screws and the rear housing clip.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When installing the evaporator/blower housing, use care not to trap wiring between the fresh air inlet housing and the dash panel.

(3) Install the housing retaining nuts on the engine compartment side of the dash panel.
(4) Unplug and connect the refrigerant lines at the expansion valve.
(5) Connect the blower motor wiring and blower vent tube.
(6) Connect the wiring at the blower motor resistors and the fin sensing cycling clutch switch.
(7) Connect the vacuum hose at the vacuum motor and attach the temperature control cable.
(8) Install the instrument panel bolt and cowl side trim panel.
(9) Install the lower instrument panel.
(10) Install the center console.
(11) Connect the battery negative cable.
(12) Evacuate and charge the refrigerant system as described in this group.
(13) Start the vehicle and check for proper heater-A/C system operation.

FIN SENSING CYCLING CLUTCH SWITCH

REMOVAL

(1) Disconnect the battery negative cable.
(2) Remove the center console. Refer to Group 23 - Body Components for the procedures.
(3) Remove the lower instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures.
(4) Pull the wiring harness retainer clip out of the housing (Fig. 27).
(5) Disconnect the switch electrical connection.
(6) Remove the wires from the retaining clip.
(7) Carefully remove the fin sensing cycling clutch switch probe from the evaporator fins.

INSTALLATION

(1) Carefully insert the fin sensing cycling clutch switch probe into the evaporator fins.
(2) Connect the switch electrical connection.
(3) Snap the wiring retainer clip into the hole in the housing.
(4) Install the lower instrument panel.
(5) Install the center console.
(6) Connect the battery negative cable.

EVAPORATOR COIL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

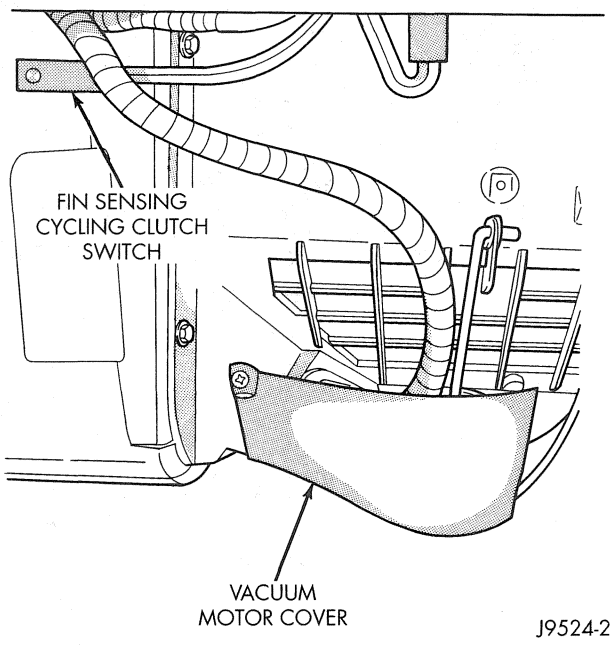


Fig. 27 Fin Sensing Cycling Clutch Switch

REMOVAL

(1) Remove the evaporator/blower housing as described in this group.
(2) Remove the top housing retaining screws, and remove the top of the evaporator housing (Fig. 28).

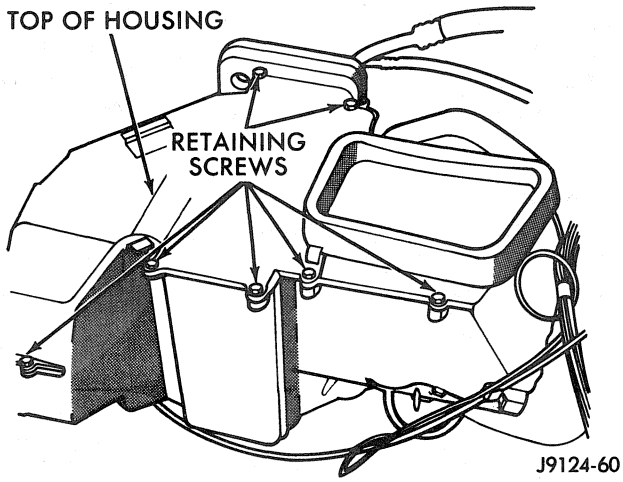


Fig. 28 Evaporator Housing Top Remove

(3) Remove the fin sensing cycling clutch switch from the evaporator as described in this group.
(4) Remove the evaporator retaining screws, and lift the evaporator out of the housing (Fig. 29).
(5) Remove the expansion valve from the evaporator.

INSTALLATION

Add 30 ml (1 fluid oz.) of refrigerant oil to the refrigerant system if the evaporator is replaced.

REMOVAL AND INSTALLATION (Continued)

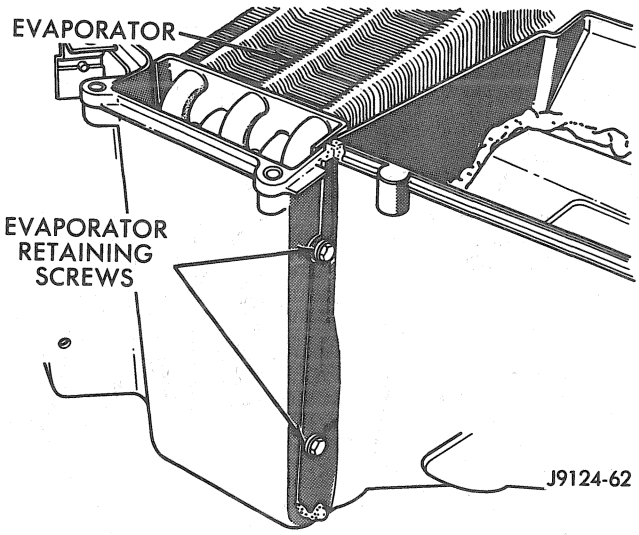


Fig. 29 Evaporator Remove

(1) Install the expansion valve on evaporator.
(2) Position the evaporator in the housing. Install and tighten the evaporator retaining screws.
(3) Install the fin sensing cycling clutch switch into the evaporator.
(4) Install the top on the evaporator housing.
(5) Install the evaporator/blower housing as described in this group.

HEATER CORE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Drain the engine cooling system. Refer to Group 7 - Cooling System for the procedures.
(2) Disconnect the heater hoses at the heater core tubes.
(3) Remove the heater/evaporator housing side cover.
(4) Remove the retaining screws and remove the heater core by pulling it straight out of the housing (Fig. 30).

INSTALLATION

(1) Install the heater core into the housing and install the retaining screws.
(2) Install the evaporator/blower housing side cover.
(3) Install the heater hoses to the heater core tubes.
(4) Fill the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

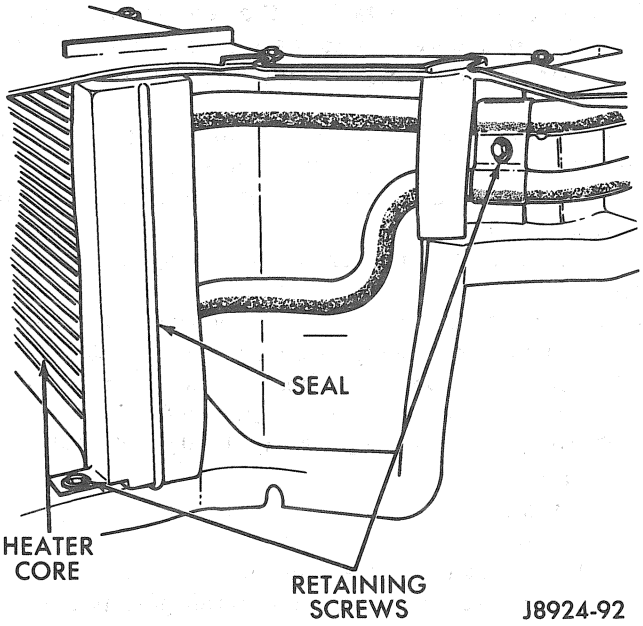


Fig. 30 Heater Core

HEATER-A/C CONTROLS

(1) Disconnect the battery negative cable.
(2) Remove the instrument panel bezel attaching screws and remove the instrument panel bezel (Fig. 31). The bezel is snap fit at the locations shown.

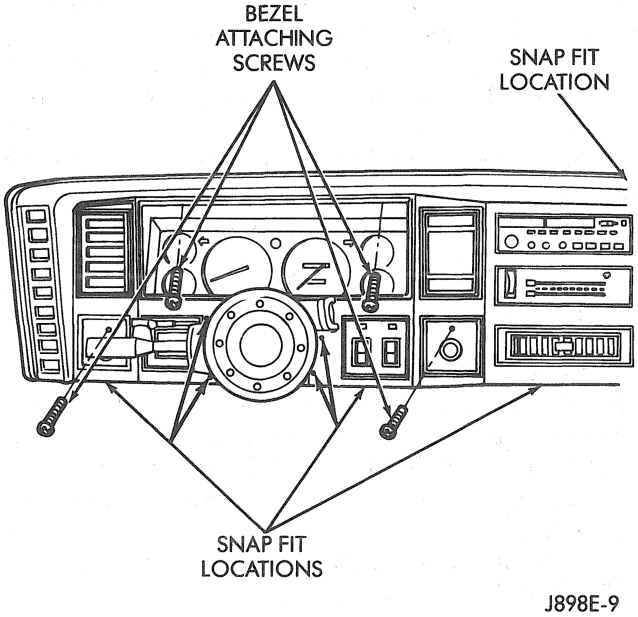


Fig. 31 Instrument Bezel Remove/Install

REMOVAL AND INSTALLATION (Continued)

(3) Remove the radio attaching screws (Fig. 32).

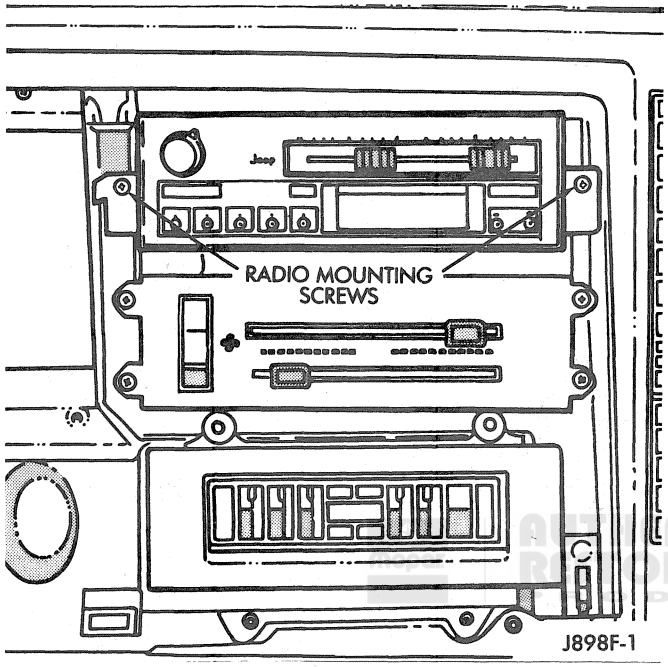


Fig. 32 Radio Remove/Install

(4) Disconnect the radio electrical connector, ground lead and antenna lead (Fig. 33).

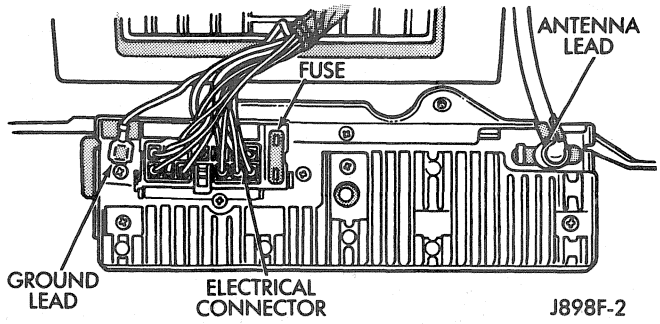


Fig. 33 Radio Connections Remove/Install

(5) Remove the heater-A/C control panel screws (Fig. 34).

(6) Remove the heater-A/C control electrical connectors (Fig. 35).

(7) Disconnect the vacuum hoses by releasing the locking tabs (Fig. 36).

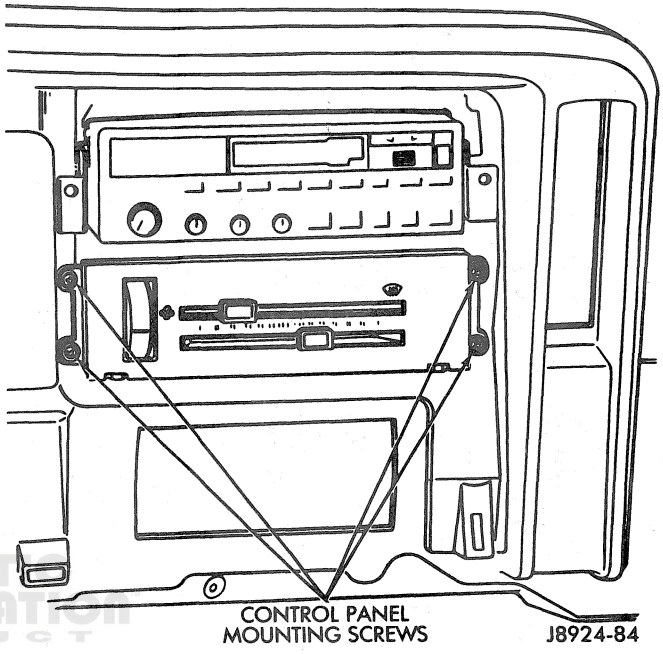


Fig. 34 Heater-A/C Control Panel Mounting Screws

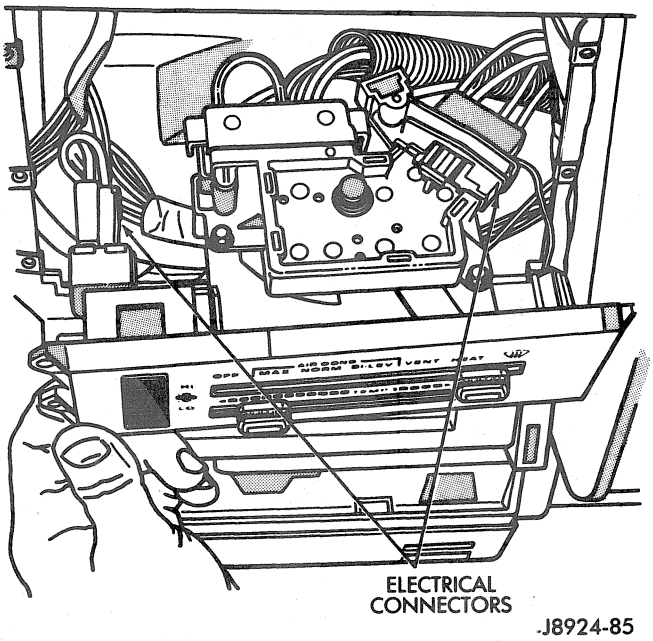


Fig. 35 Heater-A/C Control Electrical Connectors

REMOVAL AND INSTALLATION (Continued)

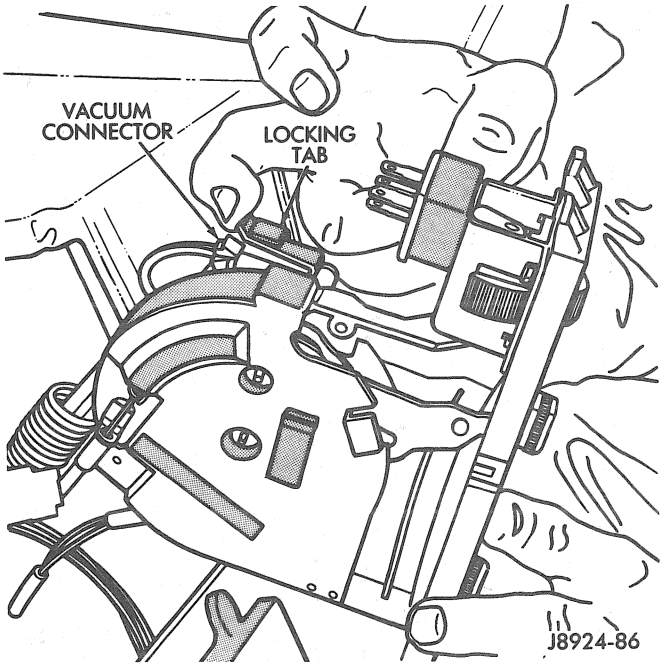


Fig. 36 Heater-A/C Vacuum Connector

(8) Remove the temperature control cable locking tab by using a screwdriver to release the tab (Fig. 37).

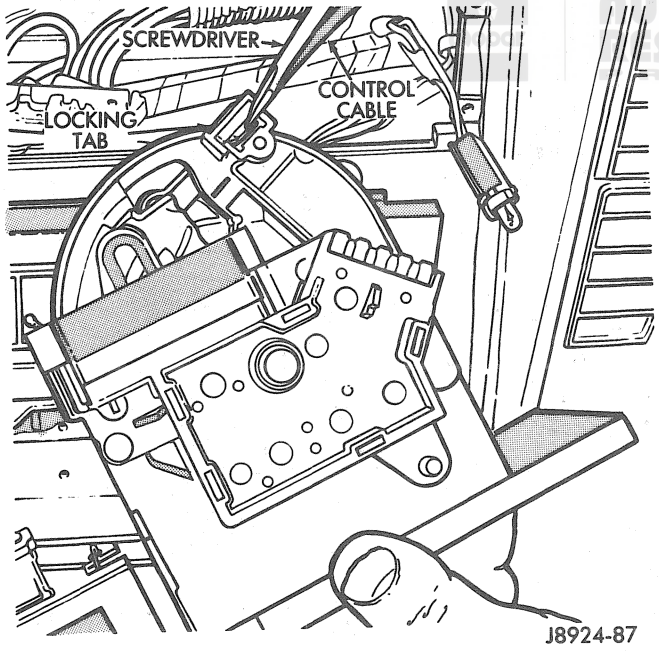


Fig. 37 Temperature Control Cable Locking Tab

(9) Remove the attaching ring on the end of the temperature control cable from the arm on the bottom of the control panel (Fig. 38).

(10) Reverse the removal procedures to install.

HEAT/DEFROST/PANEL DOOR ACTUATORS

(1) Disconnect the battery negative cable.

(2) Remove the center console. Refer to Group 23 - Body Components for the procedures.

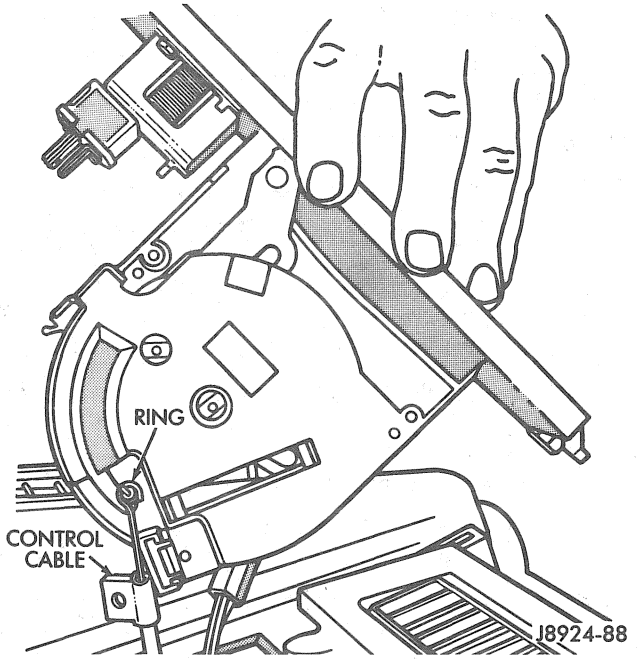


Fig. 38 Temperature Control Cable Attaching Ring

(3) Remove the lower instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures.

(4) Disconnect the vacuum hose(s) from the vacuum motor(s).

(5) Remove the vacuum motor attaching nuts and remove the vacuum motor from the bracket.

(6) Remove the vacuum motor linkage retaining clip and remove the rod from the door actuating lever (Fig. 39).

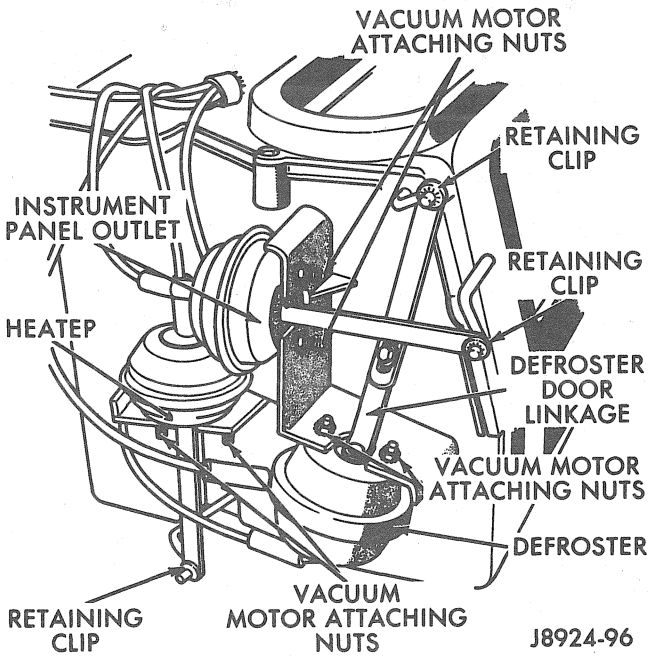


Fig. 39 Vacuum Motors Remove/Install

REMOVAL AND INSTALLATION (Continued)

(7) Reverse the removal procedures to install.

RECIRCULATION AIR DOOR VACUUM ACTUATOR

(1) Remove the vacuum motor cover (Fig. 40).

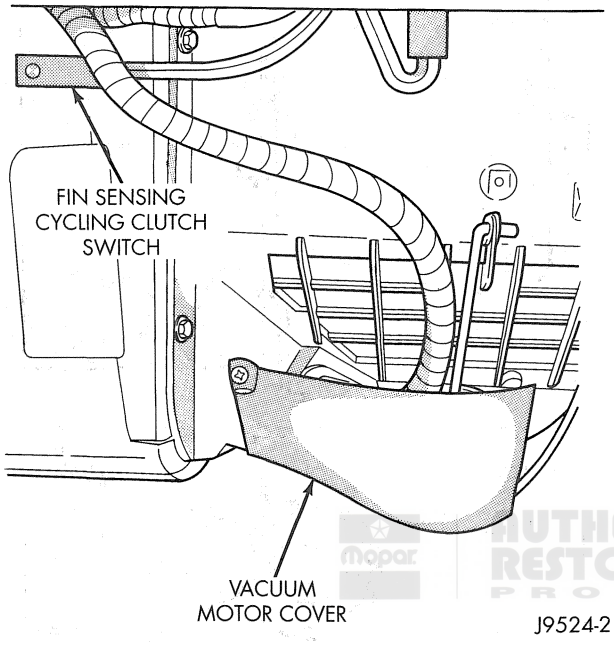


Fig. 40 Vacuum Motor Cover

(2) Disconnect the vacuum hose at the actuator (Fig. 41).

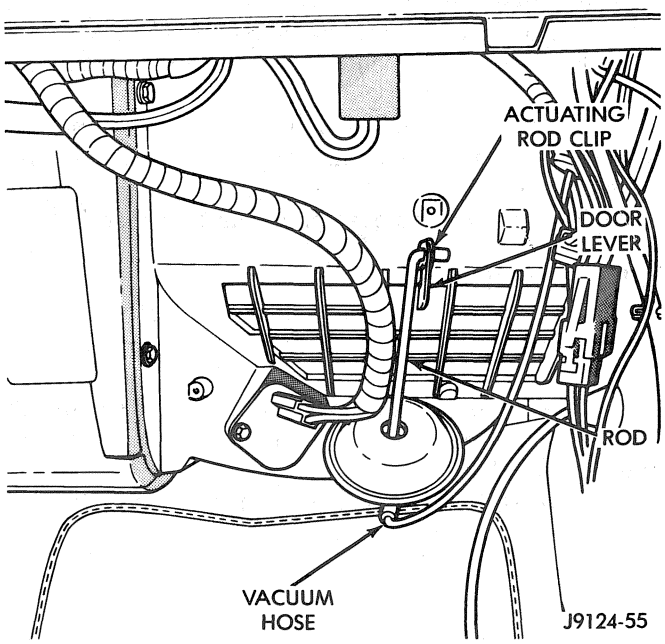


Fig. 41 Recirculation Air Door Vacuum Actuator

(3) Remove the actuating rod clip, and disengage the rod from the door lever.

(4) Remove the vacuum actuator retaining nuts, and then remove the vacuum actuator.

(5) Reverse the removal procedures to install.

TEMPERATURE CONTROL CABLE

(1) Disconnect the battery negative cable.

(2) Remove the heater-A/C controls as described in this group.

(3) Remove the lower instrument panel. Refer to Group 8E - Instrument Panel Systems for the procedures.

(4) Disconnect the cable retainer from the heater-A/C housing.

(5) Remove the push-on nut attaching the cable to the blend air door crank arm and remove the cable.

(6) Reverse the removal procedures to install.

BLOWER MOTOR

2.5L ENGINE

(1) Disconnect the battery negative cable.

(2) Disconnect the blower motor wiring (Fig. 42).

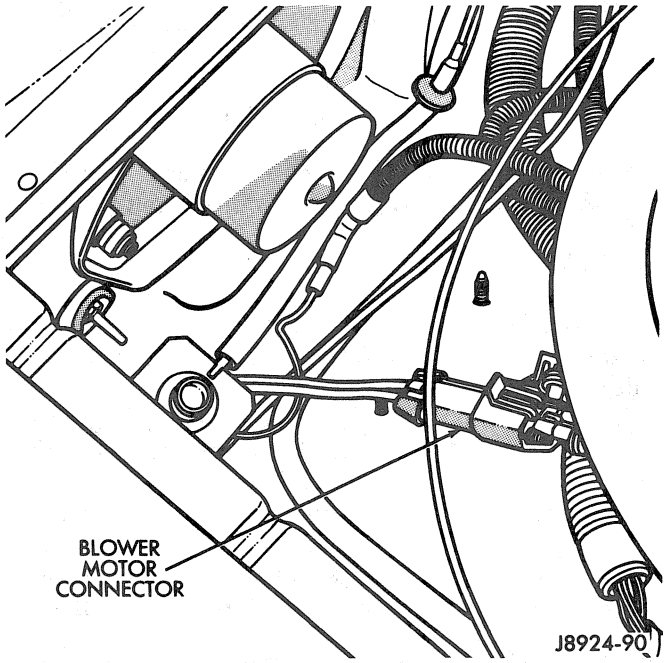


Fig. 42 Blower Motor Connector

REMOVAL AND INSTALLATION (Continued)

(3) Remove the blower motor mounting bolts (Fig. 43).

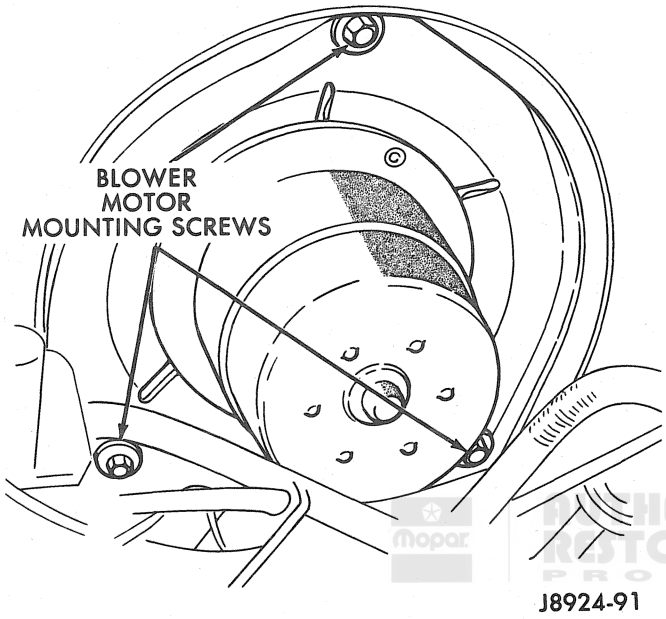


Fig. 43 Blower Motor Remove/Install

(4) Remove the blower motor and fan assembly.

(5) Remove the blower motor fan from the motor shaft for access to the motor attaching nuts (Fig. 44).

(6) Reverse the removal procedures to install.

NOTE: The ears, A and B, of the retainer clip must be over the flat surface on the motor shaft (Fig. 44).

4.0L ENGINE

(1) Disconnect the battery negative cable.

(2) Remove the washer fluid reservoir. Refer to Group 8K - Wiper and Washer Systems for the procedures.

(3) Disconnect the blower motor wiring (Fig. 42).

(4) Remove the blower motor mounting bolts (Fig. 43).

(5) Remove the blower motor and fan assembly.

(6) Remove the blower motor fan from the motor shaft for access to the motor attaching nuts (Fig. 44).

(7) Reverse the removal procedures to install.

NOTE: The ears, A and B, of the retainer clip must be over the flat surface on the motor shaft (Fig. 44).

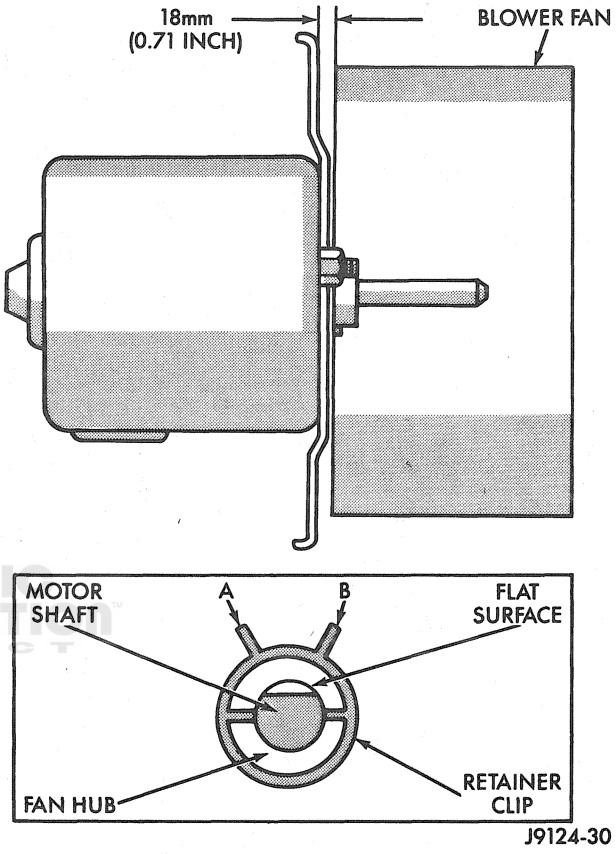


Fig. 44 Blower Fan

BLOWER MOTOR RESISTOR

(1) Disconnect the battery negative cable.

(2) Remove the vacuum motor cover retaining screw, and lower the cover.

(3) Unplug the blower motor resistor connector, remove the resistor retaining screws, and remove the resistor.

(4) Reverse the removal procedures to install.

BLOWER MOTOR SWITCH

(1) Disconnect the battery negative cable.

(2) Remove the heater-A/C controls as described in this group.

(3) Remove the screws fastening the blower motor switch to the rear of the heater-A/C control panel, and remove the switch.

(4) Reverse the removal procedures to install.

EMISSION CONTROL SYSTEMS

CONTENTS

	page		page
EVAPORATIVE EMISSION CONTROLS	10	ON-BOARD DIAGNOSTICS	1

ON-BOARD DIAGNOSTICS

INDEX

	page		page
GENERAL INFORMATION		LOAD VALUE	9
SYSTEM DESCRIPTION	1	MALFUNCTION INDICATOR LAMP (MIL)	1
DESCRIPTION AND OPERATION		MONITORED SYSTEMS	7
CIRCUIT ACTUATION TEST MODE	2	NON-MONITORED CIRCUITS	9
COMPONENT MONITORS	8	STATE DISPLAY TEST MODE	2
DIAGNOSTIC TROUBLE CODES	2	TRIP DEFINITION	8
HIGH AND LOW LIMITS	9		

GENERAL INFORMATION

SYSTEM DESCRIPTION

The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warm-up cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator (check engine) Lamp. Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example**, assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

NOTE: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, connect the DRB scan tool to the 16–way data link connector (Fig. 1) to erase all DTC's and extinguish the MIL.

Technicians can display stored DTC's by two different methods. Refer to Diagnostic Trouble Codes in this section. For DTC information, refer to charts in this section.

DESCRIPTION AND OPERATION

MALFUNCTION INDICATOR LAMP (MIL)

As a functional test, the MIL (check engine) illuminates at key-on before engine cranking. Whenever the Powertrain Control Module (PCM) sets a Diagnostic Trouble Code (DTC) that affects vehicle emissions, it illuminates the MIL. If a problem is

DESCRIPTION AND OPERATION (Continued)

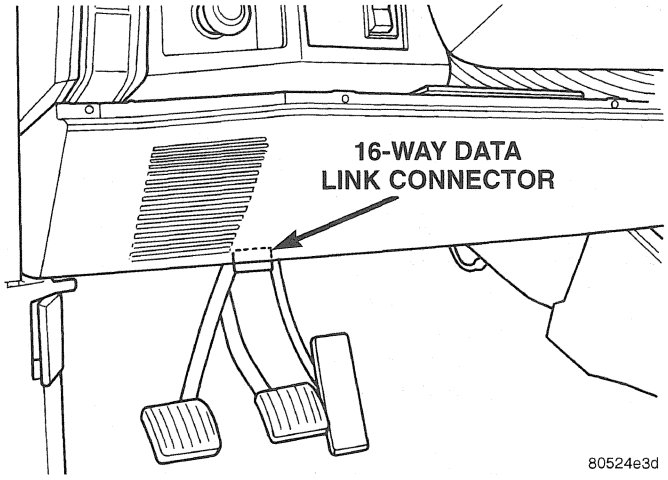


Fig. 1 Data Link (Diagnostic) Connector Location

detected, the PCM sends a message to the instrument cluster to illuminate the lamp. The PCM illuminates the MIL only for DTC's that affect vehicle emissions. There are some monitors that may take two consecutive trips, with a detected fault, before the MIL is illuminated. The MIL stays on continuously when the PCM has entered a Limp-In mode or identified a failed emission component. Refer to the Diagnostic Trouble Code charts in this group for emission related codes.

Also, the MIL either flashes or illuminates continuously when the PCM detects active engine misfire. Refer to Misfire Monitoring in this section.

Additionally, the PCM may reset (turn off) the MIL when one of the following occur:

- PCM does not detect the malfunction for 3 consecutive trips (except misfire and Fuel system Monitors).
- PCM does not detect a malfunction while performing three successive engine misfire or fuel system tests. The PCM performs these tests while the engine is operating within ± 375 RPM of and within 10 % of the load of the operating condition at which the malfunction was first detected.

STATE DISPLAY TEST MODE

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. Connect the DRB scan tool to the data link connector and access the state display screen. Then access either State Display Inputs and Outputs or State Display Sensors.

CIRCUIT ACTUATION TEST MODE

The Circuit Actuation Test Mode checks for proper operation of output circuits or devices the Powertrain Control Module (PCM) may not internally recognize. The PCM attempts to activate these outputs and allow an observer to verify proper operation. Most of the tests provide an audible or visual indication of device operation (click of relay contacts, fuel spray, etc.). Except for intermittent conditions, if a device functions properly during testing, assume the device, its associated wiring, and driver circuit work correctly. Connect the DRB scan tool to the data link connector and access the Actuators screen.

DIAGNOSTIC TROUBLE CODES

A Diagnostic Trouble Code (DTC) indicates the PCM has recognized an abnormal condition in the system.

The technician can display DTC's in two ways. The first way is to cycle the ignition switch and count the number of times the malfunction indicator (Check Engine) lamp on the instrument panel flashes on and off. The DRB scan tool provides the second method of displaying DTC's. Diagnostic trouble codes are the results of a system or circuit failure, but do not directly identify the failed component or components.

NOTE: For a list of DTC's, refer to the charts in this section.

OBTAINING DIAGNOSTIC TROUBLE CODES

USING DRB SCAN TOOL

WARNING: APPLY PARKING BRAKE AND/OR BLOCK WHEELS BEFORE PERFORMING ANY TEST ON AN OPERATING ENGINE.

(1) Connect the DRB scan tool to the data link (diagnostic) connector. This is located in the passengers compartment, below instrument cluster, and to the left of steering column (Fig. 1).

(2) Turn the ignition switch on, access Read Fault Screen. Record all the DTC's shown on the DRB scan tool. Observe the malfunction indicator (check engine) lamp on the instrument panel. The lamp should light for 2 seconds then go out (bulb check).

(3) To erase DTC's, use the Erase Trouble Code data screen on the DRB scan tool.

USING THE MALFUNCTION INDICATOR LAMP (MIL)

(1) Cycle the ignition key On - Off - On - Off - On within 5 seconds.

(2) Count the number of times the MIL (check engine lamp) on the instrument panel flashes on and off. The number of flashes represents the trouble

DESCRIPTION AND OPERATION (Continued)

code. There is a slight pause between the flashes representing the first and second digits of the code. Longer pauses separate individual two digit trouble codes.

DIAGNOSTIC TROUBLE CODE DESCRIPTIONS

MIL CODE	GENERIC SCAN TOOL CODE	HEX CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
11	P1391**	9D	Intermittent Loss of CMP or CKP	Intermittent loss of either camshaft or crankshaft position sensor
	or			
		28	No Crank Reference Signal at PCM	No crank reference signal detected during engine cranking.
	or			
	P1398**	BA	Misfire Adaptive Numerator at Limit	CKP sensor target windows have too much variation
12*			Battery Disconnect	Direct battery input to PCM was disconnected within the last 50 Key-on cycles.
13**	P1297	27	No Change in MAP From Start to Run	No difference recognized between the engine MAP reading and the barometric (atmospheric) pressure reading from start-up.
14**	P0107	24	MAP Sensor Voltage Too Low	MAP sensor input below minimum acceptable voltage.
	or			
	P0108	25	MAP Sensor Voltage Too High	MAP sensor input above maximum acceptable voltage.
	or			
	P1296	87	No 5 Volts To MAP Sensor	5 Volt output to MAP sensor open
15**	P0500	23	No Vehicle Speed Sensor Signal	No vehicle speed sensor signal detected during road load conditions.
	or			
	P0720	A6	Low Output Spd Sensr RPM, Above 15 MPH	Output Shaft Speed Sensor Circuit
17**	P0125	80	Closed Loop Temp Not Reached	Engine does not reach 20°F within acceptable limits.
	or			
17*		21	Engine Is Cold Too Long	Engine did not reach operating temperature within acceptable limits.
21**	P0131	9B	Upstream O2s Voltage Shorted to Ground	Tested at cold start only after start to run.
	or			
	P0133	66	Upstream O2 Sensor Slow Response	Upstream oxygen sensor response slower than minimum required switching frequency or value does not go below .29 and then above .78 volts.
	or			
	P0135	67	Upstream O2 Sensor Heater Failure	Upstream oxygen sensor heating element circuit malfunction. Tested at cold start only after start to run transfer.
	or			

DESCRIPTION AND OPERATION (Continued)

MIL CODE	GENERIC SCAN TOOL CODE	HEX CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
	P0137	9C	Downstream O2s Voltage Shorted to Ground	Tested at cold start only after start to run.
	or			
	P0138	7E	Downstream O2 Sensor Shorted to Voltage	Downstream oxygen sensor input voltage maintained above the normal operating range.
	or			
	P0141	69	Downstream O2 Sensor Heater Failure	Downstream oxygen sensor heating element circuit malfunction. Tested at cold start only after start to run transfer.
22**	P0117	1E	ECT Sensor Voltage Too Low	Engine coolant temperature sensor input below minimum acceptable voltage.
	or			
	P0118	1F	ECT Sensor Voltage Too High	Engine coolant temperature sensor input above maximum acceptable voltage.
23**	P0112	39	Intake Air Temp Sensor Voltage Low	Intake air temperature sensor input below the maximum acceptable voltage.
	or			
	P0113	3A	Intake Air Temp Sensor Voltage High	Intake air temperature sensor input above the minimum acceptable voltage.
24**	P0121	84	TPS Voltage Does Not Agree With MAP	TPS signal does not correlate to MAP sensor
	or			
	P0122	1A	Throttle Position Sensor Voltage Low	Throttle position sensor input below the minimum acceptable voltage
	or			
	P0123	1B	Throttle Position Sensor Voltage High	Throttle position sensor input above the maximum acceptable voltage.
25**	P0505	19	Idle Air Control Motor Circuits	A shorted or open condition detected in one or more of the idle air control motor circuits.
	or			
	P1294	8A	Target Idle Not Reached	Actual idle speed does not equal target idle speed.
27**	P0201	15	Injector #1 Control Circuit	Injector #1 output driver does not respond properly to the control signal.
	or			
	P0202	14	Injector #2 Control Circuit	Injector #2 output driver does not respond properly to the control signal.
	or			
	P0203	13	Injector #3 Control Circuit	Injector #3 output driver does not respond properly to the control signal.
	or			
	P0204	3D	Injector #4 Control Circuit	Injector #4 output driver does not respond properly to the control signal.
	or			
	P0205	45	Injector #5 Control Circuit	Injector #5 output driver does not respond properly to the control signal.
	or			

DESCRIPTION AND OPERATION (Continued)

MIL CODE	GENERIC SCAN TOOL CODE	HEX CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
	P0206	46	Injector #6 Control Circuit	Injector #6 output driver does not respond properly to the control signal.
31**	P0441	71	Evap Purge Flow Monitor Failure	Insufficient vapor flow detected during evaporative emission system operation. Tested at idle.
	or P0443	12	EVAP Purge Solenoid Circuit	An open or shorted condition detected in the duty cycle purge solenoid circuit.
33*		10	A/C Clutch Relay Circuit	An open or shorted condition detected in the A/C clutch relay circuit.
34*		0F	Speed Control Solenoid Circuits	An open or shorted condition detected in the Speed Control vacuum or vent solenoid circuits.
	or	57	Speed Control Switch Always Low	MUX speed control switch below volts.
37**	P0740	94	Torq Conv Clu, No RPM Drop At Lockup	Relationship between engine speed and vehicle speed indicates no torque converter clutch engagement.
	or P0743	0C	Torque Converter Clutch Soleniod CKT	An open or shorted condition detected in the torque converter part throttle unlock solenoid control circuit.
	or P1899	72	P/N switch Stuck In Park Or In Gear	Park/Neutral Switch Performance
41*		0B	Generator Field Not Switching Properly	An open or shorted condition detected in the generator field control circuit.
42*		65	Fuel Pump Relay Control Circuit	An open or shorted condition detected in the fuel pump relay control circuit.
	or	0A	Auto Shutdown Relay Control Circuit	An open or shorted condition detected in the auto shutdown relay circuit.
	or	2C	No ASD Relay Output Voltage at PCM	An Open condition detected In The ASD Relay Output Circuit.
	or	95	Fuel Level Sending Unit Volts Too Low	Circuit shorted to ground between PCM and fuel gauge sending unit.
	or	96	Fuel Level Sending Unit Volts Too High	Open circuit between PCM and fuel gauge sending unit.
	or	97	Fuel Level Unit No Change Over Miles	Sending unit reads low too long.
43**	P0300 or	6A	Multiple Cylinder Misfire	Misfire detected in multiple cylinders.

DESCRIPTION AND OPERATION (Continued)

MIL CODE	GENERIC SCAN TOOL CODE	HEX CODE	DRB SCAN TOOL DISPLAY	DESCRIPTION OF DIAGNOSTIC TROUBLE CODE
	P0301	6B	Cylinder #1 Misfire	Misfire detected in cylinder #1.
	or			
	P0302	6C	Cylinder #2 Misfire	Misfire detected in cylinder #2.
	or			
	P0303	6D	Cylinder #3 Misfire	Misfire detected in cylinder #3.
	or			
	P0304	6E	Cylinder #4 Misfire	Misfire detected in cylinder #4.
	or			
	P0305	AE	Cylinder #5 Misfire	Misfire detected in cylinder #5.
	or			
	P0306	AF	Cylinder #6 Misfire	Misfire detected in cylinder #6.
	or			
	P0351	2B	Ignition Coil #1 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
44**	P1492	9A	Battery Temp Sensor Voltage Too High	Battery temperature sensor input voltage above an acceptable range.
	or			
	P1493	99	Battery Temp Sensor Voltage Too Low	Battery temperature sensor input voltage below an acceptable range.
46***		06	Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
47***		05	Charging System Voltage Too Low	Battery voltage sense input below target charging during engine operation. Also, no significant change detected in battery voltage during active test of generator output circuit.
51**	P0171	77	Fuel System Lean	A lean air/fuel mixture has been indicated by an abnormally rich correction factor.
52**	P0172	76	Fuel System Rich	A rich air/fuel mixture has been indicated by an abnormally lean correction factor.
53**	P0601	02	Internal Controller Failure	PCM Internal fault condition detected.
54**	P0340	01	No Cam Signal at PCM	No camshaft signal detected during engine cranking or while running. Too many CKP signals without a CAM signal.
55*				Completion of fault code display on Check Engine lamp.
72**	P0420	70	Catalytic Converter Efficency Failure	Catalyst efficiency below required level.

* Check Engine Lamp (MIL) will not illuminate if this Diagnostic Trouble Code was recorded. Cycle Ignition key as described in manual and observe code flashed by Check Engine lamp.

** Check Engine Lamp (MIL) will illuminate during engine operation if this Diagnostic Trouble Code was recorded.

*** Generator Lamp illuminated

DESCRIPTION AND OPERATION (Continued)

MONITORED SYSTEMS

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator (Check Engine) Lamp will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the check engine lamp or a scan tool.

The following is a list of the system monitors:

- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor

All these system monitors require two consecutive trips with the malfunction present to set a fault.

Following is a description of each system monitor, and its DTC.

Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.

DTC 21—OXYGEN SENSOR (O2S) MONITOR

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the Catalyst and Fuel Monitors.

The O2S can fail in any or all of the following manners:

- slow response rate
- reduced output voltage
- dynamic shift
- shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

DTC 21—OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) shorted to voltage DTC, as well as a O2S heater DTC, the O2S fault MUST be repaired first. Before checking the O2S fault, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572 ° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The voltage readings taken from the O2S sensor are very temperature sensitive. The readings are not accurate below 300°C. Heating of the O2S sensor is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S sensor must be tested to ensure that it is heating the sensor properly.

The O2S sensor circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O2S sensor output voltage from the other effects.

DTC 43—MISFIRE MONITOR

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic convertor damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

DTC 51/52—FUEL SYSTEM MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the Air Fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

DESCRIPTION AND OPERATION (Continued)

The PCM is programmed to maintain the optimum air/fuel ratio of 14.7 to 1. This is done by making short term corrections in the fuel injector pulse width based on the O2S sensor output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual fuel-air ratio with the O2S sensor (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

DTC 64—CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S's sensor strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (check engine lamp) will be illuminated.

TRIP DEFINITION

For a component monitor to erase or turn off a MIL illumination for open/short diagnostics, the PCM must first recognize that the engine has operated for 2 minutes, 3 consecutive times, with no failures.

All system monitors, component rationality and functionality monitors have their own trip counters. Once the appropriate conditions have been met, the monitor will be run. If the monitor fails its test, the MIL will be illuminated after completion of the first or second failed test (1 trip or 2 trips). If conditions can be repeated for 3 consecutive trips with no malfunctions, the MIL will be turned off.

Anytime the MIL is illuminated, a DTC is stored. It takes three good trips without the condition present to extinguish the MIL. The DTC remains in PCM memory even though the MIL has been extinguished. Once the MIL is extinguished, the PCM must pass the diagnostic test for the most recent DTC for 40 warm-up cycles for the DTC to be erased from memory.

A warm-up cycle can best be described by the following:

- The engine must be running
- A rise of 40°F in engine temperature must occur from the time when the engine was started
- Engine coolant temperature must reach at least 160°F

Once the above conditions occur, the PCM is considered to have passed a warm-up cycle. Due to the conditions required to extinguish the MIL and erase the DTC, it is most important that after a repair has been made, all DTC's be erased and the repair verified.

COMPONENT MONITORS

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (Check Engine) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks. Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watch-

DESCRIPTION AND OPERATION (Continued)

ing for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum and 1600 rpm.

All open/short circuit checks or any component that has an associated limp in will set a fault after 1 trip with the malfunction present. Components without an associated limp in will take two trips to illuminate the MIL.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

NON-MONITORED CIRCUITS

The PCM does not monitor the following circuits, systems and conditions that could have malfunctions causing driveability problems. The PCM might not store diagnostic trouble codes for these conditions. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code

FUEL PRESSURE

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor or fuel system diagnostic trouble code.

SECONDARY IGNITION CIRCUIT

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables.

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system, although it may set a fuel system fault.

FUEL INJECTOR MECHANICAL MALFUNCTIONS

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

EXCESSIVE OIL CONSUMPTION

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

THROTTLE BODY AIR FLOW

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

VACUUM ASSIST

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

PCM SYSTEM GROUND

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, also during diagnostic.

PCM CONNECTOR ENGAGEMENT

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

LOAD VALUE

ENGINE	IDLE/NEUTRAL	2500 RPM/NEUTRAL
All Engines	2% to 8% of Maximum Load	9% to 17% of Maximum Load

EVAPORATIVE EMISSION CONTROLS

INDEX

page

DESCRIPTION AND OPERATION
- CRANKCASE VENTILATION SYSTEM 12
- DUTY CYCLE EVAP CANISTER PURGE SOLENOID 10
- EVAP CANISTER 10
- EVAPORATION (EVAP) CONTROL SYSTEM . . . 10
- FUEL TANK FILLER TUBE CAP 11
- ROLLOVER VALVE 10
- VEHICLE EMISSION CONTROL INFORMATION (VECI) LABEL 12

DIAGNOSIS AND TESTING
- VACUUM SCHEMATICS 13

REMOVAL AND INSTALLATION
- EVAP CANISTER PURGE SOLENOID 13
- EVAP CANISTER 13
- FUEL TANK FILLER TUBE CAP 14
- ROLLOVER VALVE 14

SPECIFICATIONS
- TORQUE SPECIFICATIONS 14

DESCRIPTION AND OPERATION

EVAPORATION (EVAP) CONTROL SYSTEM

The function of the EVAP control system is to prevent the emissions of gasoline vapors from the fuel tank into the atmosphere. When fuel evaporates in the fuel tank, the vapors pass through vent hoses or tubes to a carbon filled EVAP canister. They are temporarily held in the canister until they can be drawn into the intake manifold when the engine is running.

All engines use a duty cycle purge system. The PCM controls vapor flow by operating the duty cycle EVAP purge solenoid. Refer to Duty Cycle Solenoid for additional information.

The EVAP canister is a feature on all models for the storage of fuel vapors from the fuel tank.

NOTE: The hoses used in this system are specially manufactured. If replacement becomes necessary, it is important to use only fuel resistant hose.

ROLLOVER VALVE

The fuel tank is equipped with 2 rollover valves (Fig. 1). These valves will prevent fuel flow through the fuel tank vent hoses in the event of an accidental vehicle rollover.

Refer to the Fuel Tank section of Group 14, Fuel Systems for removal and installation procedures.

EVAP CANISTER

A maintenance free, EVAP canister is used on all vehicles. On conventional left hand drive (LHD) models, the EVAP canister is located in the engine compartment on the passenger side frame rail (Fig. 3). On RHD models, the canister is located in the left side of the engine compartment near the heater blower motor (Fig. 4). The EVAP canister is filled with granules of an activated carbon mixture. Fuel vapors entering the EVAP canister are absorbed by the charcoal granules.

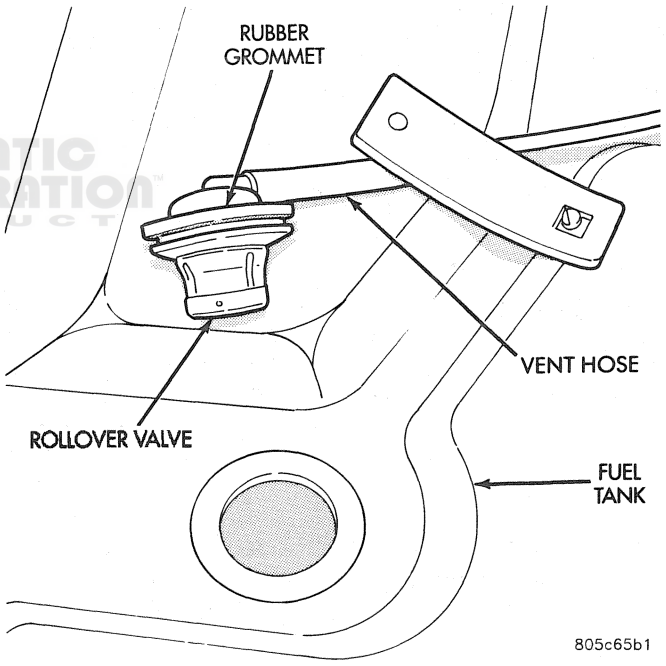


Fig. 1 Rollover Valve Location—Typical

Fuel tank pressure vents into the EVAP canister. Fuel vapors are temporarily held in the canister until they can be drawn into the intake manifold. The duty cycle EVAP canister purge solenoid allows the EVAP canister to be purged at predetermined times and at certain engine operating conditions.

DUTY CYCLE EVAP CANISTER PURGE SOLENOID

All vehicles use a duty cycle EVAP canister purge solenoid. The solenoid regulates the rate of vapor

DESCRIPTION AND OPERATION (Continued)

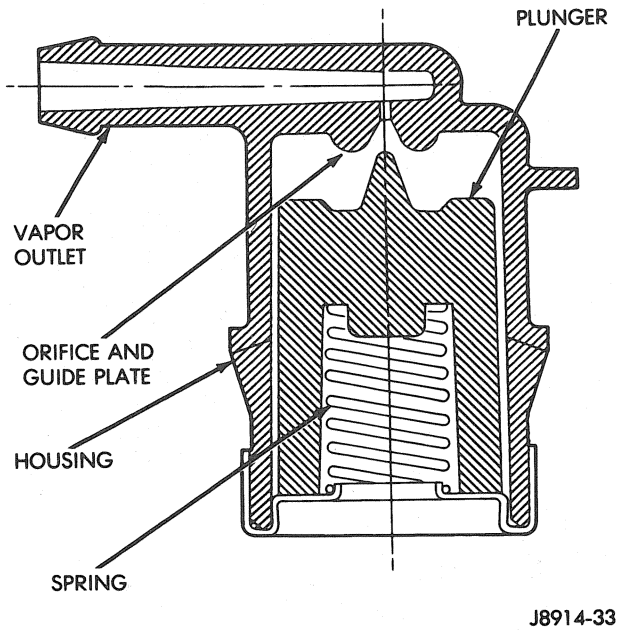


Fig. 2 Typical Rollover Valve Operation

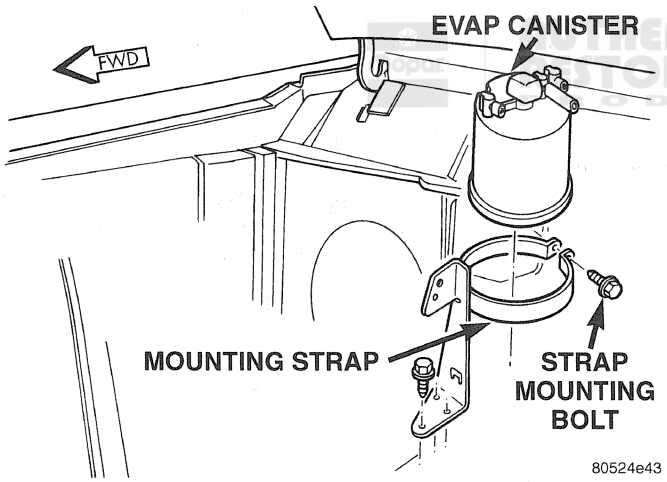


Fig. 3 EVAP Canister Location—LHD Models

flow from the EVAP canister to the intake manifold. The PCM operates the solenoid.

During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged. The PCM de-energizes the solenoid during open loop operation.

The engine enters closed loop operation after it reaches a specified temperature and the time delay ends. During closed loop operation, the PCM cycles (energizes and de-energizes) the solenoid 5 or 10 times per second, depending upon operating conditions. The PCM varies the vapor flow rate by changing solenoid pulse width. Pulse width is the amount of time that the solenoid is energized. The PCM

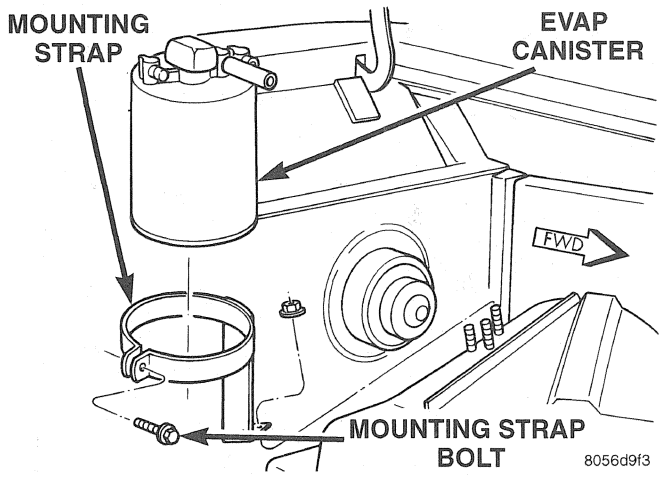


Fig. 4 EVAP Canister Location—RHD Models

adjusts solenoid pulse width based on engine operating condition.

The solenoid attaches to a bracket located in the engine compartment near the EVAP canister (Fig. 5). The top of the solenoid has the word UP or TOP on it. The solenoid will not operate properly unless it is installed correctly.

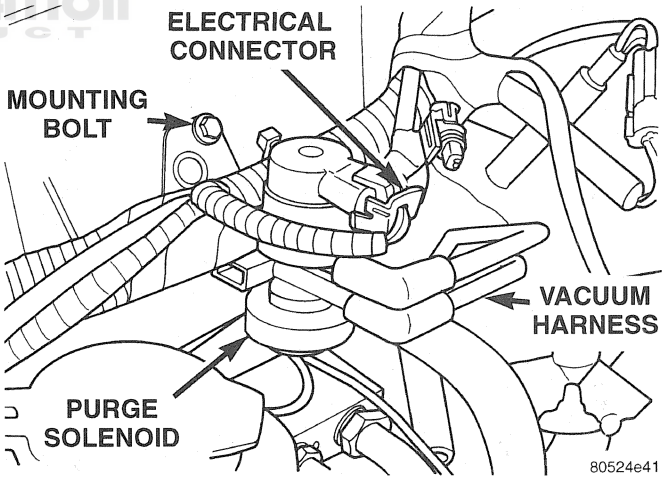


Fig. 5 Duty Cycle EVAP Purge Solenoid

FUEL TANK FILLER TUBE CAP

The fuel tank is sealed with a pressure-vacuum relief fuel tank filler tube cap. The relief valves in the cap are a safety feature. They operate only to prevent excessive pressure or vacuum in tank caused by a malfunction in system or damage to vent lines.

The cap has a threaded configuration. This allows the seal to be broken and pressure to be relieved without separation of cap from filler tube. Approximately two and a half turns are required to remove the cap.

If replacement of filler tube cap is necessary, it must be replaced with an identical cap to be sure of correct system operation.

DESCRIPTION AND OPERATION (Continued)

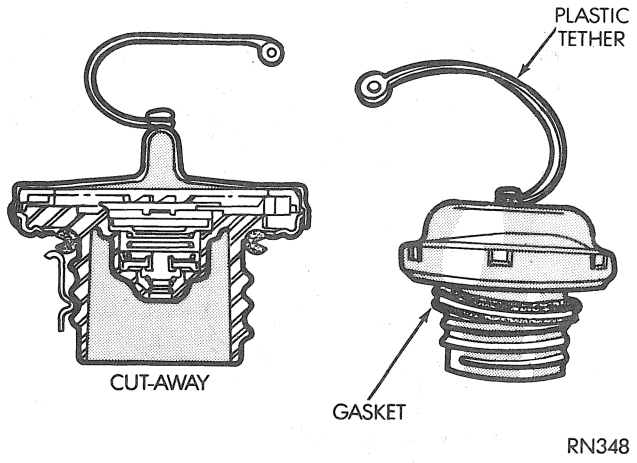


Fig. 6 Fuel Tank Filler Tube Cap—Typical

CAUTION: Remove the fuel tank filler tube cap (fuel tank cap) to relieve any fuel tank pressure. The cap must be removed prior to disconnecting any fuel system component or before draining the fuel tank.

CRANKCASE VENTILATION SYSTEM

All 2.5L 4–cylinder and 4.0L 6–cylinder engines are equipped with a Crankcase Ventilation (CCV) system (Fig. 7) or (Fig. 8). The CCV system performs the same function as a conventional PCV system, but does not use a vacuum controlled valve.

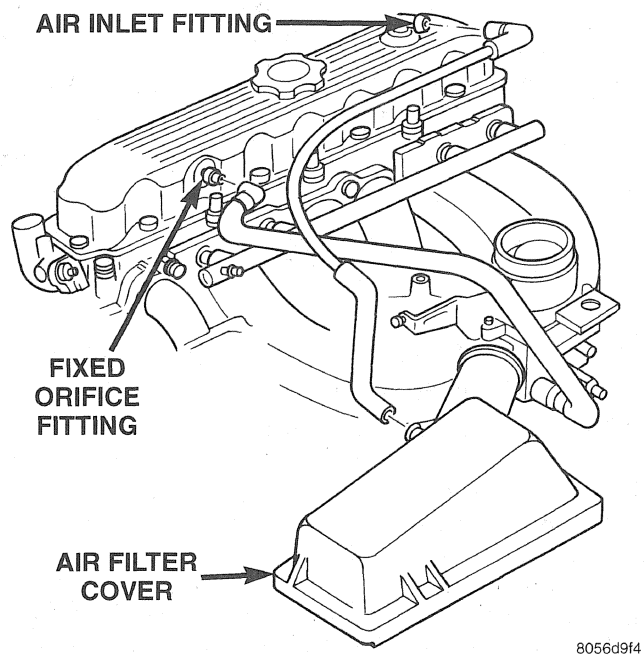


Fig. 7 CCV System—2.5L Engine—Typical

On 4.0L 6 cylinder engines, a molded vacuum tube connects manifold vacuum to top of cylinder head (valve) cover at dash panel end. The vacuum fitting

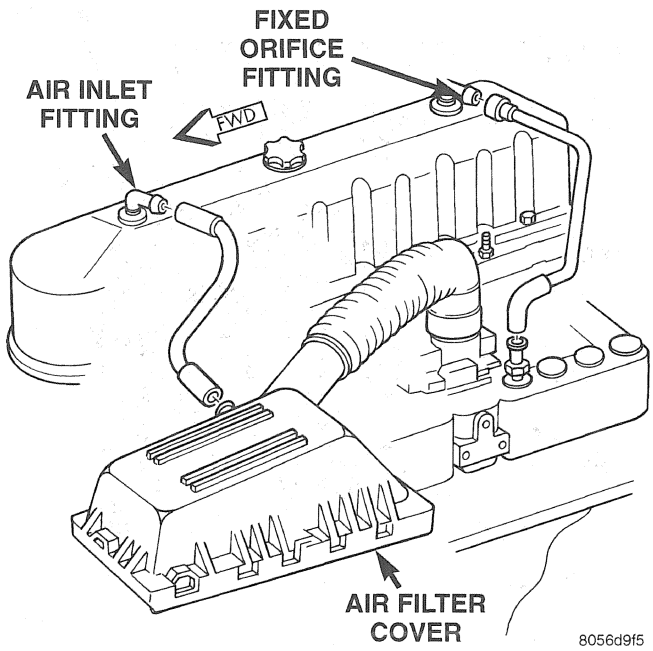


Fig. 8 CCV System—4.0L Engine—Typical

contains a fixed orifice of a calibrated size. It meters the amount of crankcase vapors drawn out of the engine.

On 2.5L 4 cylinder engines, a fitting on drivers side of cylinder head (valve) cover contains the metered orifice. It is connected to manifold vacuum.

A fresh air supply hose from the air cleaner is connected to front of cylinder head cover on 4.0L engines. It is connected to rear of cover on 2.5L engines.

When the engine is operating, fresh air enters the engine and mixes with crankcase vapors. Manifold vacuum draws the vapor/air mixture through the fixed orifice and into the intake manifold. The vapors are then consumed during combustion.

VEHICLE EMISSION CONTROL INFORMATION (VECI) LABEL

All vehicles are equipped with a combined VECI label. This label is located in the engine compartment (Fig. 9) and contains the following:

- Engine family and displacement
- Evaporative family
- Emission control system schematic
- Certification application
- Engine timing specifications (if adjustable)
- Idle speeds (if adjustable)
- Spark plug and gap

The label also contains an engine vacuum schematic. There are unique labels for vehicles built for sale in the state of California and the country of Canada. Canadian labels are written in both the English and French languages. These labels are per-

DESCRIPTION AND OPERATION (Continued)

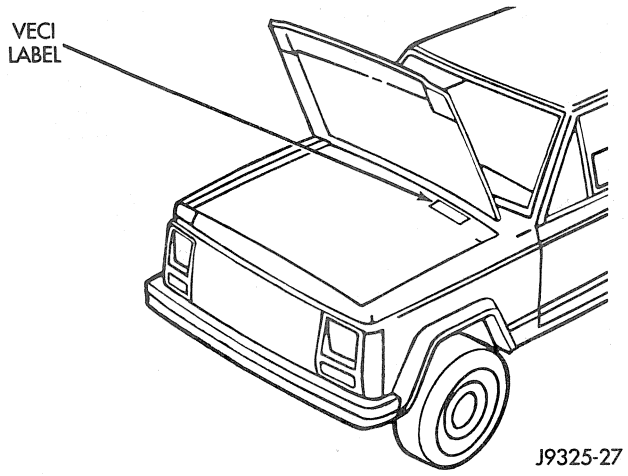


Fig. 9 VECI Label Location—Typical

manently attached and cannot be removed without defacing information and destroying label.

DIAGNOSIS AND TESTING

VACUUM SCHEMATICS

A vacuum schematic for emission related items can be found on the Vehicle Emission Control Information (VECI) Label. Refer to VECI Label in this group for label location.

REMOVAL AND INSTALLATION

EVAP CANISTER

On conventional left hand drive (LHD) models, the EVAP canister is located in the engine compartment on the passenger side frame rail (Fig. 10). On RHD models, the canister is located in the left side of the engine compartment near the heater blower motor (Fig. 11).

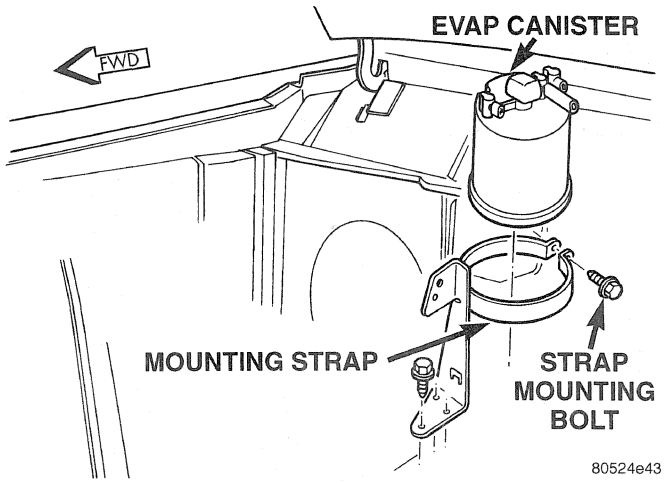


Fig. 10 EVAP Canister Location—LHD Models

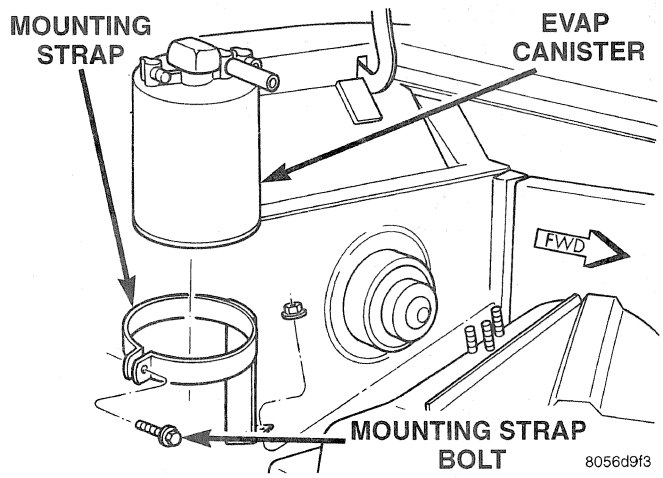


Fig. 11 EVAP Canister Location—RHD Models

REMOVAL/INSTALLATION

(1) Disconnect the vacuum lines at the EVAP canister. Note location of lines before removal.
(2) Remove canister retaining strap bolt.
(3) Remove canister from vehicle.
(4) Reverse the removal procedure for installation.
(5) Tighten strap bolt to 5 N·m (45 in. lbs.) torque.

EVAP CANISTER PURGE SOLENOID

REMOVAL

The duty cycle evap canister purge solenoid is located in the engine compartment on the cowl panel near the EVAP canister (Fig. 12).

(1) Disconnect electrical wiring connector at solenoid.

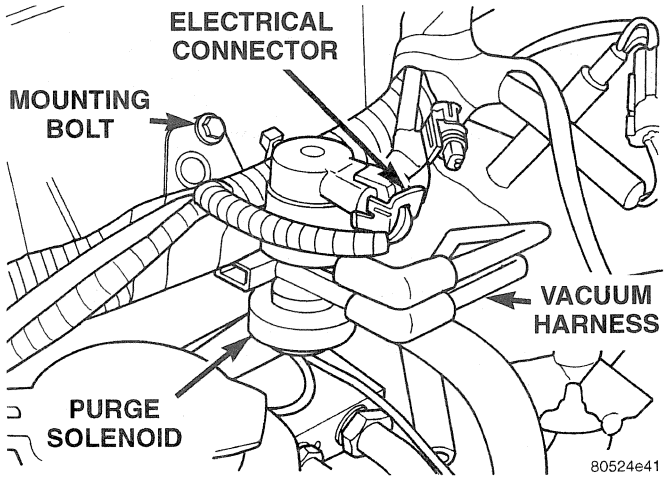


Fig. 12 Duty Cycle EVAP Canister Purge Solenoid—Typical

(2) Disconnect vacuum harness at solenoid.
(3) Remove solenoid and its support bracket.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Install EVAP canister purge solenoid and its mounting bracket to cowl panel.
(2) Tighten bolt to 5 N·m (45 in. lbs.) torque.
(3) Connect vacuum harness and wiring connector.

ROLLOVER VALVE

The two fuel rollover valves are located on the top of the fuel tank (Fig. 13).

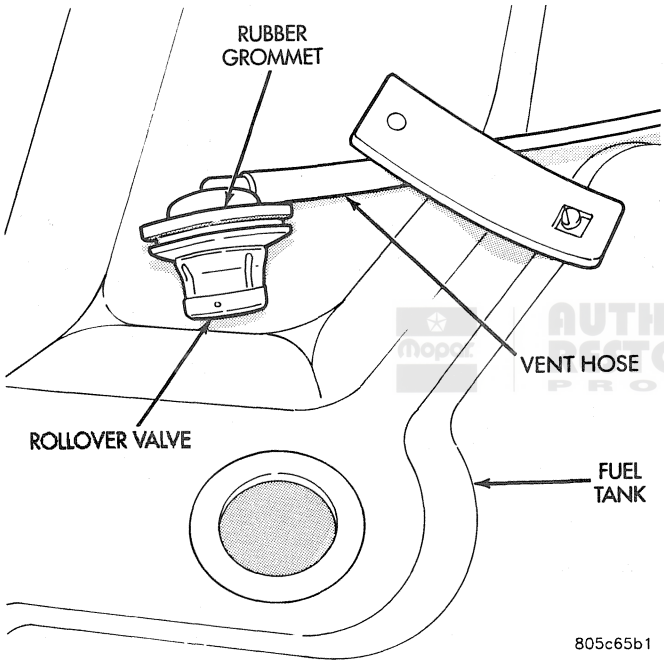


Fig. 13 Valve Location—Typical

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING THE ROLLOVER VALVE, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE IN THIS GROUP.

(1) Disconnect negative battery cable.
(2) Remove the fuel filler cap and drain fuel tank. Refer to Fuel Tank Removal.
(3) Remove fuel tank. Refer to Fuel Tank Removal.
(4) The rollover valve is seated in a grommet. Remove by prying one side upward and then roll the grommet out of tank.
(5) Inspect the condition of grommet. Replace if necessary.

INSTALLATION

(1) Start one side of grommet into opening in fuel tank. Using finger pressure only, press valve/grommet into place.
(2) Install fuel tank. Refer to Fuel Tank Installation.
(3) Fill fuel tank. Install fuel tank filler cap.
(4) Connect negative battery cable.
(5) Start vehicle and check for leaks.

FUEL TANK FILLER TUBE CAP

If replacement of the fuel tank filler tube cap (Fig. 14) is necessary, it must be replaced with an identical cap to be sure of correct system operation.

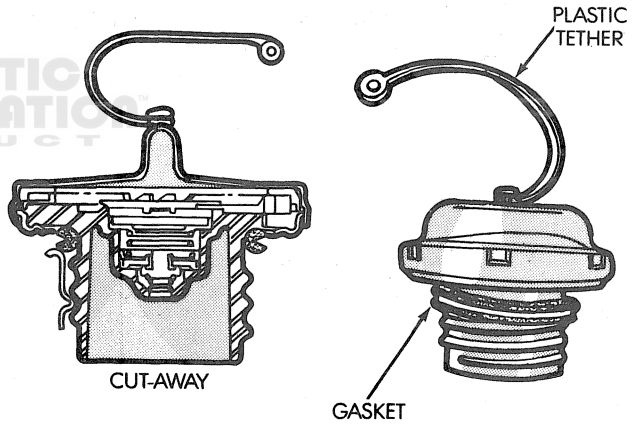


Fig. 14 Fuel Tank Filler Tube Cap—Typical

CAUTION: Remove the fuel tank filler tube cap to relieve fuel tank pressure. The cap must be removed prior to disconnecting any fuel system component or before draining the fuel tank.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	Torque
EVAP Canister Mounting Bolt	5 N·m (45 in. lbs.)
EVAP Canister Purge Solenoid Mounting Bolt	5 N·m (45 in. lbs.)

Description	Group-Page
ABS	5-31
ABS BRAKE SYSTEM, BLEEDING	5-35
ABS MAIN RELAY; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
ABS MAIN RELAY; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
ABS PUMP MOTOR RELAY; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
ABS PUMP MOTOR RELAY; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
ABS SYSTEM RELAYS	5-35
ABS WARNING LAMP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
ABS WARNING LAMP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
ABS WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
ABS WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
ABS WARNING LAMP; BRAKES	5-35
ABSOLUTE PRESSURE (MAP) SENSOR, MANIFOLD; FUEL SYSTEM	14-38
ABSOLUTE PRESSURE (MAP) SENSOR, MANIFOLD; IGNITION SYSTEM	8D-15,8D-4
ABSOLUTE PRESSURE (MAP) SENSOR TEST, MANIFOLD	14-34
ABSOLUTE PRESSURE (MAP) SENSOR—PCM INPUT, MANIFOLD	14-27
ABSOLUTE PRESSURE SENSOR, MANIFOLD; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
ABSOLUTE PRESSURE SENSOR, MANIFOLD; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
ABSORBER DIAGNOSIS, SPRING AND SHOCK	2-14
ABSORBER, SHOCK	2-14,2-7
A/C COMPRESSOR; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
A/C COMPRESSOR; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
A/C PERFORMANCE	24-10
ACCELERATION SWITCH	5-34,5-39
ACCELERATOR PEDAL	14-17
ACCESSORY DRIVE BELTS, ENGINE	7-10,7-35,7-1
ACCUMULATOR PISTONS AND SPRINGS	21-196
ACTUATION TEST MODE, CIRCUIT	25-2
ACTUATOR, FRONT DOOR INSIDE HANDLE	23-36
ACTUATOR, REAR DOOR INSIDE HANDLE	23-44
ACTUATOR, RECIRCULATION AIR DOOR VACUUM	24-33
ACTUATORS, HEAT/DEFROST/PANEL DOOR	24-32
ADAPTER HOUSING	21-40
ADAPTER HOUSING AND FRONT BEARING RETAINER	21-6
ADAPTER HOUSING SEAL REPLACEMENT	21-199
ADAPTER SEAL, SOLENOID HARNESS	21-192
ADDING ADDITIONAL COOLANT—ROUTINE	7-24
ADDITIONAL COOLANT—ROUTINE, ADDING	7-24
ADJUSTER PLUG ASSEMBLY	19-14
ADJUSTER/MOTORS, POWER SEAT	8R-1,8R-2,8R-3
ADJUSTMENT AT AXLE WITH LEAF SPRINGS	3-13
ADJUSTMENT, COMPASS VARIATION	8V-4
ADJUSTMENT, DIFFERENTIAL BEARING PRELOAD AND RING GEAR BACKLASH	3-85
ADJUSTMENT, DIFFERENTIAL SHIM PACK MEASUREMENT	3-33
ADJUSTMENT, DOOR LATCH	23-66
ADJUSTMENT, FOG LAMP	8L-7
ADJUSTMENT, FRONT BAND	21-149
ADJUSTMENT, HEADLAMP	8L-6
ADJUSTMENT, PARK INTERLOCK CABLE	21-147, 21-279
ADJUSTMENT, PINION DEPTH MEASUREMENT	3-82
ADJUSTMENT, PRELIMINARY INSPECTION	21-180
ADJUSTMENT, REAR BAND	21-150
ADJUSTMENT, SHIFT CABLE	21-147,21-278
ADJUSTMENT, SHIFT LINKAGE	21-309,21-337
ADJUSTMENT, SIDE GEAR CLEARANCE MEASUREMENT	3-86
ADJUSTMENT, THROTTLE VALVE CABLE	21-149
AFTER OVERHAUL OR FLUID/FILTER CHANGE, REFILLING	21-188
AFTERMARKET PAINT REPAIR PRODUCTS	23-3
AIR CLEANER ELEMENT	14-41
AIR CLEANER HOUSING	14-41
AIR CONDITIONER CONTROLS, HEATER	24-2
AIR CONDITIONER, HEATER	24-1
AIR CONDITIONING (A/C) CLUTCH RELAY—PCM OUTPUT	14-28
AIR CONDITIONING (A/C) CONTROLS—PCM INPUT	14-23
AIR CONTROL (IAC) MOTOR, IDLE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
AIR CONTROL (IAC) MOTOR, IDLE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
AIR CONTROL (IAC) MOTOR, IDLE; FUEL SYSTEM	14-36,14-38
AIR CONTROL (IAC) MOTOR—PCM OUTPUT, IDLE	14-29
AIR DEFLECTOR, CROSSMEMBER	23-24
AIR DOOR VACUUM ACTUATOR, RECIRCULATION	24-33
AIR EXHAUST GRILLE	23-50
AIR TEMPERATURE SENSOR, INTAKE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
AIR TEMPERATURE SENSOR, INTAKE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
AIR TEMPERATURE SENSOR, INTAKE MANIFOLD; FUEL SYSTEM	14-36,14-42
AIR TEMPERATURE SENSOR, INTAKE MANIFOLD; IGNITION SYSTEM	8D-15,8D-4,8D-9
AIR TEMPERATURE SENSOR—PCM INPUT, INTAKE MANIFOLD	14-26
AIR TESTING TRANSMISSION CLUTCH AND BAND OPERATION	21-81
AIRBAG MODULE	8M-1,8M-3
AIRBAG SYSTEM	8M-2
ALIGNMENT	2-1,2-5
ALIGNMENT, HEADLAMP	8L-6,8L-8
ALIGNMENT PREPARATION, HEADLAMP	8L-6
ALIGNMENT, REAR AXLE	3-45
ALIGNMENT, WHEEL	2-1,2-4
ALUMINUM THREAD REPAIR	21-94
AMBIENT TEMPERATURE SENSOR	8W-49-1
ANALYSIS, BACKLASH AND CONTACT PATTERN	3-34,3-61
ANALYSIS, PRESSURE TEST	21-181
ANALYSIS, RING GEAR TEETH CONTACT PATTERN	3-87
ANALYSIS, STALL SPEED TEST	21-182
ANALYSIS, STALL TEST	21-81
ANALYSIS, TIME LAG TEST	21-183
ANALYZING ROAD TEST	21-78
ANGLE MEASUREMENT, PROPELLER SHAFT	3-5
ANGLE, UNIVERSAL JOINT	3-5
ANTENNA	8F-2,8F-5,8F-9
ANTI-LOCK BRAKE SYSTEM LAMP	8E-4,8E-9
ANTILOCK BRAKES	5-31,5-35
ANTILOCK BRAKES (CAB), CONTROLLER	5-32
ANTILOCK BRAKES, CONTROLLER	5-35
A-PILLAR COWL TRIM, LOWER	23-48
A-PILLAR TRIM	23-47
APPLICATION, BULB	8L-18
APPLICATION CHARTS, GEARTRAIN OPERATION	21-173
APPLIQUE, QUARTER WINDOW	23-64
ARM, LOWER SUSPENSION	2-8
ARM, PITMAN	19-28
ARM, UPPER SUSPENSION	2-8
ARMING/DISARMING MECHANISM	8M-2
ARMS AND BLADES, WIPER	8K-2
ARMS AND PUSH RODS, ROCKER	9-30,9-48,9-70,9-88
ARMS, WIPER	8K-7
ASD AND FUEL PUMP RELAYS	14-33
ASSEMBLY, ADJUSTER PLUG	19-14
ASSEMBLY, DIFFERENTIAL	3-57
ASSEMBLY, ENGINE	9-28,9-67
ASSEMBLY, FIFTH GEAR AND SYNCHRO	21-48
ASSEMBLY, FINAL	3-37,3-64
ASSEMBLY, IMPACT SENSOR/INFLATOR	8M-2
ASSEMBLY INFORMATION, TRANSMISSION	21-38,21-2
ASSEMBLY, PINION MEASUREMENT	3-59
ASSEMBLY REPLACEMENT, DRIVE AXLE	3-20
ASSEMBLY REPLACEMENT—XJ VEHICLES, DRIVE AXLE	3-49,3-71
ASSEMBLY (SHORT BLOCK), SERVICE ENGINE	9-4
ASSIST HANDLE	23-48
ASST. OR POOR RETURN TO CENTER, INSUFFICIENT	19-4
AUDIO SYSTEM	8F-3
AUTO SHUTDOWN (ASD) RELAY—PCM OUTPUT	14-28
AUTOMATIC SHUT DOWN (ASD) RELAY; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
AUTOMATIC SHUT DOWN (ASD) RELAY; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
AUTOMATIC SHUTDOWN (ASD) RELAY; FUEL SYSTEM	14-37
AUTOMATIC SHUTDOWN (ASD) RELAY; IGNITION SYSTEM	8D-13,8D-3
AUTOMATIC SHUTDOWN (ASD) RELAY TEST	8D-4
AUTOMATIC SHUTDOWN (ASD) RELAY—PCM INPUT	14-24
AUTOMATIC TRANSMISSION, 3 ORH	21-164,21-165
AUTOMATIC TRANSMISSION, AW-4	21-279
AUTOMATIC TRANSMISSION DIAGNOSIS	21-75
AUTOMATIC TRANSMISSION OIL COOLER	7-2
AUTOMATIC TRANSMISSION—30RH	21-72
AUTOMATIC TRANSMISSION—AW4	21-169
AUXILIARY COOLERS AND COOLER LINES, REVERSE FLUSHING MAIN	21-189
AUXILIARY ELECTRIC COOLING FAN	7-22,7-34,7-8
AW-4	21-287
AW-4 AUTOMATIC TRANSMISSION	21-279
AX 4/5 MANUAL TRANSMISSION COMPONENTS	21-33
AX15	21-71
AX15 COMPONENTS	21-68
AX15 MANUAL TRANSMISSION	21-36,21-69
AX15 TRANSMISSION	21-67
AX4/5	21-35
AX4/5 MANUAL TRANSMISSION	21-1
AX4/5 MANUAL TRANSMISSION TORQUE	21-35
AXLE, 8 1/4	3-68,3-89
AXLE ALIGNMENT, REAR	3-45
AXLE ASSEMBLY REPLACEMENT, DRIVE	3-20
AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES, DRIVE	3-49,3-71
AXLE BUSHING	2-9
AXLE BUSHING REPLACEMENT	3-24
AXLE COMPONENTS	3-64
AXLE, FRONT DRIVE	3-18
AXLE, MODEL 35	3-42,3-64
AXLE SHAFT	3-51
AXLE SHAFT, HUB BEARING	3-21
AXLE SHAFT OIL SEAL REPLACEMENT, INNER	3-26
AXLE SHAFT SEAL AND BEARING	3-52
AXLE SHAFT, SEAL AND BEARING SERVICE	3-71
AXLE SHAFT—CARDAN U-JOINT	3-29
AXLE, TORQUE—MODEL 30	3-37
AXLE WITH LEAF SPRINGS, ADJUSTMENT AT	3-13
AXLE—MODEL 30, FRONT	3-37,3-38,3-89
AXLE—MODEL 35, FRONT	3-65
AXLE—TUBE AND MODEL 30, FRONT	3-14
AXLES	3-43
BACKLASH ADJUSTMENT, DIFFERENTIAL BEARING PRELOAD AND RING GEAR	3-85
BACKLASH AND CONTACT PATTERN ANALYSIS	3-34,3-61
BACK-UP LAMPS; 8W-51 REAR LIGHTING (LH)	8W-51-1
BACK-UP LAMPS; 8W-51 REAR LIGHTING (RHD)	8W-51-1

Description	Group-Page
BACK-UP/REAR TURN SIGNAL/TAIL LAMP	8L-15
BACK-UP/REAR TURN SIGNAL/TAIL LAMP BULB	8L-11
BALANCE, TIRE AND WHEEL	22-10
BALL STUD, LIFTGATE SUPPORT ROD	23-61
BALL STUDS, STEERING KNUCKLE	3-22
BAND ADJUSTMENT, FRONT	21-149
BAND ADJUSTMENT, REAR	21-150
BAND OPERATION, AIR TESTING TRANSMISSION CLUTCH	21-81
BAR, SOUND	8F-8
BAR, STABILIZER	2-14,2-9
BAR, TRACK	2-10
BASE BRAKE SYSTEM	5-1,5-6
BASE BRAKES	5-30
BASE COAT/CLEAR COAT FINISH	23-2
BATTERY	8A-11,8A-13,8A-2,8A-3
BATTERY CHARGING	8A-9
BATTERY FEED; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-1
BATTERY FEED; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
BATTERY MOUNTING	8A-3
BATTERY REPLACEMENT, REMOTE KEYLESS ENTRY TRANSMITTER	8P-9
BATTERY SIZE AND RATINGS	8A-2
BATTERY TEMPERATURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
BATTERY TEMPERATURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
BATTERY TEMPERATURE SENSOR; CHARGING SYSTEM	8C-2,8C-6,8C-8
BATTERY TEMPERATURE SENSOR—PCM INPUT	14-24
BATTERY VOLTAGE—PCM INPUT	14-24
BEAM INDICATOR LAMP, HEADLAMP HIGH	8E-11,8E-5
BEARING AND AXLE SHAFT, HUB	3-21
BEARING, AXLE SHAFT SEAL	3-52
BEARING, HUB	2-10
BEARING NOISE, GEAR	3-16,3-44
BEARING, PILOT	6-11
BEARING, PITMAN SHAFT SEALS	19-19
BEARING PRELOAD AND RING GEAR BACKLASH ADJUSTMENT, DIFFERENTIAL	3-85
BEARING, RELEASE	6-11
BEARING RETAINER, ADAPTER HOUSING AND FRONT	21-6
BEARING SERVICE, AXLE SHAFT, SEAL	3-71
BEARING—TYPICAL, OUTPUT SHAFT REAR	21-97
BEARINGS, CAMSHAFT	9-41
BEARINGS, CRANKSHAFT MAIN	9-41,9-80
BEARINGS, FITTING CONNECTING ROD	9-20, 9-60
BEARINGS, FITTING CRANKSHAFT MAIN	9-23,9-62
BELT INDICATOR WARNING LAMP, SEAT; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
BELT INDICATOR WARNING LAMP, SEAT; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
BELT REMINDER LAMP, SEAT	8E-13,8E-5
BELT SEAL, FRONT DOOR INNER	23-37
BELT SEAL, FRONT DOOR OUTER	23-37
BELT SEAL, REAR DOOR INNER	23-45
BELT SWITCH, DRIVER'S SEAT	8U-2,8U-3
BELT TENSION	7-40,7-2,7-4
BELT/BUCKLE, FRONT SHOULDER	23-51
BELT/BUCKLE, REAR SHOULDER/LAP	23-52
BELTS, ENGINE ACCESSORY DRIVE	7-10,7-35, 7-1
BETTS CONNECTORS, TERMINAL/ CONNECTOR REPAIR—THOMAS	8W-01-8
BIN, GARAGE DOOR OPENER STORAGE	8V-2
BIN, SUNGLASSES STORAGE	8V-2,8V-7
BINDING AND STICKING	19-4
BLADE INSPECTION, FAN	7-39
BLADES, WIPER ARMS	8K-2
BLEEDING ABS BRAKE SYSTEM	5-35
BLEEDING, BRAKE	5-12
BLENDS, GASOLINE/OXYGENATE	14-1
BLOCK, CYLINDER	9-48,9-49,9-87,9-88
BLOCK HEATER, ENGINE	7-35,7-2,7-4
BLOCKS—TWO-DOOR VEHICLES, FRONT DOOR SPACER	23-40
BLOWER MOTOR	24-17,24-33,24-7
BLOWER MOTOR RESISTOR	24-17,24-34,24-7
BLOWER MOTOR SWITCH	24-17,24-34,24-7
BLOWER MOTOR—A/C-HEATER; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
BLOWER MOTOR—A/C-HEATER; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
BLOWER MOTOR—HEATER ONLY; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
BLOWER MOTOR—HEATER ONLY; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
BODY CODE DECODING	0-2
BODY CODE PLATE	0-2
BODY COMPONENT SERVICE	23-16
BODY COMPONENTS, TRANSMISSION VALVE	21-174
BODY LUBRICANTS	23-68
BODY LUBRICATION	23-18
BODY OVERHAUL, TRANSMISSION VALVE	21-275
BODY SIDE MOLDING/CLADDING	23-47
BODY SOLENOIDS, TRANSMISSION VALVE	21-171,21-191
BODY STRIPES/DECALS	23-26
BODY, THROTTLE	14-30,14-37
BODY, TRANSMISSION VALVE	21-193
BODY, VALVE	21-105,21-140,21-150,21-99
BOOSTER, POWER BRAKE	5-15,5-3
BOOSTER TEST, MASTER CYLINDER/ POWER	5-9
BORES, HONING CYLINDER	9-2
BOX LAMP, GLOVE; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
BOX LAMP, GLOVE; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
B-PILLAR TRIM	23-48
BRACKET, REARVIEW MIRROR SUPPORT	23-57
BRAKE BLEEDING	5-12
BRAKE BOOSTER, POWER	5-15,5-3
BRAKE CABLE, REAR PARKING	5-21
BRAKE CABLE TENSIONER, PARKING	5-29
BRAKE CALIPER, DISC	5-16,5-24
BRAKE COMPONENTS	5-30
BRAKE DRUM	5-11
BRAKE DRUM MACHINING	5-13
BRAKE FLUID	5-29
BRAKE FLUID CONTAMINATION DETECTION PROCEDURE	5-11
BRAKE FLUID LEVEL	5-11
BRAKE HANDLE COVER, PARKING	23-54
BRAKE HOSES AND LINES	5-6
BRAKE LEVER, PARKING	5-22
BRAKE LINE	5-13
BRAKE LINE AND HOSES	5-11
BRAKE OVERHAUL, SECOND	21-265
BRAKE, PARKING	5-5
BRAKE PEDAL	5-14,5-2
BRAKE PISTON AND TRANSMISSION CASE OVERHAUL, FIRST/REVERSE	21-272
BRAKE, REAR DRUM	5-27,5-28,5-5
BRAKE ROTOR, DISC	5-10,5-19
BRAKE SERVO OVERHAUL, SECOND COAST	21-198
BRAKE SUPPORT PLATE	5-21
BRAKE SWITCH—PCM INPUT	14-24
BRAKE SYSTEM	5-2
BRAKE SYSTEM, BASE	5-1,5-6
BRAKE SYSTEM, BLEEDING ABS	5-35
BRAKE SYSTEM LAMP, ANTI-LOCK	8E-4,8E-9
BRAKE WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
BRAKE WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
BRAKE WARNING LAMP; INSTRUMENT PANEL SYSTEMS	8E-4,8E-9
BRAKE WARNING LAMP, RED	5-2,5-9
BRAKES, ANTILOCK	5-31,5-35
BRAKES, BASE	5-30
BRAKES (CAB), CONTROLLER ANTILOCK	5-32
BRAKES, CONTROLLER ANTILOCK	5-35
BRAKES, FRONT DISC	5-4
BRAKESHOE, DISC	5-17
BRAKESHOES, DRUM	5-19
BREAKER, CIRCUIT; POWER SEAT SYSTEMS	8R-1,8R-2
BREAKER, CIRCUIT; POWER WINDOW SYSTEMS	8S-1,8S-2
BUCKET SEAT	23-53
BUCKET SEAT CUSHION AND COVER	23-12
BUCKET SEAT PLATFORM	23-13
BUCKET SEATBACK COVER AND FRAME	23-13
BUFFING AND POLISHING, WET SANDING	23-2
BUILT-IN TEST INDICATOR	8A-5
BULB APPLICATION	8L-18
BULB, BACK-UP/REAR TURN SIGNAL/ TAIL LAMP	8L-11
BULB, CENTER HIGH MOUNTED STOP LAMP (CHMSL)	8L-12
BULB, DOME LAMP	8L-12
BULB, FOG LAMP	8L-9
BULB, FRONT PARK/TURN SIGNAL LAMP	8L-10
BULB, HEADLAMP	8L-9
BULB, LICENSE PLATE LAMP	8L-11
BULB, MAP READING LAMP	8L-12
BULB SERVICE, LAMP	8L-9
BULB, SIDE MARKER LAMP	8L-10
BULB, UNDERHOOD LAMP	8L-12
BULB, VISOR VANITY LAMP	8L-13
BULBS, READING/COURTESY LAMP	8V-8
BUMPER, FRONT	13-1,13-4
BUMPER, REAR	13-3,13-5
BUMPER, REAR SEATBACK LATCH STRIKER	23-14
BUMPERS	13-1
BURNED FLUID, CAUSES OF	21-77
BUS, CCD	8W-30-5
BUSHING, AXLE	2-9
BUSHING, LEAF SPRING AND SHACKLE	2-15
BUSHING REPLACEMENT, AXLE	3-24
BUSHING—2WD, EXTENSION HOUSING	21-96
BUZZER MODULE; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
BUZZER MODULE; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
BUZZER MODULE; CHIME/BUZZER WARNING SYSTEMS	8U-1,8U-2,8U-3
CABLE ADJUSTMENT, PARK INTERLOCK	21-147,21-279
CABLE ADJUSTMENT, SHIFT	21-147,21-278
CABLE ADJUSTMENT, THROTTLE VALVE	21-149
CABLE, HOOD RELEASE	23-23
CABLE, REAR PARKING BRAKE	5-21
CABLE REPLACEMENT, TRANSMISSION THROTTLE	21-201,21-277
CABLE RESISTANCE, SPARK PLUG	8D-22
CABLE, SERVO	8H-2,8H-8
CABLE, TEMPERATURE CONTROL	24-33
CABLE TENSIONER, PARKING BRAKE	5-29
CABLE, THROTTLE	14-18
CABLES, SPARK PLUG	8D-12,8D-3,8D-9
CALIBRATION, COMPASS	8V-4
CALIBRATION, GAUGE	8E-20
CALIPER	5-26
CALIPER, DISC BRAKE	5-16,5-24
CAMSHAFT	9-38,9-77
CAMSHAFT AND CRANKSHAFT POSITION SENSORS	14-35
CAMSHAFT BEARINGS	9-41
CAMSHAFT PIN REPLACEMENT	9-39,9-78
CAMSHAFT POSITION SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
CAMSHAFT POSITION SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
CAMSHAFT POSITION SENSOR; FUEL SYSTEM	14-40
CAMSHAFT POSITION SENSOR; IGNITION SYSTEM	8D-14,8D-3,8D-8
CAMSHAFT POSITION SENSOR—PCM INPUT	14-24
CANISTER, EVAP	25-10,25-13
CANISTER PURGE SOLENOID, DUTY CYCLE EVAP; EMISSION CONTROL SYSTEMS	25-10
CANISTER PURGE SOLENOID, DUTY CYCLE EVAP; FUEL SYSTEM	14-39
CANISTER PURGE SOLENOID, EVAP	25-13
CAP, DISTRIBUTOR	8D-6
CAP, FUEL TANK FILLER TUBE; EMISSION CONTROL SYSTEMS	25-11,25-14
CAP, FUEL TANK FILLER TUBE; FUEL SYSTEM	14-5

Description	Group-Page
CAP, RADIATOR PRESSURE	7-39,7-6
CAPACITIES, COOLING SYSTEM	7-40
CAPACITIES, FLUID	0-2
CAPACITY, FUEL TANK	14-18
CAPACITY, RECOMMENDED FLUID	21-170
CAPS, PRESSURE TESTING RADIATOR	7-23
CAP-TO-FILLER NECK SEAL—PRESSURE RELIEF CHECK, RADIATOR	7-23
CARDAN (CV), DOUBLE	3-9
CARDAN JOINT, SINGLE AND DOUBLE	3-13
CARDAN, SINGLE	3-8
CARDAN U-JOINT	3-37
CARGO LAMP, COURTESY LAMPS AND DOME LAMP	8W-44-1
CARGO LAMP, COURTESY LAMPS, AND DOME LAMP	8W-44-1
CARPET/MAT, FRONT	23-56
CARPET/MAT, REAR	23-56
CASE COVER OIL SEAL, TIMING	9-35,9-84
CASE COVER, TIMING	9-36,9-75
CASE DIAGNOSIS, NV242 TRANSFER	21-313
CASE DISASSEMBLY, DIFFERENTIAL	3-76
CASE, GEAR	21-45
CASE IDENTIFICATION, TRANSFER	21-289, 21-312
CASE, NV231 TRANSFER	21-289,21-292,21-293, 21-306,21-314
CASE, NV242 TRANSFER	21-312,21-315,21-336
CASE OVERHAUL, FIRST/REVERSE BRAKE PISTON AND TRANSMISSION	21-272
CASE SKID PLATE, TRANSFER	13-6
CATALYTIC CONVERTER	11-1,11-3
CAUSES OF BURNED FLUID	21-77
CAUTIONS, AND WARNINGS, NOTES	8W-01-2
CAUTIONS, SERVICE WARNINGS &	5-2
CCD BUS	8W-30-5
CENTER HIGH MOUNTED STOP LAMP (CHMSL) BULB	8L-12
CENTER, INSUFFICIENT ASST. OR POOR RETURN TO	19-4
CENTER, RELAY	8E-3
CERTIFICATION LABEL, VEHICLE SAFETY	0-1
CHAIN AND SPROCKETS, TIMING	9-37,9-75
CHANGE, LUBRICANT	3-20,3-49,3-70
CHANGE, REFILLING AFTER OVERHAUL OR FLUID/FILTER	21-188
CHANNEL WEATHERSTRIP, FRONT DOOR GLASS RUN	23-37
CHANNEL WEATHERSTRIP, REAR DOOR GLASS RUN	23-45
CHARGE, REFRIGERANT SYSTEM	24-21
CHARGING, BATTERY	8A-9
CHARGING SYSTEM; 8W-20 CHARGING SYSTEM (LH)	8W-20-1
CHARGING SYSTEM; 8W-20 CHARGING SYSTEM (RHD)	8W-20-1
CHARGING SYSTEM; CHARGING SYSTEM	8C-2
CHARGING SYSTEM INDICATOR LAMP	8W-40-3
CHARGING SYSTEM OPERATION	8C-1
CHARGING SYSTEM RESISTANCE TESTS	8C-3
CHARGING SYSTEM WARNING LAMP	8W-40-2
CHART, LEAD CORRECTION	22-4,22-5
CHART, TORQUE	5-39
CHART, TORQUE; BRAKES	5-30
CHART, TORQUE; STEERING	19-22,19-26,19-29, 19-9
CHART, TORQUE; SUSPENSION	2-11,2-16
CHART, VEHICLE IDENTIFICATION NUMBER DECODING	0-1
CHARTS, DIAGNOSIS	21-85
CHARTS, GEARTRAIN OPERATION AND APPLICATION	21-173
CHARTS, POWER STEERING SYSTEM DIAGNOSIS	19-4
CHECK COIL TEST	8D-5
CHECK, FLUID LEVEL	21-92
CHECK, OIL COOLER FLOW	21-77
CHECK, RADIATOR CAP-TO-FILLER NECK SEAL—PRESSURE RELIEF	7-23
CHECK, RADIATOR COOLANT FLOW	7-20
CHECK VALVE SERVICE, CONVERTER DRAINBACK	21-94
CHECKING FLUID CONDITION	21-187
CHECKING FLUID LEVEL	21-187
CHECKING FLUID LEVEL AND CONDITION	21-76
CHECK—ROUTINE, COOLANT LEVEL	7-24
CHECKS, PRELIMINARY	7-10
CHECK-SERVICE, COOLANT LEVEL	7-24
CHIME/BUZZER WARNING SYSTEM SWITCHES	8U-3
CHMSL LAMPS, STOP LAMPS; 8W-51 REAR LIGHTING (LH)	8W-51-1
CHMSL LAMPS, STOP LAMPS; 8W-51 REAR LIGHTING (RHD)	8W-51-1
CIGAR LIGHTER; 8W-41 HORN/CIGAR LIGHTER (LH)	8W-41-1
CIGAR LIGHTER; 8W-41 HORN/CIGAR LIGHTER (RHD)	8W-41-1
CIRCUIT ACTUATION TEST MODE	25-2
CIRCUIT BREAKER; POWER SEAT SYSTEMS	8R-1,8R-2
CIRCUIT BREAKER; POWER WINDOW SYSTEMS	8S-1,8S-2
CIRCUIT IDENTIFICATION	8W-01-3
CIRCUIT SENSE—PCM INPUT, IGNITION	14-26
CIRCUIT TESTS, CONTROL	8B-5
CIRCUIT TESTS, FEED	8B-4
CIRCUITS, NON-MONITORED	25-9
CIRCUITS, PRINTED	8E-15,8E-6
CLAMPS, FUEL TUBES/LINES/HOSES	14-9
CLASSIFICATION OF LUBRICANTS	0-1
CLEANER ELEMENT, AIR	14-41
CLEANER HOUSING, AIR	14-41
CLEANING AND INSPECTION, TRANSMISSION PARTS	21-277
CLEANING, COOLING SYSTEM	7-39
CLEANING OF TIRES	22-7
CLEANING, RADIATOR	7-39
CLEAN-UP PROCEDURE	8M-2
CLEARANCE MEASUREMENT AND ADJUSTMENT, SIDE GEAR	3-86
CLUSTER GEAR, OUTPUT SHAFT	21-61
CLUSTER GROUND	8W-40-3
CLUSTER ILLUMINATION LAMPS	8E-10,8E-4
CLUSTER, INSTRUMENT; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
CLUSTER, INSTRUMENT; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-1
CLUSTER, INSTRUMENT; INSTRUMENT PANEL SYSTEMS	8E-14
CLUSTERS, INSTRUMENT	8E-2
CLUTCH AND BAND OPERATION, AIR TESTING TRANSMISSION	21-81
CLUTCH COIL, COMPRESSOR	24-18
CLUTCH COMPONENT LUBRICATION	6-9
CLUTCH COMPONENTS	6-1
CLUTCH, COMPRESSOR	24-22,24-7
CLUTCH COVER AND DISC	6-10
CLUTCH ENGAGEMENT, CONVERTER	21-75
CLUTCH FLUID LEVEL	6-9
CLUTCH, FRONT	21-130,21-145
CLUTCH HOUSING	6-13
CLUTCH HYDRAULIC LINKAGE	6-13
CLUTCH INSPECTION, TORQUE CONVERTER STATOR	21-186
CLUTCH LINKAGE FLUID	6-9
CLUTCH OPERATION	6-2
CLUTCH OVERHAUL, DIRECT	21-251
CLUTCH OVERHAUL, FORWARD	21-256
CLUTCH OVERHAUL, OVERDRIVE PLANETARY GEAR	21-241
CLUTCH OVERHAUL, SUN GEAR AND NO. 1 ONE-WAY	21-263
CLUTCH PEDAL	6-15
CLUTCH, REAR	21-131,21-146
CLUTCH RELAY, COMPRESSOR	24-18,24-7
CLUTCH RELAY—PCM OUTPUT, AIR CONDITIONING (A/C)	14-28
CLUTCH SWITCH, FIN SENSING CYCLING	24-19,24-29,24-8
CLUTCH (TCC) SOLENOID, TORQUE CONVERTER; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
CLUTCH (TCC) SOLENOID, TORQUE CONVERTER; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
CLUTCH/LOW-REVERSE DRUM, OVERRUNNING	21-125
CLUTCH/LOW-REVERSE DRUM/REAR SUPPORT, OVERRUNNING	21-144
COAST BRAKE SERVO OVERHAUL, SECOND	21-198
COAT FINISH, BASE COAT/CLEAR	23-2
COAT/CLEAR COAT FINISH, BASE	23-2
CODE DECODING, BODY	0-2
CODE IDENTIFICATION, WIRE	8W-01-2
CODE, PAINT	23-2
CODE PLATE, BODY	0-2
CODES, DIAGNOSTIC TROUBLE	25-2
CODES, OVERSIZE AND UNDERSIZE COMPONENT	9-16,9-57
CODES, SPEED CONTROL DIAGNOSTIC TROUBLE	8H-5
COIL, COMPRESSOR CLUTCH	24-18
COIL, EVAPORATOR	24-29,24-8
COIL, IGNITION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
COIL, IGNITION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
COIL, IGNITION; IGNITION SYSTEM	8D-13, 8D-22,8D-3
COIL SPRING	2-7
COIL TEST, CHECK	8D-5
COIL, TESTING FOR SPARK AT	8D-4
COIL—PCM OUTPUT, IGNITION	14-30
COLD CRANKING TEST	8B-4
COLUMN, STEERING	19-23,19-24
COMBINATION FLASHER; 8W-52 TURN SIGNALS (LH)	8W-52-1
COMBINATION FLASHER; 8W-52 TURN SIGNALS (RHD)	8w52-1
COMBINATION FLASHER; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-1,8J-3
COMBINATION VALVE	5-15,5-34,5-4,5-9
COMBUSTION PRESSURE LEAKAGE TEST, CYLINDER	9-9
COMPASS	8V-1
COMPASS CALIBRATION	8V-4
COMPASS DEMAGNETIZING	8V-5
COMPASS VARIATION ADJUSTMENT	8V-4
COMPASS/DISPLAY MODULE	8V-2
COMPASS/THERMOMETER/DISPLAY MODULE	8V-6
COMPRESSION PRESSURE TEST, CYLINDER	9-8
COMPRESSOR	24-17,24-21,24-7
COMPRESSOR, A/C; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
COMPRESSOR, A/C; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
COMPRESSOR CLUTCH	24-22,24-7
COMPRESSOR CLUTCH COIL	24-18
COMPRESSOR CLUTCH RELAY	24-18,24-7
CONDENSER	24-24,24-8
CONDITION, CHECKING FLUID	21-187
CONDITION, CHECKING FLUID LEVEL	21-76
CONDITIONER CONTROLS, HEATER AND AIR	24-2
CONDITIONER, HEATER AND AIR	24-1
CONDITIONING (A/C) CLUTCH RELAY—PCM OUTPUT, AIR	14-28
CONDITIONING (A/C) CONTROLS—PCM INPUT, AIR	14-23
CONDITIONS, SPARK PLUG	8D-10
CONNECTING ROD BEARINGS, FITTING	9-20, 9-60
CONNECTING RODS, PISTONS	9-44,9-82
CONNECTIONS, INTERMITTENT AND POOR	8W-01-5
CONNECTOR AND TERMINAL REPLACEMENT	8W-01-9
CONNECTOR, DATA LINK; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
CONNECTOR, DATA LINK; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
CONNECTOR, DATA LINK; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
CONNECTOR, DATA LINK; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
CONNECTOR REPLACEMENT	8W-01-8
CONNECTOR/GROUND LOCATIONS; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
CONNECTOR/GROUND LOCATIONS; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
CONNECTOR/GROUND LOCATIONS; 8W-90 CONNECTOR LOCATIONS (LH)	8W-90-1
CONNECTOR/GROUND LOCATIONS; 8W-90 CONNECTOR LOCATIONS (RHD)	8W-90-1
CONNECTOR—PCM INPUT AND OUTPUT, DATA LINK	14-29
CONNECTORS	8W-01-3

Description	Group-Page
CONNECTORS, TERMINAL/CONNECTOR REPAIR-MOLEX	8W-01-7
CONNECTORS, TERMINAL/CONNECTOR REPAIR—THOMAS AND BETTS	8W-01-8
CONSOLE, FULL FLOOR	23-54
CONSOLE, MINI-FLOOR	23-53
CONSOLE, OVERHEAD	8V-6
CONTACT PATTERN ANALYSIS, BACKLASH	3-34,3-61
CONTACT PATTERN ANALYSIS, RING GEAR TEETH	3-87
CONTAMINATION DETECTION PROCEDURE, BRAKE FLUID	5-11
CONTAMINATION, FLUID	21-77
CONTINUED	3-19
CONTINUED, DIAGNOSIS TABLE	21-185
CONTROL AND DISPLAY SYMBOLS, INTERNATIONAL	0-3
CONTROL AND DISPLAY SYMBOLS, INTERNATIONAL VEHICLE	0-3
CONTROL CABLE, TEMPERATURE	24-33
CONTROL CIRCUIT TESTS	8B-5
CONTROL DIAGNOSTIC TROUBLE CODES, SPEED	8H-5
CONTROL ELECTRICAL TEST, SPEED	8H-5
CONTROL (IAC) MOTOR, IDLE AIR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
CONTROL (IAC) MOTOR, IDLE AIR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
CONTROL (IAC) MOTOR, IDLE AIR; FUEL SYSTEM	14-36,14-38
CONTROL (IAC) MOTOR—PCM OUTPUT, IDLE AIR	14-29
CONTROL INFORMATION (VECI) LABEL, VEHICLE EMISSION	25-12
CONTROL MODULE (PCM), POWERTRAIN; FUEL SYSTEM	14-23,14-39
CONTROL MODULE (PCM), POWERTRAIN; IGNITION SYSTEM	8D-19
CONTROL MODULE (PCM), POWERTRAIN; VEHICLE SPEED CONTROL SYSTEM	8H-6
CONTROL MODULE, POWERTRAIN; IGNITION SYSTEM	8D-2
CONTROL MODULE, POWERTRAIN; VEHICLE SPEED CONTROL SYSTEM	8H-2,8H-8
CONTROL MODULE (TCM) SERVICE, TRANSMISSION	21-188
CONTROL MODULE (TCM), TRANSMISSION	21-170
CONTROL MODULE, TRANSMISSION	21-191
CONTROL MODULE—4.0L ENGINE ONLY, TRANSMISSION; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
CONTROL MODULE—4.0L ENGINE ONLY, TRANSMISSION; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
CONTROL SERVO, SPEED	8H-1,8H-6,8H-7
CONTROL SOLENOIDS—PCM OUTPUT, SPEED	14-30
CONTROL SWITCH, SPEED	8H-1,8H-5,8H-7
CONTROL SWITCH—PCM INPUT, SPEED	14-27
CONTROL SYSTEM, EVAPORATION (EVAP)	25-10
CONTROL SYSTEM, HYDRAULIC	21-74
CONTROL UNIT (HCU), HYDRAULIC	5-32
CONTROL UNIT, HYDRAULIC; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
CONTROL UNIT, HYDRAULIC; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
CONTROL UNIT, HYDRAULIC; BRAKES	5-36
CONTROL VALVE, FLOW	19-9
CONTROL, VEHICLE SPEED; 8W-33 VEHICLE SPEED CONTROL (LH)	8W-33-1
CONTROL, VEHICLE SPEED; 8W-33 VEHICLE SPEED CONTROL (RHD)	8W-33-1
CONTROLLER ANTILOCK BRAKES	5-35
CONTROLLER ANTILOCK BRAKES (CAB)	5-32
CONTROLS, ELECTRONIC	21-170
CONTROLS, EVAPORATIVE EMISSION	25-10
CONTROLS, HEATER AND AIR CONDITIONER	24-2
CONTROLS, HEATER-A/C	24-12,24-30
CONTROLS—PCM INPUT, AIR CONDITIONING (A/C)	14-23
CONVERSION FORMULAS AND EQUIVALENT VALUES	0-7
CONVERSION, METRIC	0-8
CONVERTER, CATALYTIC	11-1,11-3
CONVERTER CLUTCH ENGAGEMENT	21-75
CONVERTER CLUTCH (TCC) SOLENOID, TORQUE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
CONVERTER CLUTCH (TCC) SOLENOID, TORQUE; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
CONVERTER DRAINBACK CHECK VALVE SERVICE	21-94
CONVERTER DRAINBACK VALVE	21-75
CONVERTER HOUSING FLUID LEAK DIAGNOSIS	21-81
CONVERTER STALL TEST	21-80
CONVERTER STALL TEST, TORQUE	21-182
CONVERTER STATOR CLUTCH INSPECTION, TORQUE	21-186
CONVERTER, TORQUE	21-102,21-171,21-74
CONVERTER, TRANSMISSION AND TORQUE	21-202
COOLANT	7-2
COOLANT FLOW CHECK, RADIATOR	7-20
COOLANT LEVEL CHECK—ROUTINE	7-24
COOLANT LEVEL CHECK-SERVICE	7-24
COOLANT LEVEL-AERATION, LOW	7-24
COOLANT PERFORMANCE	7-5
COOLANT RESERVE TANK	7-27
COOLANT RESERVE/OVERFLOW SYSTEM	7-3
COOLANT ROUTING, SYSTEM	7-2
COOLANT SELECTION-ADDITIVES	7-6
COOLANT SERVICE	7-24
COOLANT TEMPERATURE GAUGE	8E-3,8E-7
COOLANT TEMPERATURE GAUGE, ENGINE	8W-40-2
COOLANT TEMPERATURE SENSOR, ENGINE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
COOLANT TEMPERATURE SENSOR, ENGINE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
COOLANT TEMPERATURE SENSOR, ENGINE; FUEL SYSTEM	14-35,14-42
COOLANT TEMPERATURE SENSOR, ENGINE; IGNITION SYSTEM	8D-15,8D-4,8D-9
COOLANT TEMPERATURE SENSOR—PCM INPUT, ENGINE	14-25
COOLANT TEMPERATURE WARNING LAMP	8E-10,8E-4
COOLANT TEMPERATURE WARNING LAMP, ENGINE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
COOLANT TEMPERATURE WARNING LAMP, ENGINE; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
COOLANT—ROUTINE, ADDING ADDITIONAL	7-24
COOLER, AUTOMATIC TRANSMISSION OIL	7-2
COOLER FLOW CHECK, OIL	21-77
COOLER, FLOW TESTING TRANSMISSION MAIN	21-186
COOLER LINE AND FITTINGS, TRANSMISSION	21-100
COOLER LINE FITTINGS, TRANSMISSION	21-189
COOLER LINES, REVERSE FLUSHING MAIN AND AUXILIARY COOLERS	21-189
COOLER REVERSE FLUSHING, TRANSMISSION	21-94
COOLER, TRANSMISSION	21-188
COOLER—AUXILLARY, TRANSMISSION	21-100
COOLERS AND COOLER LINES, REVERSE FLUSHING MAIN AND AUXILIARY	21-189
COOLERS, TRANSMISSION OIL	7-26
COOLING FAN, AUXILIARY ELECTRIC	7-22,7-34,7-8
COOLING SYSTEM	7-41,7-2
COOLING SYSTEM CAPACITIES	7-40
COOLING SYSTEM CLEANING	7-39
COOLING SYSTEM COMPONENTS	7-2
COOLING SYSTEM DIAGNOSIS	7-14
COOLING SYSTEM, DRAINING AND FILLING	7-24
COOLING SYSTEM FANS	7-38,7-3
COOLING SYSTEM FOR LEAKS, TESTING	7-20
COOLING SYSTEM HOSES	7-39,7-6
CORE, HEATER	24-30
COURTESY LAMPS AND DOME LAMP, CARGO LAMP	8W-44-1
COURTESY LAMPS, AND DOME LAMP, CARGO LAMP	8W-44-1
COVER AND DISC, CLUTCH	6-10
COVER AND FRAME, BUCKET SEATBACK	23-13
COVER, BUCKET SEAT CUSHION	23-12
COVER, CYLINDER HEAD	9-30
COVER, ENGINE CYLINDER HEAD	9-70,9-88
COVER OIL SEAL, TIMING CASE	9-35,9-84
COVER, PARKING BRAKE HANDLE	23-54
COVER, REAR SEAT CUSHION	23-13
COVER, REAR SEATBACK	23-14
COVER, TIMING CASE	9-36,9-75
COWL GRILLE	23-25
COWL TRIM, LOWER A-PILLAR	23-48
COWL WEATHERSTRIP SEAL	23-24
C-PILLAR TRIM	23-49
CRANKCASE VENTILATION SYSTEM	25-12
CRANKING TEST, COLD	8B-4
CRANKSHAFT MAIN BEARINGS	9-41,9-80
CRANKSHAFT MAIN BEARINGS, FITTING	9-23,9-62
CRANKSHAFT POSITION SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
CRANKSHAFT POSITION SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
CRANKSHAFT POSITION SENSOR; FUEL SYSTEM	14-40
CRANKSHAFT POSITION SENSOR; IGNITION SYSTEM	8D-14,8D-3
CRANKSHAFT POSITION SENSOR TEST	8D-7
CRANKSHAFT POSITION SENSOR—PCM INPUT	14-25
CRANKSHAFT POSITION SENSORS, CAMSHAFT	14-35
CROSSMEMBER AIR DEFLECTOR	23-24
CROSSMEMBER, RADIATOR SUPPORT	23-20
CURRENT OUTPUT TEST	8C-3
CUSHION AND COVER, BUCKET SEAT	23-12
CUSHION COVER, REAR SEAT	23-13
CUSHION, REAR SEAT	23-54
CUT-OFF SWITCH, LOW/HIGH PRESSURE	24-19,24-8
CYCLE EVAP CANISTER PURGE SOLENOID, DUTY; EMISSION CONTROL SYSTEMS	25-10
CYCLE EVAP CANISTER PURGE SOLENOID, DUTY; FUEL SYSTEM	14-39
CYCLE EVAP PURGE SOLENOID VALVE-PCM OUTPUT, DUTY	14-29
CYCLE EVAP\PURGE SOLENOID, DUTY; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
CYCLE EVAP\PURGE SOLENOID, DUTY; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
CYCLING CLUTCH SWITCH, FIN SENSING	24-19,24-29,24-8
CYLINDER BLOCK	9-48,9-49,9-87,9-88
CYLINDER BORES, HONING	9-2
CYLINDER COMBUSTION PRESSURE LEAKAGE TEST	9-9
CYLINDER COMPRESSION PRESSURE TEST	9-8
CYLINDER, FRONT DOOR LOCK	23-35
CYLINDER HEAD COVER	9-30
CYLINDER HEAD COVER, ENGINE	9-70,9-88
CYLINDER HEAD, ENGINE	9-32,9-49,9-71,9-87
CYLINDER HEAD GASKET FAILURE DIAGNOSIS, ENGINE	9-8
CYLINDER, IGNITION SWITCH AND KEY	8D-19
CYLINDER, IGNITION SWITCH AND KEY LOCK	8D-4
CYLINDER, LIFTGATE LOCK	23-62
CYLINDER, LIFTGATE SUPPORT ROD	23-61
CYLINDER, MASTER	5-11,5-15,5-4
CYLINDER RESERVOIR, MASTER	5-23
CYLINDER, WHEEL	5-20,5-25,5-27
CYLINDER/POWER BOOSTER TEST, MASTER	5-9
DAMAGED OR WORN THREADS, REPAIR	9-4
DAMPER, ENGINE	9-27
DAMPER, STEERING	19-29
DAMPER, VIBRATION	9-35,9-74

Description	Group-Page
DASH PANEL INSULATOR PANEL	23-24
DATA LINK CONNECTOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
DATA LINK CONNECTOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
DATA LINK CONNECTOR; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
DATA LINK CONNECTOR; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
DATA LINK CONNECTOR—PCM INPUT AND OUTPUT	14-29
DAYTIME RUNNING LAMP (DRL) MODULE	8W-50-2
DAYTIME RUNNING LAMP MODULE	8L-17,8L-1
DEAERATION	7-24
DECODING, BODY CODE	0-2
DECODING CHART, VEHICLE IDENTIFICATION NUMBER	0-1
DEFINITION, TRIP	25-8
DEFLECTOR, CROSSMEMBER AIR	23-24
DEFOGGER GLASS GRID	8N-1,8N-2
DEFOGGER GLASS GRID REPAIRS	8N-3
DEFOGGER, REAR WINDOW; 8W-48 REAR WINDOW DEFOGGER (LH)	8W-48-1
DEFOGGER, REAR WINDOW; 8W-48 REAR WINDOW DEFOGGER (RHD)	8W-48-1
DEFOGGER RELAY/TIMER	8N-1,8N-2,8N-4
DEFOGGER SWITCH	8N-1,8N-2,8N-4
DEFOGGER SYSTEM, REAR WINDOW	8N-1
DELAY MODULE, HEADLAMP; 8W-50 FRONT LIGHTING (LH)	8W-50-1
DELAY MODULE, HEADLAMP; 8W-50 FRONT LIGHTING (RHD)	8W-50-1
DELAY MODULE, HEADLAMP; LAMPS	8L-5
DELAY MODULE, SENTINEL HEADLAMP	8L-17,8L-1
DELIVERY SYSTEM, FUEL	14-3
DEMAGNETIZING, COMPASS	8V-5
DEPTH INFORMATION, PINION GEAR	3-15,3-57
DEPTH MEASUREMENT AND ADJUSTMENT, PINION	3-82
DEPTH VARIANCE, PINION GEAR	3-16,3-58,3-83
DESCRIPTION, ENGINE	9-15,9-54
DESCRIPTION, SYSTEM	25-1
DESCRIPTION, TRANSMISSION	21-170
DETECTION PROCEDURE, BRAKE FLUID CONTAMINATION	5-11
DEVICES, ELECTROSTATIC DISCHARGE (ESD) SENSITIVE	8W-01-5
DIAGNOSIS	3-18
DIAGNOSIS, AUTOMATIC TRANSMISSION	21-75
DIAGNOSIS CHARTS	21-85
DIAGNOSIS CHARTS, POWER STEERING SYSTEM	19-4
DIAGNOSIS (CONT'D), SERVICE	3-48
DIAGNOSIS, CONVERTER HOUSING FLUID LEAK	21-81
DIAGNOSIS, COOLING SYSTEM	7-14
DIAGNOSIS, ENGINE	9-8
DIAGNOSIS, ENGINE CYLINDER HEAD GASKET FAILURE	9-8
DIAGNOSIS, EXHAUST SYSTEM	11-2
DIAGNOSIS, FOG LAMP	8L-4
DIAGNOSIS, HEADLAMP	8L-2,8L-3
DIAGNOSIS INFORMATION, GENERAL	21-180
DIAGNOSIS, INTAKE MANIFOLD LEAKAGE	9-8
DIAGNOSIS, LAMP	8L-1
DIAGNOSIS, NOISE	3-69
DIAGNOSIS, NV242 TRANSFER CASE	21-313
DIAGNOSIS, NV321	21-291
DIAGNOSIS, POWER STEERING GEAR LEAKAGE	19-12
DIAGNOSIS, PRELIMINARY	21-75
DIAGNOSIS, PUMP LEAKAGE	19-6
DIAGNOSIS, SERVICE; DIFFERENTIAL AND DRIVELINE	3-47
DIAGNOSIS, SERVICE; TRANSMISSION AND TRANSFER CASE	21-184
DIAGNOSIS, SHOCK	2-6
DIAGNOSIS, SPRING AND SHOCK	2-13
DIAGNOSIS, SPRING AND SHOCK ABSORBER	2-14
DIAGNOSIS, SUSPENSION AND STEERING SYSTEM	2-3
DIAGNOSIS, SYSTEM	14-23
DIAGNOSIS TABLE	21-184
DIAGNOSIS TABLE CONTINUED	21-185
DIAGNOSIS—LUBRICATION, SERVICE	9-14
DIAGNOSIS—MECHANICAL, SERVICE	9-13
DIAGNOSIS—PERFORMANCE, SERVICE	9-11
DIAGNOSTIC INFORMATION	6-2
DIAGNOSTIC PROCEDURES	8L-2
DIAGNOSTIC SYSTEM TEST, ON-BOARD	8C-6
DIAGNOSTIC TROUBLE CODES	25-2
DIAGNOSTIC TROUBLE CODES, SPEED CONTROL	8H-5
DIAGNOSTICS (OBD), ON-BOARD	7-9
DIAGNOSTICS, ON-BOARD	25-1
DIAGNOSTICS TEST, ON-BOARD	8H-2
DIAGRAM INDEX, WIRING; 8W-20 CHARGING SYSTEM (LH)	8W-20-1
DIAGRAM INDEX, WIRING; 8W-20 CHARGING SYSTEM (RHD)	8W-20-1
DIAGRAM INDEX, WIRING; 8W-21 STARTING SYSTEM (LH)	8W-21-1
DIAGRAM INDEX, WIRING; 8W-21 STARTING SYSTEM (RHD)	8W-21-1
DIAGRAM INDEX, WIRING; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
DIAGRAM INDEX, WIRING; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
DIAGRAM INDEX, WIRING; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
DIAGRAM INDEX, WIRING; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
DIAGRAM INDEX, WIRING; 8W-33 VEHICLE SPEED CONTROL (LH)	8W-33-1
DIAGRAM INDEX, WIRING; 8W-33 VEHICLE SPEED CONTROL (RHD)	8W-33-1
DIAGRAM INDEX, WIRING; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
DIAGRAM INDEX, WIRING; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
DIAGRAM INDEX, WIRING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
DIAGRAM INDEX, WIRING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-4
DIAGRAM INDEX, WIRING; 8W-41 HORN/CIGAR LIGHTER (LH)	8W-41-1
DIAGRAM INDEX, WIRING; 8W-41 HORN/CIGAR LIGHTER (RHD)	8W-41-1
DIAGRAM INDEX, WIRING; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
DIAGRAM INDEX, WIRING; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
DIAGRAM INDEX, WIRING; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
DIAGRAM INDEX, WIRING; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
DIAGRAM INDEX, WIRING; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
DIAGRAM INDEX, WIRING; 8W-47 AUDIO SYSTEM (RHD)	8W-47-2
DIAGRAM INDEX, WIRING; 8W-48 REAR WINDOW DEFOGGER (LH)	8W-48-1
DIAGRAM INDEX, WIRING; 8W-48 REAR WINDOW DEFOGGER (RHD)	8W-48-1
DIAGRAM INDEX, WIRING; 8W-49 OVERHEAD CONSOLE (LH)	8W-49-1
DIAGRAM INDEX, WIRING; 8W-50 FRONT LIGHTING (LH)	8W-50-2
DIAGRAM INDEX, WIRING; 8W-50 FRONT LIGHTING (RHD)	8W-50-2
DIAGRAM INDEX, WIRING; 8W-51 REAR LIGHTING (LH)	8W-51-1
DIAGRAM INDEX, WIRING; 8W-51 REAR LIGHTING (RHD)	8W-51-1
DIAGRAM INDEX, WIRING; 8W-52 TURN SIGNALS (LH)	8W-52-1
DIAGRAM INDEX, WIRING; 8W-52 TURN SIGNALS (RHD)	8w52-1
DIAGRAM INDEX, WIRING; 8W-53 WIPERS (LH)	8W-53-1
DIAGRAM INDEX, WIRING; 8W-53 WIPERS (RHD)	8W-53-1
DIAGRAM INDEX, WIRING; 8W-54 TRAILER TOW (LH)	8W-54-1
DIAGRAM INDEX, WIRING; 8W-54 TRAILER TOW (RHD)	8W-54-1
DIAGRAM INDEX, WIRING; 8W-60 POWER WINDOWS (LH)	8W-60-2
DIAGRAM INDEX, WIRING; 8W-60 POWER WINDOWS (RHD)	8W-60-2
DIAGRAM INDEX, WIRING; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
DIAGRAM INDEX, WIRING; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
DIAGRAM INDEX, WIRING; 8W-62 POWER MIRRORS (LH)	8W-62-1
DIAGRAM INDEX, WIRING; 8W-62 POWER MIRRORS (RHD)	8W-62-1
DIAGRAM INDEX, WIRING; 8W-63 POWER SEAT (LH)	8W-63-1
DIAGRAM INDEX, WIRING; 8W-63 POWER SEAT (RHD)	8W-63-1
DIFFERENTIAL	3-24,3-29,3-37,3-82
DIFFERENTIAL AND PINION MEASUREMENT	3-31
DIFFERENTIAL ASSEMBLY	3-57
DIFFERENTIAL BEARING PRELOAD AND RING GEAR BACKLASH ADJUSTMENT	3-85
DIFFERENTIAL CASE DISASSEMBLY	3-76
DIFFERENTIAL, LIMITED SLIP	3-46
DIFFERENTIAL MEASUREMENT AND INSTALLATION	3-60
DIFFERENTIAL OVERHAUL—TRAC-LOC	3-78
DIFFERENTIAL REMOVAL	3-52
DIFFERENTIAL SERVICE	3-74
DIFFERENTIAL SHIM PACK MEASUREMENT AND ADJUSTMENT	3-33
DIFFERENTIAL, STANDARD	3-53
DIFFERENTIAL, TRAC-LOC	3-82
DIMENSIONS, FRAME	13-7
DIMENSIONS, VEHICLE	0-2
DIMENSIONS, VEHICLE EXTERIOR	0-3
DIMENSIONS, VEHICLE INTERIOR	0-3
DIODE REPLACEMENT	8W-01-10
DIRECT CLUTCH OVERHAUL	21-251
DISASSEMBLY, DIFFERENTIAL CASE	3-76
DISC BRAKE CALIPER	5-16,5-24
DISC BRAKE ROTOR	5-10,5-19
DISC BRAKES, FRONT	5-4
DISC BRAKESHOE	5-17
DISC, CLUTCH COVER	6-10
DISC ROTOR MACHINING	5-12
DISCHARGE (ESD) SENSITIVE DEVICES, ELECTROSTATIC	8W-01-5
DISPLAY SYMBOLS, INTERNATIONAL CONTROL	0-3
DISPLAY SYMBOLS, INTERNATIONAL VEHICLE CONTROL	0-3
DISPLAY TEST MODE, STATE	25-2
DISTANCE SENSOR—PCM INPUT, VEHICLE SPEED	14-27
DISTRIBUTOR	8D-15,8D-2
DISTRIBUTOR CAP	8D-6
DISTRIBUTOR ROTOR	8D-7
DOME LAMP	8L-16
DOME LAMP BULB	8L-12
DOME LAMP, CARGO LAMP, COURTESY LAMPS; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
DOME LAMP, CARGO LAMP, COURTESY LAMPS; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
DOOR	23-66
DOOR ACTUATORS, HEAT/DEFROST/ PANEL	24-32
DOOR, FRONT	23-32
DOOR GLASS EXTERIOR MOLDING, FRONT	23-39
DOOR GLASS EXTERIOR MOLDING, REAR	23-45
DOOR GLASS, FRONT	23-41
DOOR GLASS RUN CHANNEL WEATHERSTRIP, FRONT	23-37
DOOR GLASS RUN CHANNEL WEATHERSTRIP, REAR	23-45
DOOR HINGE, FRONT	23-34
DOOR HINGE PIN, FRONT	23-33
DOOR HINGE PIN, REAR	23-42
DOOR HINGE, REAR	23-42
DOOR INNER BELT SEAL, FRONT	23-37
DOOR INNER BELT SEAL, REAR	23-45
DOOR INSIDE HANDLE ACTUATOR, FRONT	23-36

Description	Group-Page
DOOR INSIDE HANDLE ACTUATOR, REAR	23-44
DOOR JAMB SWITCH, DRIVER'S	8U-1,8U-2
DOOR LATCH ADJUSTMENT	23-66
DOOR LATCH, FRONT	23-35
DOOR LATCH, REAR	23-43
DOOR LATCH STRIKER, FRONT	23-36
DOOR LATCH STRIKER, REAR	23-44
DOOR LOCK CYLINDER, FRONT	23-35
DOOR OPENER STORAGE BIN, GARAGE	8V-2
DOOR OUTER BELT SEAL, FRONT	23-37
DOOR OUTSIDE HANDLE, FRONT	23-34
DOOR OUTSIDE HANDLE, REAR	23-43
DOOR, REAR	23-42
DOOR RESTRAINT, FRONT	23-34
DOOR RESTRAINT, REAR	23-42
DOOR SPACER BLOCKS—TWO-DOOR VEHICLES, FRONT	23-40
DOOR STATIONARY WINDOW GLASS, REAR	23-8
DOOR TRIM PANEL, FRONT	23-30
DOOR TRIM PANEL, REAR	23-41
DOOR VACUUM ACTUATOR, RECIRCULATION AIR	24-33
DOOR WEATHERSTRIP, FRONT	23-38
DOOR WEATHERSTRIP, REAR	23-46
DOOR WINDOW GLASS, REAR	23-46
DOOR WINDOW REGULATOR, FRONT	23-39
DOOR WINDOW REGULATOR, REAR	23-46
DOUBLE CARDAN (CV)	3-9
DOUBLE CARDAN JOINT, SINGLE	3-13
DOWNSTREAM OXYGEN SENSOR	14-41
DRAG LINK	19-29
DRAINBACK CHECK VALVE SERVICE, CONVERTER	21-94
DRAINBACK VALVE, CONVERTER	21-75
DRAINING AND FILLING COOLING SYSTEM	7-24
DRAW FUSE, IGNITION-OFF	8F-1
DRAW TEST, IGNITION-OFF	8A-8
DRB SCAN TOOL	7-10
DRIP RAIL MOLDING	23-64
DRIVE (4WD) SWITCH, FOUR-WHEEL; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
DRIVE (4WD) SWITCH, FOUR-WHEEL; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
DRIVE (4WD) SWITCH, FOUR-WHEEL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
DRIVE (4WD) SWITCH, FOUR-WHEEL; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
DRIVE AXLE ASSEMBLY REPLACEMENT	3-20
DRIVE AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES	3-49,3-71
DRIVE AXLE, FRONT	3-18
DRIVE BELTS, ENGINE ACCESSORY	7-10,7-35, 7-1
DRIVE GEAR, SPEED SENSOR ROTOR-SPEEDOMETER	21-200
DRIVE INDICATOR LAMPS, FOUR-WHEEL	8E-11, 8E-5
DRIVE REMOVAL/INSTALLATION, VISCOUS FAN	7-39
DRIVE, VISCOUS FAN	7-22,7-7
DRIVELINE SNAP	3-17,3-45
DRIVELINE VIBRATION	3-3
DRIVER'S DOOR JAMB SWITCH	8U-1,8U-2
DRIVER'S SEAT BELT SWITCH	8U-2,8U-3
DRUM, BRAKE	5-11
DRUM BRAKE, REAR	5-27,5-28,5-5
DRUM BRAKESHOES	5-19
DRUM MACHINING, BRAKE	5-13
DRUM, OVERRUNNING CLUTCH/LOW-REVERSE	21-125
DRUM/REAR SUPPORT, OVERRUNNING CLUTCH/LOW-REVERSE	21-144
DUTY CYCLE EVAP CANISTER PURGE SOLENOID; EMISSION CONTROL SYSTEMS	25-10
DUTY CYCLE EVAP CANISTER PURGE SOLENOID; FUEL SYSTEM	14-39
DUTY CYCLE EVAP PURGE SOLENOID VALVE-PCM OUTPUT	14-29
DUTY CYCLE EVAP\PURGE SOLENOID; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
DUTY CYCLE EVAP\PURGE SOLENOID; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
EFFECTS OF INCORRECT FLUID LEVEL	21-77
ELECTRIC COOLING FAN, AUXILIARY	7-22,7-34, 7-8
ELECTRICAL TEST, SPEED CONTROL	8H-5
ELECTRONIC CONTROLS	21-170
ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES	8W-01-5
ELEMENT, AIR CLEANER	14-41
ELEMENTS, HEATER	8W-62-1
EMERGENCY TOW HOOKS	0-11
EMISSION CONTROL INFORMATION (VECI) LABEL, VEHICLE	25-12
EMISSION CONTROLS, EVAPORATIVE	25-10
END PLUG, HOUSING	19-14
ENGAGEMENT, CONVERTER CLUTCH	21-75
ENGINE, 2.5L	9-15
ENGINE, 4.0L	9-54,9-93
ENGINE ACCESSORY DRIVE BELTS	7-10,7-35, 7-1
ENGINE ASSEMBLY	9-28,9-67
ENGINE ASSEMBLY (SHORT BLOCK), SERVICE	9-4
ENGINE BLOCK HEATER	7-35,7-2,7-4
ENGINE COOLANT TEMPERATURE GAUGE	8W-40-2
ENGINE COOLANT TEMPERATURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
ENGINE COOLANT TEMPERATURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
ENGINE COOLANT TEMPERATURE SENSOR; FUEL SYSTEM	14-35,14-42
ENGINE COOLANT TEMPERATURE SENSOR; IGNITION SYSTEM	8D-15,8D-4,8D-9
ENGINE COOLANT TEMPERATURE SENSOR—PCM INPUT	14-25
ENGINE COOLANT TEMPERATURE WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
ENGINE COOLANT TEMPERATURE WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
ENGINE CYLINDER HEAD	9-32,9-49,9-71,9-87
ENGINE CYLINDER HEAD COVER	9-70,9-88
ENGINE CYLINDER HEAD GASKET FAILURE DIAGNOSIS	9-8
ENGINE DAMPER	9-27
ENGINE DESCRIPTION	9-15,9-54
ENGINE DIAGNOSIS	9-8
ENGINE, ENGINE FIRING ORDER—2.5L 4-CYLINDER	8D-22
ENGINE, ENGINE FIRING ORDER—4.0L 6-CYLINDER	8D-22
ENGINE, EXHAUST MANIFOLD—2.5L	11-7
ENGINE, EXHAUST MANIFOLD—4.0L	11-8
ENGINE FIRING ORDER—2.5L 4-CYLINDER ENGINE	8D-22
ENGINE FIRING ORDER—4.0L 6-CYLINDER ENGINE	8D-22
ENGINE, FUEL PUMP PRESSURE TEST—2.5L	14-6
ENGINE, FUEL PUMP PRESSURE TEST–4.0L	14-6
ENGINE, FUEL SYSTEM PRESSURE RELEASE PROCEDURE—2.5L	14-9
ENGINE, FUEL SYSTEM PRESSURE RELEASE PROCEDURE–4.0L	14-9
ENGINE, INTAKE MANIFOLD—2.5L	11-5
ENGINE, INTAKE MANIFOLD—4.0L	11-6
ENGINE MOUNT—REAR	9-27,9-66
ENGINE MOUNTS—FRONT	9-26,9-66
ENGINE OIL	9-5
ENGINE OIL PRESSURE	9-10
ENGINE ONLY, TRANSMISSION CONTROL MODULE—4.0L; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
ENGINE ONLY, TRANSMISSION CONTROL MODULE—4.0L; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
ENGINE PERFORMANCE	9-2
ENGINE, POWER STEERING PRESSURE SWITCH—2.5L	14-40
ENGINE SPECIFICATIONS, 2.5L	9-50
ENGINE SPECIFICATIONS, 4.0L	9-90
ENGINE, STARTER NOISE - 2.5L	8B-7
ENTRY MODULE, REMOTE KEYLESS; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
ENTRY MODULE, REMOTE KEYLESS; OVERHEAD CONSOLE SYSTEMS	8V-2
ENTRY MODULE, REMOTE KEYLESS; POWER LOCK SYSTEMS	8P-12,8P-2,8P-8
ENTRY SYSTEM, POWER LOCK/REMOTE KEYLESS	8P-2
ENTRY TRANSMITTER BATTERY REPLACEMENT, REMOTE KEYLESS	8P-9
ENTRY TRANSMITTER PROGRAMMING, KEYLESS	8P-9
ENTRY TRANSMITTER, REMOTE KEYLESS	8P-2,8P-8
EQUIPMENT, REFRIGERANT SYSTEM SERVICE	24-9
EQUIVALENT VALUES, CONVERSION FORMULAS	0-7
EVACUATE, REFRIGERANT SYSTEM	24-21
EVAP CANISTER	25-10,25-13
EVAP CANISTER PURGE SOLENOID	25-13
EVAP CANISTER PURGE SOLENOID, DUTY CYCLE; EMISSION CONTROL SYSTEMS	25-10
EVAP CANISTER PURGE SOLENOID, DUTY CYCLE; FUEL SYSTEM	14-39
EVAP PURGE SOLENOID VALVE-PCM OUTPUT, DUTY CYCLE	14-29
EVAPORATION (EVAP) CONTROL SYSTEM	25-10
EVAPORATIVE EMISSION CONTROLS	25-10
EVAPORATOR COIL	24-29,24-8
EVAPORATOR/BLOWER HOUSING	24-27
EVAP\PURGE SOLENOID, DUTY CYCLE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
EVAP\PURGE SOLENOID, DUTY CYCLE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
EXHAUST GRILLE, AIR	23-50
EXHAUST HEAT SHIELDS	11-2
EXHAUST MANIFOLD—2.5L ENGINE	11-7
EXHAUST MANIFOLD—4.0L ENGINE	11-8
EXHAUST PIPE	11-3
EXHAUST SYSTEM	11-1
EXHAUST SYSTEM DIAGNOSIS	11-2
EXHAUST TAILPIPE, MUFFLER	11-4
EXPANSION VALVE	24-19,24-26,24-8
EXTENDED IDLE SWITCH	8W-30-5
EXTENDED IDLE SWITCH TEST	14-36
EXTENDED IDLE SWITCH—PCM INPUT	14-25
EXTENSION HOUSING AND PARK LOCK	21-140
EXTENSION HOUSING BUSHING—2WD	21-96
EXTENSION HOUSING—2WD	21-96
EXTENSION, QUARTER TRIM PANEL	23-49
EXTERIOR DIMENSIONS, VEHICLE	0-3
EXTERIOR LAMPS	8L-18
EXTERIOR MOLDING, FRONT DOOR GLASS	23-39
EXTERIOR MOLDING, REAR DOOR GLASS	23-45
EXTERIOR NAMEPLATES	23-26
FAILURE DIAGNOSIS, ENGINE CYLINDER HEAD GASKET	9-8
FAILURE TO START TEST	8D-5
FAN, AUXILIARY ELECTRIC COOLING	7-22,7-34, 7-8
FAN BLADE INSPECTION	7-39
FAN DRIVE REMOVAL/INSTALLATION, VISCOUS	7-39
FAN DRIVE, VISCOUS	7-22,7-7
FAN RELAY AND MOTOR, RADIATOR; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
FAN RELAY AND MOTOR, RADIATOR; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
FAN RELAY—PCM OUTPUT, RADIATOR	14-30
FANS, COOLING SYSTEM	7-38,7-3
FASTENER IDENTIFICATION	0-4,0-5
FASTENER STRENGTH	0-6
FEED, BATTERY; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-1
FEED, BATTERY; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
FEED CIRCUIT TESTS	8B-4

Description	Group-Page
FENDER/LINER/WHEELHOUSE FLARE, FRONT	23-28
FIELD—PCM OUTPUT, GENERATOR	14-28
FIFTH GEAR AND SYNCHRO ASSEMBLY	21-48
FILL LEVEL, RECOMMENDED LUBRICANT	21-289,21-314
FILL PROCEDURE, TRANSMISSION	21-93
FILLER TUBE CAP, FUEL TANK; EMISSION CONTROL SYSTEMS	25-11,25-14
FILLER TUBE CAP, FUEL TANK; FUEL SYSTEM	14-5
FILLING COOLING SYSTEM, DRAINING	7-24
FILTER, FUEL	14-13,14-4
FILTER REPLACEMENT, FLUID	21-92
FILTER-DRIER	24-26,24-8
FIN SENSING CYCLING CLUTCH SWITCH	24-19,24-29,24-8
FINAL ASSEMBLY	3-37,3-64
FINISH, BASE COAT/CLEAR COAT	23-2
FIRING ORDER—2.5L 4-CYLINDER ENGINE, ENGINE	8D-22
FIRING ORDER—4.0L 6-CYLINDER ENGINE, ENGINE	8D-22
FIRST/REVERSE BRAKE PISTON AND TRANSMISSION CASE OVERHAUL	21-272
FIRST/SECOND/THIRD/REVERSE GEAR COMPONENTS	21-172
FITTING CONNECTING ROD BEARINGS	9-20, 9-60
FITTING CRANKSHAFT MAIN BEARINGS	9-23, 9-62
FITTING, PISTON	9-18,9-57
FITTING, PISTON RING	9-19,9-58
FITTINGS, QUICK-CONNECT	14-10,14-5
FITTINGS, TRANSMISSION COOLER LINE	21-100,21-189
FIVE VOLT SENSOR SUPPLY—PRIMARY	14-24
FIVE VOLT SENSOR SUPPLY—SECONDARY	14-24
FLARE, FRONT FENDER/LINER/WHEELHOUSE	23-28
FLARES AND LINERS, REAR WHEELHOUSE	23-63
FLASHER, COMBINATION; 8W-52 TURN SIGNALS (LH)	8W-52-1
FLASHER, COMBINATION; 8W-52 TURN SIGNALS (RHD)	8w52-1
FLASHER, COMBINATION; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-1,8J-3
FLASHERS, HAZARD; 8W-52 TURN SIGNALS (LH)	8W-52-1
FLASHERS, HAZARD; 8W-52 TURN SIGNALS (RHD)	8w52-1
FLAT SURFACE TOWING	0-11
FLOOR CONSOLE, FULL	23-54
FLOW CHECK, OIL COOLER	21-77
FLOW CHECK, RADIATOR COOLANT	7-20
FLOW CONTROL VALVE	19-9
FLOW TESTING TRANSMISSION MAIN COOLER	21-186
FLUID AND FILTER REPLACEMENT	21-92
FLUID, BRAKE	5-29
FLUID CAPACITIES	0-2
FLUID CAPACITY, RECOMMENDED	21-170
FLUID, CAUSES OF BURNED	21-77
FLUID, CLUTCH LINKAGE	6-9
FLUID CONDITION, CHECKING	21-187
FLUID CONTAMINATION	21-77
FLUID CONTAMINATION DETECTION PROCEDURE, BRAKE	5-11
FLUID LEAK DIAGNOSIS, CONVERTER HOUSING	21-81
FLUID LEVEL AND CONDITION, CHECKING	21-76
FLUID LEVEL, BRAKE	5-11
FLUID LEVEL CHECK	21-92
FLUID LEVEL, CHECKING	21-187
FLUID LEVEL, CLUTCH	6-9
FLUID LEVEL, EFFECTS OF INCORRECT	21-77
FLUID, RECOMMENDED	21-74
FLUID WARNING LAMP, LOW WASHER; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
FLUID WARNING LAMP, LOW WASHER; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
FLUID WARNING LAMP, LOW WASHER; 8W-53 WIPERS (LH)	8W-53-1
FLUID WARNING LAMP, LOW WASHER; 8W-53 WIPERS (RHD)	8W-53-1
FLUID WARNING LAMP, LOW WASHER; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
FLUID/FILTER CHANGE, REFILLING AFTER OVERHAUL OR	21-188
FLUSHING MAIN AND AUXILIARY COOLERS AND COOLER LINES, REVERSE	21-189
FLUSHING, REVERSE	7-25
FLUSHING, TRANSMISSION COOLER REVERSE	21-94
FLYWHEEL	6-9
FOG LAMP	8L-14
FOG LAMP ADJUSTMENT	8L-7
FOG LAMP BULB	8L-9
FOG LAMP DIAGNOSIS	8L-4
FOG LAMPS; 8W-50 FRONT LIGHTING (LH)	8W-50-2
FOG LAMPS; 8W-50 FRONT LIGHTING (RHD)	8W-50-2
FORK, SHIFT RAIL	21-54
FORM-IN-PLACE GASKETS	9-1
FORMULAS AND EQUIVALENT VALUES, CONVERSION	0-7
FORTH GEAR OVERDRIVE COMPONENTS	21-172
FORWARD CLUTCH OVERHAUL	21-256
FOUR-WHEEL DRIVE (4WD) SWITCH; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
FOUR-WHEEL DRIVE (4WD) SWITCH; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
FOUR-WHEEL DRIVE (4WD) SWITCH; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
FOUR-WHEEL DRIVE (4WD) SWITCH; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
FOUR-WHEEL DRIVE INDICATOR LAMPS	8E-11,8E-5
FOUR-WHEEL-DRIVE VEHICLE TOWING	0-10
FRAME	13-6
FRAME, BUCKET SEATBACK COVER	23-13
FRAME DIMENSIONS	13-7
FRAME TORQUE SPECIFICATIONS	13-10
FREQUENCY INTERFERENCE, RADIO	8F-6
FRONT AXLE—MODEL 30	3-37,3-38,3-89
FRONT AXLE—MODEL 35	3-65
FRONT AXLE—TUBE AND MODEL 30	3-14
FRONT BAND ADJUSTMENT	21-149
FRONT BEARING RETAINER, ADAPTER HOUSING	21-6
FRONT BUMPER	13-1,13-4
FRONT CARPET/MAT	23-56
FRONT CLUTCH	21-130,21-145
FRONT DISC BRAKES	5-4
FRONT DOOR	23-32
FRONT DOOR GLASS	23-41
FRONT DOOR GLASS EXTERIOR MOLDING	23-39
FRONT DOOR GLASS RUN CHANNEL WEATHERSTRIP	23-37
FRONT DOOR HINGE	23-34
FRONT DOOR HINGE PIN	23-33
FRONT DOOR INNER BELT SEAL	23-37
FRONT DOOR INSIDE HANDLE ACTUATOR	23-36
FRONT DOOR LATCH	23-35
FRONT DOOR LATCH STRIKER	23-36
FRONT DOOR LOCK CYLINDER	23-35
FRONT DOOR OUTER BELT SEAL	23-37
FRONT DOOR OUTSIDE HANDLE	23-34
FRONT DOOR RESTRAINT	23-34
FRONT DOOR SPACER BLOCKS—TWO-DOOR VEHICLES	23-40
FRONT DOOR TRIM PANEL	23-30
FRONT DOOR WEATHERSTRIP	23-38
FRONT DOOR WINDOW REGULATOR	23-39
FRONT DRIVE AXLE	3-18
FRONT FENDER/LINER/WHEELHOUSE FLARE	23-28
FRONT INNER SCUFF PLATE	23-48
FRONT PARK/TURN SIGNAL LAMP	8L-14
FRONT PARK/TURN SIGNAL LAMP BULB	8L-10
FRONT PLANETARY GEAR OVERHAUL	21-261
FRONT PROPELLER SHAFT	3-7
FRONT SERVO	21-144
FRONT SERVO PISTON	21-126
FRONT SHOULDER BELT/BUCKLE	23-51
FRONT SKID PLATE	13-6
FRONT SUSPENSION	2-12,2-6
FRONT TOW HOOKS	13-1
FRONT WHEEL SENSOR	5-37
FUEL DELIVERY SYSTEM	14-3
FUEL FILTER	14-13,14-4
FUEL GAUGE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
FUEL GAUGE; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-1
FUEL GAUGE; INSTRUMENT PANEL SYSTEMS	8E-3,8E-7
FUEL GAUGE SENDING UNIT	14-4,14-7
FUEL INJECTION SYSTEM	14-19
FUEL INJECTOR RAIL	14-15
FUEL INJECTOR TEST	14-7
FUEL INJECTORS; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
FUEL INJECTORS; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
FUEL INJECTORS; FUEL SYSTEM	14-16,14-5
FUEL INJECTORS—PCM OUTPUT	14-29
FUEL LEVEL SENSOR	14-15
FUEL LEVEL SENSOR—PCM INPUT	14-24
FUEL PRESSURE REGULATOR	14-14,14-4
FUEL PUMP	14-3
FUEL PUMP INLET STRAINER	14-15
FUEL PUMP MODULE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
FUEL PUMP MODULE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
FUEL PUMP MODULE; FUEL SYSTEM	14-14,14-3
FUEL PUMP PRESSURE TEST—2.5L ENGINE	14-6
FUEL PUMP PRESSURE TEST–4.0L ENGINE	14-6
FUEL PUMP RELAY; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
FUEL PUMP RELAY; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
FUEL PUMP RELAY; FUEL SYSTEM	14-14,14-37
FUEL PUMP RELAY-PCM OUTPUT	14-29
FUEL PUMP RELAYS, ASD	14-33
FUEL RAIL	14-5
FUEL REQUIREMENTS	14-1
FUEL SYSTEM PRESSURE	14-18
FUEL SYSTEM PRESSURE RELEASE PROCEDURE—2.5L ENGINE	14-9
FUEL SYSTEM PRESSURE RELEASE PROCEDURE–4.0L ENGINE	14-9
FUEL TANK	14-16,14-5
FUEL TANK CAPACITY	14-18
FUEL TANK FILLER TUBE CAP; EMISSION CONTROL SYSTEMS	25-11,25-14
FUEL TANK FILLER TUBE CAP; FUEL SYSTEM	14-5
FUEL TANK SKID PLATE	13-6
FUEL TUBES/LINES/HOSES AND CLAMPS	14-9
FUEL WARNING LAMP, LOW; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
FUEL WARNING LAMP, LOW; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
FUEL WARNING LAMP, LOW; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
FULL FLOOR CONSOLE	23-54
FUSE, IGNITION-OFF DRAW	8F-1
FUSE, IN-LINE	8F-1
FUSEBLOCK MODULE	8E-3
GARAGE DOOR OPENER STORAGE BIN	8V-2
GASKET FAILURE DIAGNOSIS, ENGINE CYLINDER HEAD	9-8
GASKETS, FORM-IN-PLACE	9-1
GASOLINE/OXYGENATE BLENDS	14-1
GAUGE CALIBRATION	8E-20
GAUGE, COOLANT TEMPERATURE	8E-3,8E-7
GAUGE, ENGINE COOLANT TEMPERATURE	8W-40-2
GAUGE, FUEL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
GAUGE, FUEL; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-1
GAUGE, FUEL; INSTRUMENT PANEL SYSTEMS	8E-3,8E-7
GAUGE, OIL PRESSURE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
GAUGE, OIL PRESSURE; INSTRUMENT PANEL SYSTEMS	8E-3,8E-7
GAUGE SENDING UNIT, FUEL	14-4,14-7
GAUGES	8E-15,8E-2

Description	Group-Page
GAUGES, PRESSURE	22-3
GEAR AND BEARING NOISE	3-16,3-44
GEAR AND CLUTCH OVERHAUL, OVERDRIVE PLANETARY	21-241
GEAR AND NO. 1 ONE–WAY CLUTCH OVERHAUL, SUN	21-263
GEAR AND SYNCHRO ASSEMBLY, FIFTH	21-48
GEAR BACKLASH ADJUSTMENT, DIFFERENTIAL BEARING PRELOAD AND RING	3-85
GEAR CASE	21-45
GEAR CLEARANCE MEASUREMENT AND ADJUSTMENT, SIDE	3-86
GEAR COMPONENTS, FIRST/SECOND/ THIRD/REVERSE	21-172
GEAR DEPTH INFORMATION, PINION	3-15,3-57
GEAR DEPTH VARIANCE, PINION	3-16,3-58,3-83
GEAR, GOVERNOR AND PARK	21-104,21-139, 21-98
GEAR LEAKAGE DIAGNOSIS, POWER STEERING	19-12
GEAR, OUTPUT SHAFT AND CLUSTER	21-61
GEAR OVERDRIVE COMPONENTS, FORTH	21-172
GEAR OVERHAUL, FRONT PLANETARY	21-261
GEAR, PINION	3-26,3-54
GEAR, POWER STEERING	19-11,19-22
GEAR RATIOS	21-1
GEAR RATIOS, TRANSMISSION	21-38,21-74
GEAR, RING	3-77
GEAR SHAFT REMOVAL, PINION	3-75
GEAR, SPEED SENSOR ROTOR-SPEEDOMETER DRIVE	21-200
GEAR, STEERING	19-13,19-20
GEAR TEETH CONTACT PATTERN ANALYSIS, RING	3-87
GEAR TRAIN/OUTPUT SHAFT, PLANETARY	21-134
GEARSHIFT MECHANISM	21-74
GEARTRAIN OPERATION AND APPLICATION CHARTS	21-173
GEARTRAIN, PLANETARY	21-146
GENERAL DIAGNOSIS INFORMATION	21-180
GENERAL INFORMATION; DIFFERENTIAL AND DRIVELINE	3-16,3-42,3-44
GENERAL INFORMATION; ENGINE	9-8
GENERAL INFORMATION; FUEL SYSTEM	14-1
GENERAL INFORMATION; LAMPS	8L-18,8L-1
GENERAL INFORMATION; LUBRICATION AND MAINTENANCE	0-1
GENERAL INFORMATION; TRANSMISSION AND TRANSFER CASE	21-289, 21-312,21-36,21-1
GENERAL SERVICE INFORMATION	23-1
GENERATOR	8C-2,8C-7
GENERATOR FIELD—PCM OUTPUT	14-28
GENERATOR LAMP—PCM OUTPUT	14-28
GENERATOR RATINGS	8C-8
GENERATOR WARNING LAMP	8E-11,8E-5
GLASS EXTERIOR MOLDING, FRONT DOOR	23-39
GLASS EXTERIOR MOLDING, REAR DOOR	23-45
GLASS, FRONT DOOR	23-41
GLASS GRID, DEFOGGER	8N-1,8N-2
GLASS GRID REPAIRS, DEFOGGER	8N-3
GLASS, LIFTGATE WINDOW	23-9
GLASS, REAR DOOR STATIONARY WINDOW	23-8
GLASS, REAR DOOR WINDOW	23-46
GLASS, REAR QUARTER WINDOW	23-8
GLASS, REFRIGERANT SYSTEM SIGHT	24-10, 24-19
GLASS RUN CHANNEL WEATHERSTRIP, FRONT DOOR	23-37
GLASS RUN CHANNEL WEATHERSTRIP, REAR DOOR	23-45
GLASS, STATIONARY	23-11,23-4
GLOVE BOX LAMP; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
GLOVE BOX LAMP; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
GOVERNOR AND PARK GEAR	21-104,21-139, 21-98
GRID, DEFOGGER GLASS	8N-1,8N-2
GRID REPAIRS, DEFOGGER GLASS	8N-3
GRILLE	23-18
GRILLE, AIR EXHAUST	23-50
GRILLE, COWL	23-25
GRILLE OPENING PANEL (GOP)	23-19
GROUND; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-1
GROUND; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
GROUND, CLUSTER	8W-40-3
GROUND, POWER	14-28
GROUP, HOW TO USE THIS; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
GROUP, HOW TO USE THIS; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
G-SWITCH; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
G-SWITCH; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
HALO LAMP, IGNITION SWITCH KEY-IN; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
HALO LAMP, IGNITION SWITCH KEY-IN; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
HANDLE ACTUATOR, FRONT DOOR INSIDE	23-36
HANDLE ACTUATOR, REAR DOOR INSIDE	23-44
HANDLE, ASSIST	23-48
HANDLE COVER, PARKING BRAKE	23-54
HANDLE, FRONT DOOR OUTSIDE	23-34
HANDLE, LIFTGATE OUTSIDE	23-61
HANDLE, REAR DOOR OUTSIDE	23-43
HARD SHIFTING	21-38,21-4
HARNESS ADAPTER SEAL, SOLENOID	21-192
HAZARD FLASHERS; 8W-52 TURN SIGNALS (LH)	8W-52-1
HAZARD FLASHERS; 8W-52 TURN SIGNALS (RHD)	8w52-1
HAZARD WARNING SYSTEM	8J-1
HEAD COVER, CYLINDER	9-30
HEAD COVER, ENGINE CYLINDER	9-70,9-88
HEAD, ENGINE CYLINDER	9-32,9-49,9-71,9-87
HEAD GASKET FAILURE DIAGNOSIS, ENGINE CYLINDER	9-8
HEAD RESTRAINT	23-12
HEADLAMP	8L-14
HEADLAMP ADJUSTMENT	8L-6
HEADLAMP ALIGNMENT	8L-6,8L-8
HEADLAMP ALIGNMENT PREPARATION	8L-6
HEADLAMP BULB	8L-9
HEADLAMP DELAY MODULE; 8W-50 FRONT LIGHTING (LH)	8W-50-1
HEADLAMP DELAY MODULE; 8W-50 FRONT LIGHTING (RHD)	8W-50-1
HEADLAMP DELAY MODULE; LAMPS	8L-5
HEADLAMP DELAY MODULE, SENTINEL	8L-17, 8L-1
HEADLAMP DIAGNOSIS	8L-2,8L-3
HEADLAMP HIGH BEAM INDICATOR LAMP	8E-11,8E-5
HEADLAMP SWITCH; CHIME/BUZZER WARNING SYSTEMS	8U-1,8U-3
HEADLAMP SWITCH; INSTRUMENT PANEL SYSTEMS	8E-17
HEADLAMPS; 8W-50 FRONT LIGHTING (LH)	8W-50-1
HEADLAMPS; 8W-50 FRONT LIGHTING (RHD)	8W-50-1
HEADLINER	23-58
HEAT SHIELDS, EXHAUST	11-2
HEAT/DEFROST/PANEL DOOR ACTUATORS	24-32
HEATED OXYGEN (O2S) SENSORS	14-35
HEATED OXYGEN SENSOR (O2S)—PCM INPUT	14-26
HEATED OXYGEN SENSORS; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
HEATED OXYGEN SENSORS; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
HEATER AND AIR CONDITIONER	24-1
HEATER AND AIR CONDITIONER CONTROLS	24-2
HEATER CORE	24-30
HEATER ELEMENTS	8W-62-1
HEATER, ENGINE BLOCK	7-35,7-2,7-4
HEATER PERFORMANCE	24-12
HEATER-A/C CONTROLS	24-12,24-30
HEATER-A/C HOUSING	24-27
HELPFUL INFORMATION; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
HELPFUL INFORMATION; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-4
HELPFUL INFORMATION; 8W-54 TRAILER TOW (LH)	8W-54-1
HELPFUL INFORMATION; 8W-54 TRAILER TOW (RHD)	8W-54-1
HELPFUL INFORMATION; 8W-60 POWER WINDOWS (LH)	8W-60-2
HELPFUL INFORMATION; 8W-60 POWER WINDOWS (RHD)	8W-60-2
HELPFUL INFORMATION; 8W-62 POWER MIRRORS (LH)	8W-62-1
HIGH AND LOW LIMITS	25-9
HIGH BEAM INDICATOR LAMP, HEADLAMP	8E-11,8E-5
HIGH MOUNTED STOP LAMP (CHMSL) BULB, CENTER	8L-12
HIGH PRESSURE RELIEF VALVE	24-8
HIGH-BEAM INDICATOR LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
HIGH-BEAM INDICATOR LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
HIGH—SPEED OPERATION, TIRE PRESSURE	22-3
HINGE, FRONT DOOR	23-34
HINGE, HOOD	23-21
HINGE, LIFTGATE	23-60
HINGE PIN, FRONT DOOR	23-33
HINGE PIN, REAR DOOR	23-42
HINGE, REAR DOOR	23-42
HITCH, TRAILER	13-7
HOISTING, JUMP STARTING, TOWING	0-8
HOISTING RECOMMENDATIONS	0-11
HONING CYLINDER BORES	9-2
HOOD	23-21,23-65
HOOD HINGE	23-21
HOOD LATCH	23-23
HOOD LATCH STRIKER	23-23
HOOD RELEASE CABLE	23-23
HOOK, REAR TOW	13-3
HOOKS, EMERGENCY TOW	0-11
HOOKS, FRONT TOW	13-1
HORN; 8W-41 HORN/CIGAR LIGHTER (LH)	8W-41-1
HORN; 8W-41 HORN/CIGAR LIGHTER (RHD)	8W-41-1
HORN; HORN SYSTEMS	8G-1,8G-2,8G-4
HORN RELAY	8G-1,8G-3
HORN SWITCH	8G-1,8G-2,8G-3
HOSES AND LINES, BRAKE	5-6
HOSES, BRAKE LINE	5-11
HOSES, COOLING SYSTEM	7-39,7-6
HOUSING, ADAPTER	21-40
HOUSING, AIR CLEANER	14-41
HOUSING AND FRONT BEARING RETAINER, ADAPTER	21-6
HOUSING AND PARK LOCK, EXTENSION	21-140
HOUSING BUSHING—2WD, EXTENSION	21-96
HOUSING, CLUTCH	6-13
HOUSING END PLUG	19-14
HOUSING, EVAPORATOR/BLOWER	24-27
HOUSING FLUID LEAK DIAGNOSIS, CONVERTER	21-81
HOUSING, HEATER-A/C	24-27
HOUSING SEAL REPLACEMENT, ADAPTER	21-199
HOUSING—2WD, EXTENSION	21-96
HOW TO USE THIS GROUP; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
HOW TO USE THIS GROUP; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
HUB BEARING	2-10
HUB BEARING AND AXLE SHAFT	3-21
HYDRAULIC CONTROL SYSTEM	21-74
HYDRAULIC CONTROL UNIT; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
HYDRAULIC CONTROL UNIT; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
HYDRAULIC CONTROL UNIT; BRAKES	5-36
HYDRAULIC CONTROL UNIT (HCU)	5-32
HYDRAULIC LINKAGE, CLUTCH	6-13
HYDRAULIC PRESSURE TEST	21-180,21-78
HYDRAULIC SYSTEM	21-174
HYDRAULIC TAPPETS	9-34,9-74,9-88
HYDROMETER TEST	8A-5
HYDROSTATIC LOCK	9-4
IDENTIFICATION, CIRCUIT	8W-01-3

Description	Group-Page
IDENTIFICATION, FASTENER	0-4,0-5
IDENTIFICATION NUMBER DECODING CHART, VEHICLE	0-1
IDENTIFICATION NUMBER, VEHICLE	0-1
IDENTIFICATION, SECTION; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
IDENTIFICATION, SECTION; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
IDENTIFICATION, TRAMSMISSION	21-1
IDENTIFICATION, TRANSFER CASE	21-289, 21-312
IDENTIFICATION, TRANSMISSION	21-170,21-37,21-74
IDENTIFICATION, WIRE CODE	8W-01-2
IDLE AIR CONTROL (IAC) MOTOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
IDLE AIR CONTROL (IAC) MOTOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
IDLE AIR CONTROL (IAC) MOTOR; FUEL SYSTEM	14-36,14-38
IDLE AIR CONTROL (IAC) MOTOR—PCM OUTPUT	14-29
IDLE SWITCH, EXTENDED	8W-30-5
IDLE SWITCH TEST, EXTENDED	14-36
IDLE SWITCH—PCM INPUT, EXTENDED	14-25
IGNITION CIRCUIT SENSE—PCM INPUT	14-26
IGNITION COIL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
IGNITION COIL; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
IGNITION COIL; IGNITION SYSTEM	8D-13,8D-22, 8D-3
IGNITION COIL—PCM OUTPUT	14-30
IGNITION KEY-IN SWITCH	8U-1,8U-2
IGNITION SWITCH; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-1
IGNITION SWITCH; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
IGNITION SWITCH; STEERING	19-24
IGNITION SWITCH AND KEY CYLINDER	8D-19
IGNITION SWITCH AND KEY LOCK CYLINDER	8D-4
IGNITION SWITCH KEY-IN HALO LAMP; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
IGNITION SWITCH KEY-IN HALO LAMP; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
IGNITION SYSTEM	8D-1
IGNITION TIMING	8D-21,8D-7
IGNITION-OFF DRAW FUSE	8F-1
IGNITION-OFF DRAW TEST	8A-8
ILLUMINATION LAMPS, CLUSTER	8E-10,8E-4
ILLUMINATION LAMPS, INSTRUMENT PANEL; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
ILLUMINATION LAMPS, INSTRUMENT PANEL; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
ILLUMINATION, RADIO; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
ILLUMINATION, RADIO; 8W-47 AUDIO SYSTEM (RHD)	8W-47-1
ILLUMINATION RELAY, RADIO	8F-1,8F-4,8F-7
IMPACT SENSOR/INFLATOR ASSEMBLY	8M-2
INCORRECT FLUID LEVEL, EFFECTS OF	21-77
INDEX, WIRING DIAGRAM; 8W-20 CHARGING SYSTEM (LH)	8W-20-1
INDEX, WIRING DIAGRAM; 8W-20 CHARGING SYSTEM (RHD)	8W-20-1
INDEX, WIRING DIAGRAM; 8W-21 STARTING SYSTEM (LH)	8W-21-1
INDEX, WIRING DIAGRAM; 8W-21 STARTING SYSTEM (RHD)	8W-21-1
INDEX, WIRING DIAGRAM; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
INDEX, WIRING DIAGRAM; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
INDEX, WIRING DIAGRAM; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
INDEX, WIRING DIAGRAM; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
INDEX, WIRING DIAGRAM; 8W-33 VEHICLE SPEED CONTROL (LH)	8W-33-1
INDEX, WIRING DIAGRAM; 8W-33 VEHICLE SPEED CONTROL (RHD)	8W-33-1
INDEX, WIRING DIAGRAM; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
INDEX, WIRING DIAGRAM; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
INDEX, WIRING DIAGRAM; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
INDEX, WIRING DIAGRAM; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-4
INDEX, WIRING DIAGRAM; 8W-41 HORN/CIGAR LIGHTER (LH)	8W-41-1
INDEX, WIRING DIAGRAM; 8W-41 HORN/CIGAR LIGHTER (RHD)	8W-41-1
INDEX, WIRING DIAGRAM; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
INDEX, WIRING DIAGRAM; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
INDEX, WIRING DIAGRAM; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
INDEX, WIRING DIAGRAM; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
INDEX, WIRING DIAGRAM; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
INDEX, WIRING DIAGRAM; 8W-47 AUDIO SYSTEM (RHD)	8W-47-2
INDEX, WIRING DIAGRAM; 8W-48 REAR WINDOW DEFOGGER (LH)	8W-48-1
INDEX, WIRING DIAGRAM; 8W-48 REAR WINDOW DEFOGGER (RHD)	8W-48-1
INDEX, WIRING DIAGRAM; 8W-49 OVERHEAD CONSOLE (LH)	8W-49-1
INDEX, WIRING DIAGRAM; 8W-50 FRONT LIGHTING (LH)	8W-50-2
INDEX, WIRING DIAGRAM; 8W-50 FRONT LIGHTING (RHD)	8W-50-2
INDEX, WIRING DIAGRAM; 8W-51 REAR LIGHTING (LH)	8W-51-1
INDEX, WIRING DIAGRAM; 8W-51 REAR LIGHTING (RHD)	8W-51-1
INDEX, WIRING DIAGRAM; 8W-52 TURN SIGNALS (LH)	8W-52-1
INDEX, WIRING DIAGRAM; 8W-52 TURN SIGNALS (RHD)	8w52-1
INDEX, WIRING DIAGRAM; 8W-53 WIPERS (LH)	8W-53-1
INDEX, WIRING DIAGRAM; 8W-53 WIPERS (RHD)	8W-53-1
INDEX, WIRING DIAGRAM; 8W-54 TRAILER TOW (LH)	8W-54-1
INDEX, WIRING DIAGRAM; 8W-54 TRAILER TOW (RHD)	8W-54-1
INDEX, WIRING DIAGRAM; 8W-60 POWER WINDOWS (LH)	8W-60-2
INDEX, WIRING DIAGRAM; 8W-60 POWER WINDOWS (RHD)	8W-60-2
INDEX, WIRING DIAGRAM; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
INDEX, WIRING DIAGRAM; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
INDEX, WIRING DIAGRAM; 8W-62 POWER MIRRORS (LH)	8W-62-1
INDEX, WIRING DIAGRAM; 8W-62 POWER MIRRORS (RHD)	8W-62-1
INDEX, WIRING DIAGRAM; 8W-63 POWER SEAT (LH)	8W-63-1
INDEX, WIRING DIAGRAM; 8W-63 POWER SEAT (RHD)	8W-63-1
INDICATOR, BUILT-IN TEST	8A-5
INDICATOR LAMP, CHARGING SYSTEM	8W-40-3
INDICATOR LAMP, HEADLAMP HIGH BEAM	8E-11,8E-5
INDICATOR LAMP, HIGH-BEAM; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
INDICATOR LAMP, HIGH-BEAM; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
INDICATOR LAMP, MALFUNCTION	8E-13,8E-5
INDICATOR LAMP (MIL), MALFUNCTION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
INDICATOR LAMP (MIL), MALFUNCTION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
INDICATOR LAMP (MIL), MALFUNCTION; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
INDICATOR LAMP (MIL), MALFUNCTION; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
INDICATOR LAMP (MIL), MALFUNCTION; EMISSION CONTROL SYSTEMS	25-1
INDICATOR LAMP, UPSHIFT	8E-14,8E-6
INDICATOR LAMP—PCM OUTPUT, MALFUNCTION	14-30
INDICATOR LAMPS	8E-3
INDICATOR LAMPS, FOUR-WHEEL DRIVE	8E-11, 8E-5
INDICATOR LAMPS, TURN SIGNAL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
INDICATOR LAMPS, TURN SIGNAL; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
INDICATOR LAMPS, TURN SIGNAL; INSTRUMENT PANEL SYSTEMS	8E-13,8E-6
INDICATOR LAMPS, TURN SIGNAL; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-2
INDICATOR WARNING LAMP, SEAT BELT; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
INDICATOR WARNING LAMP, SEAT BELT; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
INDICATORS, TREAD WEAR	22-3
INFLATION PRESSURES, TIRE	22-2
INJECTION SYSTEM, FUEL	14-19
INJECTOR RAIL, FUEL	14-15
INJECTOR TEST, FUEL	14-7
INJECTORS, FUEL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
INJECTORS, FUEL; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
INJECTORS, FUEL; FUEL SYSTEM	14-16,14-5
INJECTORS—PCM OUTPUT, FUEL	14-29
INLET STRAINER, FUEL PUMP	14-15
IN-LINE FUSE	8F-1
INNER AXLE SHAFT OIL SEAL REPLACEMENT	3-26
INNER BELT SEAL, FRONT DOOR	23-37
INNER BELT SEAL, REAR DOOR	23-45
INNER SCUFF PLATE, FRONT	23-48
INPUT, AIR CONDITIONING (A/C) CONTROLS—PCM	14-23
INPUT AND OUTPUT, DATA LINK CONNECTOR—PCM	14-29
INPUT, AUTOMATIC SHUTDOWN (ASD) RELAY—PCM	14-24
INPUT, BATTERY TEMPERATURE SENSOR—PCM	14-24
INPUT, BATTERY VOLTAGE—PCM	14-24
INPUT, BRAKE SWITCH—PCM	14-24
INPUT, CAMSHAFT POSITION SENSOR—PCM	14-24
INPUT, CRANKSHAFT POSITION SENSOR—PCM	14-25
INPUT, ENGINE COOLANT TEMPERATURE SENSOR—PCM	14-25
INPUT, EXTENDED IDLE SWITCH—PCM	14-25
INPUT, FUEL LEVEL SENSOR—PCM	14-24
INPUT, HEATED OXYGEN SENSOR (O2S)—PCM	14-26
INPUT, IGNITION CIRCUIT SENSE—PCM	14-26
INPUT, INTAKE MANIFOLD AIR TEMPERATURE SENSOR—PCM	14-26
INPUT, MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—PCM	14-27
INPUT, POWER STEERING PRESSURE SWITCH—PCM	14-27
INPUT, SPEED CONTROL SWITCH—PCM	14-27
INPUT, STOP LAMP SWITCH; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
INPUT, STOP LAMP SWITCH; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
INPUT, STOP LAMP SWITCH; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
INPUT, THROTTLE POSITION SENSOR (TPS)—PCM	14-27
INPUT, TRANSMISSION PARK/NEUTRAL SWITCH—PCM	14-27
INPUT, VEHICLE SPEED AND DISTANCE SENSOR—PCM	14-27
INSIDE HANDLE ACTUATOR, FRONT DOOR	23-36
INSIDE HANDLE ACTUATOR, REAR DOOR	23-44
INSPECTION	3-5
INSPECTION AND ADJUSTMENT, PRELIMINARY	21-180
INSPECTION (ENGINE OIL LEAKS IN GENERAL)	9-9
INSPECTION, FAN BLADE	7-39
INSPECTION, PRE-ALIGNMENT	2-1

Description	Group-Page
INSPECTION, TORQUE CONVERTER STATOR CLUTCH	21-186
INSPECTION, TRANSMISSION PARTS CLEANING	21-277
INSPECTION, UNSCHEDULED	0-3
INSPECTION, VISUAL	14-31
INSPECTION, WHEEL	22-8
INSTALLATION, DIFFERENTIAL MEASUREMENT	3-60
INSTALLATION METHODS AND PARTS USAGE	6-2
INSTALLATION, WHEEL	22-9
INSTRUMENT CLUSTER; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
INSTRUMENT CLUSTER; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-1
INSTRUMENT CLUSTER; INSTRUMENT PANEL SYSTEMS	8E-14
INSTRUMENT CLUSTERS	8E-2
INSTRUMENT PANEL	8E-18,8E-2
INSTRUMENT PANEL ILLUMINATION LAMPS; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
INSTRUMENT PANEL ILLUMINATION LAMPS; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
INSUFFICIENT ASST. OR POOR RETURN TO CENTER	19-4
INSULATOR PANEL, DASH PANEL	23-24
INTAKE AIR TEMPERATURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
INTAKE AIR TEMPERATURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
INTAKE MANIFOLD AIR TEMPERATURE SENSOR; FUEL SYSTEM	14-36,14-42
INTAKE MANIFOLD AIR TEMPERATURE SENSOR; IGNITION SYSTEM	8D-15,8D-4,8D-9
INTAKE MANIFOLD AIR TEMPERATURE SENSOR—PCM INPUT	14-26
INTAKE MANIFOLD LEAKAGE DIAGNOSIS	9-8
INTAKE MANIFOLD—2.5L ENGINE	11-5
INTAKE MANIFOLD—4.0L ENGINE	11-6
INTERFERENCE, RADIO FREQUENCY	8F-6
INTERIOR DIMENSIONS, VEHICLE	0-3
INTERIOR LAMPS	8L-18
INTERLOCK CABLE ADJUSTMENT, PARK	21-147,21-279
INTERLOCK, SHIFT; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
INTERLOCK, SHIFT; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
INTERLOCK, SHIFTER/IGNITION	8D-21
INTERMITTENT AND POOR CONNECTIONS	8W-01-5
INTERMITTENT WIPE MODULE	8K-3,8K-8
INTERMITTENT WIPERS; 8W-53 WIPERS (LH)	8W-53-1
INTERMITTENT WIPERS; 8W-53 WIPERS (RHD)	8W-53-1
INTERNATIONAL CONTROL AND DISPLAY SYMBOLS	0-3
INTERNATIONAL SYMBOLS	0-1
INTERNATIONAL VEHICLE CONTROL AND DISPLAY SYMBOLS	0-3
INTRODUCTION; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
INTRODUCTION; 8W-02 COMPONENT INDEX (LH)	8W-02-1
INTRODUCTION; 8W-02 COMPONENT INDEX (RHD)	8W-02-1
INTRODUCTION; 8W-10 FUSE/FUSE BLOCK (LH)	8W-10-1
INTRODUCTION; 8W-10 FUSE/FUSE BLOCK (RHD)	8W-10-1
INTRODUCTION; 8W-11 POWER DISTRIBUTION (LH)	8W-11-1
INTRODUCTION; 8W-11 POWER DISTRIBUTION (RHD)	8W-11-1
INTRODUCTION; 8W-15 GROUND DISTRIBUTION	8-1
INTRODUCTION; 8W-15 GROUND DISTRIBUTION (LH)	8W-15-1
INTRODUCTION; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
INTRODUCTION; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
INTRODUCTION; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
INTRODUCTION; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
INTRODUCTION; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
INTRODUCTION; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
INTRODUCTION; 8W-49 OVERHEAD CONSOLE (LH)	8W-49-1
INTRODUCTION; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
INTRODUCTION; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
INTRODUCTION; 8W-70 SPLICE INFORMATION (LH)	8W-70-1
INTRODUCTION; 8W-70 SPLICE INFORMATION (RHD)	8W-70-1
INTRODUCTION; 8W-80 CONNECTOR PIN-OUTS (LH)	8W-80-1
INTRODUCTION; 8W-80 CONNECTOR PIN-OUTS (RHD)	8W-80-1
INTRODUCTION; 8W-90 CONNECTOR LOCATIONS (LH)	8W-90-1
INTRODUCTION; 8W-90 CONNECTOR LOCATIONS (RHD)	8W-90-1
INTRODUCTION; 8W-95 SPLICE LOCATIONS (LH)	8W-95-1
INTRODUCTION; 8W-95 SPLICE LOCATIONS (RHD)	8W-95-1
INTRODUCTION; AUDIO SYSTEMS	8F-1
INTRODUCTION; BATTERY	8A-1
INTRODUCTION; CHIME/BUZZER WARNING SYSTEMS	8U-1
INTRODUCTION; ELECTRICALLY HEATED SYSTEMS	8N-1
INTRODUCTION; FUEL SYSTEM	14-20,14-1
INTRODUCTION; HORN SYSTEMS	8G-1
INTRODUCTION; IGNITION SYSTEM	8D-1
INTRODUCTION; INSTRUMENT PANEL SYSTEMS	8E-1
INTRODUCTION; LUBRICATION AND MAINTENANCE	0-1,0-3
INTRODUCTION; OVERHEAD CONSOLE SYSTEMS	8V-1
INTRODUCTION; PASSIVE RESTRAINT SYSTEMS	8M-1
INTRODUCTION; POWER LOCK SYSTEMS	8P-1
INTRODUCTION; POWER MIRROR SYSTEMS	8T-1
INTRODUCTION; POWER SEAT SYSTEMS	8R-1
INTRODUCTION; POWER WINDOW SYSTEMS	8S-1
INTRODUCTION; STARTING SYSTEMS	8B-1
INTRODUCTION; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-1,8J-2
INTRODUCTION; VEHICLE SPEED CONTROL SYSTEM	8H-1
INTRODUCTION; WIPER AND WASHER SYSTEMS	8K-1
JAMB SWITCH, DRIVER'S DOOR	8U-1,8U-2
JOINT ANGLE, UNIVERSAL	3-5
JOINT, SINGLE AND DOUBLE CARDAN	3-13
JOINTS, UNIVERSAL	3-2
JUMP STARTING PROCEDURE	0-8
JUMP STARTING, TOWING AND HOISTING	0-8
KEY CYLINDER, IGNITION SWITCH	8D-19
KEY LOCK CYLINDER, IGNITION SWITCH	8D-4
KEY-IN HALO LAMP, IGNITION SWITCH; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
KEY-IN HALO LAMP, IGNITION SWITCH; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
KEY-IN SWITCH, IGNITION	8U-1,8U-2
KEYLESS ENTRY MODULE, REMOTE; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
KEYLESS ENTRY MODULE, REMOTE; OVERHEAD CONSOLE SYSTEMS	8V-2
KEYLESS ENTRY MODULE, REMOTE; POWER LOCK SYSTEMS	8P-12,8P-2,8P-8
KEYLESS ENTRY SYSTEM, POWER LOCK/REMOTE	8P-2
KEYLESS ENTRY TRANSMITTER BATTERY REPLACEMENT, REMOTE	8P-9
KEYLESS ENTRY TRANSMITTER PROGRAMMING	8P-9
KEYLESS ENTRY TRANSMITTER, REMOTE	8P-2,8P-8
KNOCK, LOW SPEED	3-17,3-45
KNUCKLE AND BALL STUDS, STEERING	3-22
KNUCKLE, STEERING	2-8
LABEL SPECIFICATIONS, VECI; FUEL SYSTEM	14-18,14-43
LABEL SPECIFICATIONS, VECI; IGNITION SYSTEM	8D-21
LABEL, VEHICLE EMISSION CONTROL INFORMATION (VECI)	25-12
LABEL, VEHICLE SAFETY CERTIFICATION	0-1
LAG TEST ANALYSIS, TIME	21-183
LAG TEST, TIME	21-182
LAMP, ABS WARNING; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
LAMP, ABS WARNING; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
LAMP, ABS WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LAMP, ABS WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
LAMP, ABS WARNING; BRAKES	5-35
LAMP ADJUSTMENT, FOG	8L-7
LAMP, ANTI-LOCK BRAKE SYSTEM	8E-4,8E-9
LAMP, BACK-UP/REAR TURN SIGNAL/ TAIL	8L-15
LAMP, BRAKE WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
LAMP, BRAKE WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
LAMP, BRAKE WARNING; INSTRUMENT PANEL SYSTEMS	8E-4,8E-9
LAMP BULB, BACK-UP/REAR TURN SIGNAL/TAIL	8L-11
LAMP BULB, DOME	8L-12
LAMP BULB, FOG	8L-9
LAMP BULB, FRONT PARK/TURN SIGNAL	8L-10
LAMP BULB, LICENSE PLATE	8L-11
LAMP BULB, MAP READING	8L-12
LAMP BULB SERVICE	8L-9
LAMP BULB, SIDE MARKER	8L-10
LAMP BULB, UNDERHOOD	8L-12
LAMP BULB, VISOR VANITY	8L-13
LAMP BULBS, READING/COURTESY	8V-8
LAMP, CARGO LAMP, COURTESY LAMPS AND DOME	8W-44-1
LAMP, CARGO LAMP, COURTESY LAMPS, AND DOME	8W-44-1
LAMP, CHARGING SYSTEM INDICATOR	8W-40-3
LAMP, CHARGING SYSTEM WARNING	8W-40-2
LAMP (CHMSL) BULB, CENTER HIGH MOUNTED STOP	8L-12
LAMP, COOLANT TEMPERATURE WARNING	8E-10,8E-4
LAMP, COURTESY LAMPS AND DOME LAMP, CARGO	8W-44-1
LAMP, COURTESY LAMPS, AND DOME LAMP, CARGO	8W-44-1
LAMP DIAGNOSIS	8L-1
LAMP DIAGNOSIS, FOG	8L-4
LAMP, DOME	8L-16
LAMP (DRL) MODULE, DAYTIME RUNNING	8W-50-2
LAMP, ENGINE COOLANT TEMPERATURE WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LAMP, ENGINE COOLANT TEMPERATURE WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
LAMP, FOG	8L-14
LAMP, FRONT PARK/TURN SIGNAL	8L-14
LAMP, GENERATOR WARNING	8E-11,8E-5
LAMP, GLOVE BOX; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
LAMP, GLOVE BOX; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
LAMP, HEADLAMP HIGH BEAM INDICATOR	8E-11,8E-5
LAMP, HIGH-BEAM INDICATOR; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
LAMP, HIGH-BEAM INDICATOR; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3

Description	Group-Page
LAMP, IGNITION SWITCH KEY-IN HALO; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
LAMP, IGNITION SWITCH KEY-IN HALO; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
LAMP, LICENSE PLATE	8L-15
LAMP, LOW FUEL WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
LAMP, LOW FUEL WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
LAMP, LOW FUEL WARNING; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
LAMP, LOW OIL PRESSURE WARNING	8E-12, 8E-5
LAMP, LOW WASHER FLUID WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LAMP, LOW WASHER FLUID WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
LAMP, LOW WASHER FLUID WARNING; 8W-53 WIPERS (LH)	8W-53-1
LAMP, LOW WASHER FLUID WARNING; 8W-53 WIPERS (RHD)	8W-53-1
LAMP, LOW WASHER FLUID WARNING; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
LAMP, MALFUNCTION INDICATOR	8E-13,8E-5
LAMP, MANUAL TRANSMISSION UP-SHIFT; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
LAMP, MANUAL TRANSMISSION UP-SHIFT; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
LAMP, MAP/READING	8L-16
LAMP (MIL), MALFUNCTION INDICATOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
LAMP (MIL), MALFUNCTION INDICATOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
LAMP (MIL), MALFUNCTION INDICATOR; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LAMP (MIL), MALFUNCTION INDICATOR; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
LAMP (MIL), MALFUNCTION INDICATOR; EMISSION CONTROL SYSTEMS	25-1
LAMP MODULE, DAYTIME RUNNING	8L-17,8L-1
LAMP, OIL PRESSURE WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LAMP, OIL PRESSURE WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
LAMP, RED BRAKE WARNING	5-2,5-9
LAMP RELAY, STOP; 8W-54 TRAILER TOW (LH)	8W-54-1
LAMP RELAY, STOP; 8W-54 TRAILER TOW (RHD)	8W-54-1
LAMP, SEAT BELT INDICATOR WARNING; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LAMP, SEAT BELT INDICATOR WARNING; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
LAMP, SEAT BELT REMINDER	8E-13,8E-5
LAMP SERVICE	8L-14
LAMP, SIDE MARKER	8L-15
LAMP SWITCH INPUT, STOP; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
LAMP SWITCH INPUT, STOP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
LAMP SWITCH INPUT, STOP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
LAMP SWITCH, STOP; BRAKES	5-14,5-27,5-2,5-9
LAMP SWITCH, STOP; VEHICLE SPEED CONTROL SYSTEM	8H-1,8H-6,8H-8
LAMP SYSTEMS	8L-17
LAMP, UNDERHOOD; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
LAMP, UNDERHOOD; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
LAMP, UNDERHOOD; LAMPS	8L-15
LAMP, UPSHIFT INDICATOR	8E-14,8E-6
LAMP, VISOR VANITY	8L-16
LAMP—PCM OUTPUT, GENERATOR	14-28
LAMP—PCM OUTPUT, MALFUNCTION INDICATOR	14-30
LAMPS	8W-44-2
LAMPS AND CHMSL LAMPS, STOP; 8W-51 REAR LIGHTING (LH)	8W-51-1
LAMPS AND CHMSL LAMPS, STOP; 8W-51 REAR LIGHTING (RHD)	8W-51-1
LAMPS AND DOME LAMP, CARGO LAMP, COURTESY	8W-44-1
LAMPS, AND DOME LAMP, CARGO LAMP, COURTESY	8W-44-1
LAMPS AND REAR LICENSE PLATE LAMPS, TAIL; 8W-51 REAR LIGHTING (LH)	8W-51-1
LAMPS AND REAR LICENSE PLATE LAMPS, TAIL; 8W-51 REAR LIGHTING (RHD)	8W-51-1
LAMPS, BACK-UP; 8W-51 REAR LIGHTING (LH)	8W-51-1
LAMPS, BACK-UP; 8W-51 REAR LIGHTING (RHD)	8W-51-1
LAMPS, CLUSTER ILLUMINATION	8E-10,8E-4
LAMPS, EXTERIOR	8L-18
LAMPS, FOG; 8W-50 FRONT LIGHTING (LH)	8W-50-2
LAMPS, FOG; 8W-50 FRONT LIGHTING (RHD)	8W-50-2
LAMPS, FOUR-WHEEL DRIVE I NDICATOR	8E-11,8E-5
LAMPS, INDICATOR	8E-3
LAMPS, INSTRUMENT PANEL ILLUMINATION; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
LAMPS, INSTRUMENT PANEL ILLUMINATION; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
LAMPS, INTERIOR	8L-18
LAMPS, PARKING; 8W-50 FRONT LIGHTING (LH)	8W-50-1
LAMPS, PARKING; 8W-50 FRONT LIGHTING (RHD)	8W-50-1
LAMPS, READING; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
LAMPS, READING; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
LAMPS, READING/COURTESY	8V-2
LAMPS, STOP LAMPS AND CHMSL; 8W-51 REAR LIGHTING (LH)	8W-51-1
LAMPS, STOP LAMPS AND CHMSL; 8W-51 REAR LIGHTING (RHD)	8W-51-1
LAMPS, TAIL LAMPS AND REAR LICENSE PLATE; 8W-51 REAR LIGHTING (LH)	8W-51-1
LAMPS, TAIL LAMPS AND REAR LICENSE PLATE; 8W-51 REAR LIGHTING (RHD)	8W-51-1
LAMPS, TURN SIGNAL	8J-2
LAMPS, TURN SIGNAL INDICATOR; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
LAMPS, TURN SIGNAL INDICATOR; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
LAMPS, TURN SIGNAL INDICATOR; INSTRUMENT PANEL SYSTEMS	8E-13,8E-6
LAMPS, TURN SIGNAL INDICATOR; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-2
LAMPS, VISOR VANITY MIRROR	8W-44-2
LATCH ADJUSTMENT, DOOR	23-66
LATCH, FRONT DOOR	23-35
LATCH, HOOD	23-23
LATCH, LIFTGATE	23-62
LATCH, REAR DOOR	23-43
LATCH STRIKER AND BUMPER, REAR SEATBACK	23-14
LATCH STRIKER, FRONT DOOR	23-36
LATCH STRIKER, HOOD	23-23
LATCH STRIKER, LIFTGATE	23-63
LATCH STRIKER, REAR DOOR	23-44
LATCH STRIKER, SAFETY	23-24
LEAD CORRECTION CHART	22-4,22-5
LEAD, LOOSE STEERING AND VEHICLE	19-4
LEAF SPRING	2-14
LEAF SPRING AND SHACKLE BUSHING	2-15
LEAF SPRINGS, ADJUSTMENT AT AXLE WITH	3-13
LEAK DIAGNOSIS, CONVERTER HOUSING FLUID	21-81
LEAKAGE DIAGNOSIS, INTAKE MANIFOLD	9-8
LEAKAGE DIAGNOSIS, POWER STEERING GEAR	19-12
LEAKAGE DIAGNOSIS, PUMP	19-6
LEAKAGE TEST, CYLINDER COMBUSTION PRESSURE	9-9
LEAKS, REFRIGERANT SYSTEM	24-20
LEAKS, REPAIRING	22-7
LEAKS, TESTING COOLING SYSTEM	7-20
LEAKS, WATER	23-17
LEFT TURN RELAY; 8W-54 TRAILER TOW (LH)	8W-54-1
LEFT TURN RELAY; 8W-54 TRAILER TOW (RHD)	8W-54-1
LEVEL AND CONDITION, CHECKING FLUID	21-76
LEVEL, BRAKE FLUID	5-11
LEVEL CHECK, FLUID	21-92
LEVEL, CHECKING FLUID	21-187
LEVEL CHECK—ROUTINE, COOLANT	7-24
LEVEL CHECK-SERVICE, COOLANT	7-24
LEVEL, CLUTCH FLUID	6-9
LEVEL, EFFECTS OF INCORRECT FLUID	21-77
LEVEL, LOW LUBRICANT	21-38,21-3
LEVEL, RECOMMENDED LUBRICANT AND FILL	21-289,21-314
LEVEL, REFRIGERANT OIL	24-21
LEVEL SENSOR, FUEL	14-15
LEVEL SENSOR—PCM INPUT, FUEL	14-24
LEVEL-AERATION, LOW COOLANT	7-24
LEVER, PARKING BRAKE	5-22
LEVER POSITIONS, TRANSMISSION RANGES AND SHIFT	21-170
LEVER, SHIFT	21-292,21-314
LICENSE PLATE LAMP	8L-15
LICENSE PLATE LAMP BULB	8L-11
LICENSE PLATE LAMPS, TAIL LAMPS AND REAR; 8W-51 REAR LIGHTING (LH)	8W-51-1
LICENSE PLATE LAMPS, TAIL LAMPS AND REAR; 8W-51 REAR LIGHTING (RHD)	8W-51-1
LIFTGATE	23-59,23-67
LIFTGATE HINGE	23-60
LIFTGATE LATCH	23-62
LIFTGATE LATCH STRIKER	23-63
LIFTGATE LOCK CYLINDER	23-62
LIFTGATE OUTSIDE HANDLE	23-61
LIFTGATE PILLAR TRIM	23-51
LIFTGATE SUPPORT ROD BALL STUD	23-61
LIFTGATE SUPPORT ROD CYLINDER	23-61
LIFTGATE TRIM PANEL	23-59
LIFTGATE WEATHERSTRIP	23-63
LIFTGATE WINDOW GLASS	23-9
LIGHTER, CIGAR; 8W-41 HORN/CIGAR LIGHTER (LH)	8W-41-1
LIGHTER, CIGAR; 8W-41 HORN/CIGAR LIGHTER (RHD)	8W-41-1
LIMITED SLIP DIFFERENTIAL	3-46
LIMITS, HIGH AND LOW	25-9
LINE AND FITTINGS, TRANSMISSION COOLER	21-100
LINE AND HOSES, BRAKE	5-11
LINE, BRAKE	5-13
LINE FITTINGS, TRANSMISSION COOLER	21-189
LINERS, REAR WHEELHOUSE FLARES	23-63
LINES, BRAKE HOSES	5-6
LINES, REFRIGERANT	24-9
LINES, REVERSE FLUSHING MAIN AND AUXILIARY COOLERS AND COOLER	21-189
LINK CONNECTOR, DATA; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
LINK CONNECTOR, DATA; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
LINK CONNECTOR, DATA; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
LINK CONNECTOR, DATA; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
LINK CONNECTOR—PCM INPUT AND OUTPUT, DATA	14-29
LINK, DRAG	19-29
LINKAGE ADJUSTMENT, SHIFT	21-309,21-337
LINKAGE AND PIVOTS, WIPER	8K-2,8K-8
LINKAGE, CLUTCH HYDRAULIC	6-13
LINKAGE FLUID, CLUTCH	6-9
LINKAGE, STEERING	19-27,19-30
LOAD TEST	8A-7
LOAD VALUE	25-9
LOCATIONS, CONNECTOR/GROUND; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
LOCATIONS, CONNECTOR/GROUND; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
LOCATIONS, CONNECTOR/GROUND; 8W-90 CONNECTOR LOCATIONS (LH)	8W-90-1
LOCATIONS, CONNECTOR/GROUND; 8W-90 CONNECTOR LOCATIONS (RHD)	8W-90-1

Description	Group-Page
LOCATIONS, SPLICE; 8W-01 GENERAL INFORMATION (LH)	8W-01-2
LOCATIONS, SPLICE; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
LOCATIONS, SPLICE; 8W-95 SPLICE LOCATIONS (LH)	8W-95-1
LOCATIONS, SPLICE; 8W-95 SPLICE LOCATIONS (RHD)	8W-95-1
LOCATIONS, TRANSMISSION SWITCH AND PLUG	21-37
LOCK CYLINDER, FRONT DOOR	23-35
LOCK CYLINDER, IGNITION SWITCH AND KEY	8D-4
LOCK CYLINDER, LIFTGATE	23-62
LOCK, EXTENSION HOUSING AND PARK	21-140
LOCK, HYDROSTATIC	9-4
LOCK MOTOR, POWER	8P-10,8P-1,8P-8
LOCK, PARK	21-98
LOCK RELAY; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
LOCK RELAY; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
LOCK SWITCH, POWER	8P-1,8P-2,8P-9
LOCK/REMOTE KEYLESS ENTRY SYSTEM, POWER	8P-2
LOCK/UNLOCK RELAYS, POWER	8P-10,8P-1,8P-7
LOOSE STEERING AND VEHICLE LEAD	19-4
LOW COOLANT LEVEL-AERATION	7-24
LOW FUEL WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
LOW FUEL WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
LOW FUEL WARNING LAMP; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
LOW LIMITS, HIGH	25-9
LOW LUBRICANT LEVEL	21-38,21-3
LOW OIL PRESSURE WARNING LAMP	8E-12,8E-5
LOW SPEED KNOCK	3-17,3-45
LOW WASHER FLUID WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
LOW WASHER FLUID WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
LOW WASHER FLUID WARNING LAMP; 8W-53 WIPERS (LH)	8W-53-1
LOW WASHER FLUID WARNING LAMP; 8W-53 WIPERS (RHD)	8W-53-1
LOW WASHER FLUID WARNING LAMP; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
LOWER A-PILLAR COWL TRIM	23-48
LOWER SUSPENSION ARM	2-8
LOW/HIGH PRESSURE CUT-OFF SWITCH	24-19,24-8
LUBRICANT AND FILL LEVEL, RECOMMENDED	21-289,21-314
LUBRICANT CHANGE	3-20,3-49,3-70
LUBRICANT LEVEL, LOW	21-38,21-3
LUBRICANT RECOMMENDATIONS, PARTS	0-1
LUBRICANT, RECOMMENDED	21-1
LUBRICANT SPECIFICATIONS	3-42,3-69
LUBRICANT, TRANSMISSION	21-37
LUBRICANTS, BODY	23-68
LUBRICANTS, CLASSIFICATION OF	0-1
LUBRICATION	3-2
LUBRICATION, BODY	23-18
LUBRICATION, CLUTCH COMPONENT	6-9
LUBRICATION SPECIFICATIONS	3-14
LUBRICATION SYSTEM	9-16,9-55
LUG NUT, WHEEL	22-11
LUGGAGE RACK	23-65
MACHINING, BRAKE DRUM	5-13
MACHINING, DISC ROTOR	5-12
MAIN AND AUXILIARY COOLERS AND COOLER LINES, REVERSE FLUSHING	21-189
MAIN BEARINGS, CRANKSHAFT	9-41,9-80
MAIN BEARINGS, FITTING CRANKSHAFT	9-23,9-62
MAIN COOLER, FLOW TESTING TRANSMISSION	21-186
MAIN OIL SEALS, REAR	9-46,9-83
MAIN RELAY, ABS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
MAIN RELAY, ABS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
MAINSHAFT	21-20
MAINTENANCE SCHEDULES	0-3
MALFUNCTION INDICATOR LAMP	8E-13,8E-5
MALFUNCTION INDICATOR LAMP (MIL); 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
MALFUNCTION INDICATOR LAMP (MIL); 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
MALFUNCTION INDICATOR LAMP (MIL); 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
MALFUNCTION INDICATOR LAMP (MIL); 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
MALFUNCTION INDICATOR LAMP (MIL); EMISSION CONTROL SYSTEMS	25-1
MALFUNCTION INDICATOR LAMP—PCM OUTPUT	14-30
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR; FUEL SYSTEM	14-38
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR; IGNITION SYSTEM	8D-15,8D-4
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR TEST	14-34
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—PCM INPUT	14-27
MANIFOLD ABSOLUTE PRESSURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
MANIFOLD ABSOLUTE PRESSURE SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
MANIFOLD AIR TEMPERATURE SENSOR, INTAKE; FUEL SYSTEM	14-36,14-42
MANIFOLD AIR TEMPERATURE SENSOR, INTAKE; IGNITION SYSTEM	8D-15,8D-4,8D-9
MANIFOLD AIR TEMPERATURE SENSOR—PCM INPUT, INTAKE	14-26
MANIFOLD LEAKAGE DIAGNOSIS, INTAKE	9-8
MANIFOLD—2.5L ENGINE, EXHAUST	11-7
MANIFOLD—2.5L ENGINE, INTAKE	11-5
MANIFOLD—4.0L ENGINE, EXHAUST	11-8
MANIFOLD—4.0L ENGINE, INTAKE	11-6
MANUAL SHIFTING TEST	21-180
MANUAL TRANSMISSION, AX15	21-36,21-69
MANUAL TRANSMISSION, AX4/5	21-1
MANUAL TRANSMISSION COMPONENTS, AX 4/5	21-33
MANUAL TRANSMISSION TORQUE, AX4/5	21-35
MANUAL TRANSMISSION UP-SHIFT LAMP; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
MANUAL TRANSMISSION UP-SHIFT LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
MANUAL VALVE SHAFT OVERHAUL	21-239
MANUAL VALVE SHAFT SEAL REPLACEMENT	21-195
MAP READING LAMP BULB	8L-12
MAP SENSOR	8D-7
MAP/READING LAMP	8L-16
MARKER LAMP BULB, SIDE	8L-10
MARKER LAMP, SIDE	8L-15
MASTER CYLINDER	5-11,5-15,5-4
MASTER CYLINDER RESERVOIR	5-23
MASTER CYLINDER/POWER BOOSTER TEST	5-9
MATCH MOUNTING	22-6
MEASUREMENT AND ADJUSTMENT, DIFFERENTIAL SHIM PACK	3-33
MEASUREMENT AND ADJUSTMENT, PINION DEPTH	3-82
MEASUREMENT AND ADJUSTMENT, SIDE GEAR CLEARANCE	3-86
MEASUREMENT AND ASSEMBLY, PINION	3-59
MEASUREMENT AND INSTALLATION, DIFFERENTIAL	3-60
MEASUREMENT, DIFFERENTIAL AND PINION	3-31
MEASUREMENT, PROPELLER SHAFT ANGLE	3-5
MEASURING WITH PLASTIGAGE	9-3
MECHANISM, ARMING/DISARMING	8M-2
MECHANISM, GEARSHIFT	21-74
MECHANISM, SHIFT	21-10
MEMORY, RADIO; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
MEMORY, RADIO; 8W-47 AUDIO SYSTEM (RHD)	8W-47-1
METHODS AND PARTS USAGE, INSTALLATION	6-2
METRIC CONVERSION	0-8
METRIC SYSTEM	0-7
MINI-FLOOR CONSOLE	23-53
MIRROR LAMPS, VISOR VANITY	8W-44-2
MIRROR OPERATION, POWER	8W-62-1
MIRROR, POWER	8T-1,8T-4
MIRROR, REARVIEW	23-57
MIRROR SUPPORT BRACKET, REARVIEW	23-57
MIRROR SWITCH, POWER	8T-1,8T-4
MIRROR SYSTEM, POWER	8T-1
MIRRORS, POWER	8W-62-1
MIRRORS, SIDE VIEW	23-28
MODE, CIRCUIT ACTUATION TEST	25-2
MODE, STATE DISPLAY TEST	25-2
MODEL 30, FRONT AXLE—TUBE	3-14
MODEL 35 AXLE	3-42,3-64
MODES OF OPERATION	14-20
MODULE, AIRBAG	8M-1,8M-3
MODULE, BUZZER; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
MODULE, BUZZER; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
MODULE, BUZZER; CHIME/BUZZER WARNING SYSTEMS	8U-1,8U-2,8U-3
MODULE, COMPASS/DISPLAY	8V-2
MODULE, COMPASS/THERMOMETER/ DISPLAY	8V-6
MODULE, DAYTIME RUNNING LAMP	8L-17,8L-1
MODULE, DAYTIME RUNNING LAMP (DRL)	8W-50-2
MODULE, FUEL PUMP; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
MODULE, FUEL PUMP; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
MODULE, FUEL PUMP; FUEL SYSTEM	14-14,14-3
MODULE, FUSEBLOCK	8E-3
MODULE, HEADLAMP DELAY; 8W-50 FRONT LIGHTING (LH)	8W-50-1
MODULE, HEADLAMP DELAY; 8W-50 FRONT LIGHTING (RHD)	8W-50-1
MODULE, HEADLAMP DELAY; LAMPS	8L-5
MODULE, INTERMITTENT WIPE	8K-3,8K-8
MODULE (PCM), POWERTRAIN CONTROL; FUEL SYSTEM	14-23,14-39
MODULE (PCM), POWERTRAIN CONTROL; IGNITION SYSTEM	8D-19
MODULE (PCM), POWERTRAIN CONTROL; VEHICLE SPEED CONTROL SYSTEM	8H-6
MODULE, POWERTRAIN CONTROL; IGNITION SYSTEM	8D-2
MODULE, POWERTRAIN CONTROL; VEHICLE SPEED CONTROL SYSTEM	8H-2,8H-8
MODULE, REMOTE KEYLESS ENTRY; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
MODULE, REMOTE KEYLESS ENTRY; OVERHEAD CONSOLE SYSTEMS	8V-2
MODULE, REMOTE KEYLESS ENTRY; POWER LOCK SYSTEMS	8P-12,8P-2,8P-8
MODULE, SENTINEL HEADLAMP DELAY	8L-17,8L-1
MODULE (TCM) SERVICE, TRANSMISSION CONTROL	21-188
MODULE (TCM), TRANSMISSION CONTROL	21-170
MODULE, TRANSMISSION CONTROL	21-191
MODULE—4.0L ENGINE ONLY, TRANSMISSION CONTROL; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
MODULE—4.0L ENGINE ONLY, TRANSMISSION CONTROL; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
MOLDING, DRIP RAIL	23-64
MOLDING, FRONT DOOR GLASS EXTERIOR	23-39
MOLDING, REAR DOOR GLASS EXTERIOR	23-45
MOLDING/CLADDING, BODY SIDE	23-47
MONITORED SYSTEMS	25-7
MONITORS, COMPONENT	25-8
MOTOR, BLOWER	24-17,24-33,24-7
MOTOR, IDLE AIR CONTROL (IAC); 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5

Description	Group-Page
MOTOR, IDLE AIR CONTROL (IAC); 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
MOTOR, IDLE AIR CONTROL (IAC); FUEL SYSTEM	14-36,14-38
MOTOR, POWER LOCK	8P-10,8P-1,8P-8
MOTOR, POWER WINDOW	8S-1,8S-7
MOTOR, RADIATOR FAN RELAY; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
MOTOR, RADIATOR FAN RELAY; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
MOTOR RELAY, ABS PUMP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
MOTOR RELAY, ABS PUMP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
MOTOR RESISTOR, BLOWER	24-17,24-34,24-7
MOTOR SWITCH, BLOWER	24-17,24-34,24-7
MOTOR, WIPER	8K-8
MOTOR—A/C-HEATER, BLOWER; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
MOTOR—A/C-HEATER, BLOWER; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
MOTOR—HEATER ONLY, BLOWER; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
MOTOR—HEATER ONLY, BLOWER; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
MOTOR—PCM OUTPUT, IDLE AIR CONTROL (IAC)	14-29
MOTORS, WIPER	8K-2
MOUNTED STOP LAMP (CHMSL) BULB, CENTER HIGH	8L-12
MOUNTING, BATTERY	8A-3
MOUNTING, MATCH	22-6
MOUNTING STUDS, WHEEL	2-10
MOUNT—REAR, ENGINE	9-27,9-66
MOUNTS—FRONT, ENGINE	9-26,9-66
MUFFLER AND EXHAUST TAILPIPE	11-4
MULTI-FUNCTION SWITCH	8J-2,8J-3
NAMEPLATES, EXTERIOR	23-26
NECK SEAL—PRESSURE RELIEF CHECK, RADIATOR CAP-TO-FILLER	7-23
NO. 1 ONE–WAY CLUTCH OVERHAUL, SUN GEAR	21-263
NOISE - 2.5L ENGINE, STARTER	8B-7
NOISE DIAGNOSIS	3-69
NOISE, GEAR AND BEARING	3-16,3-44
NOISE OR VIBRATION, TIRE	22-4
NOISE, STEERING	19-2
NOISE SUPPRESSION, RADIO	8F-2
NOISE, TRANSMISSION	21-38,21-4
NOISE, WIND	23-18
NON-MONITORED CIRCUITS	25-9
NOTES, CAUTIONS, AND WARNINGS	8W-01-2
NOZZLES AND PLUMBING, WASHER	8K-3
NUMBER DECODING CHART, VEHICLE IDENTIFICATION	0-1
NUMBER, VEHICLE IDENTIFICATION	0-1
NUT, WHEEL LUG	22-11
NV231	21-310
NV231 TRANSFER CASE	21-289,21-292,21-293,21-306,21-314
NV242	21-338
NV242 TRANSFER CASE	21-312,21-315,21-336
NV242 TRANSFER CASE DIAGNOSIS	21-313
NV321 DIAGNOSIS	21-291
(O2S)—PCM INPUT, HEATED OXYGEN SENSOR	14-26
ODOMETER, TRIP	8E-4,8E-8
OIL COOLER, AUTOMATIC TRANSMISSION	7-2
OIL COOLER FLOW CHECK	21-77
OIL COOLERS, TRANSMISSION	7-26
OIL, ENGINE	9-5
OIL LEVEL, REFRIGERANT	24-21
OIL PAN	9-43,9-81
OIL PRESSURE, ENGINE	9-10
OIL PRESSURE GAUGE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
OIL PRESSURE GAUGE; INSTRUMENT PANEL SYSTEMS	8E-3,8E-7
OIL PRESSURE WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
OIL PRESSURE WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
OIL PRESSURE WARNING LAMP, LOW	8E-12,8E-5
OIL PUMP; ENGINE	9-44,9-84
OIL PUMP; TRANSMISSION AND TRANSFER CASE	21-174
OIL PUMP AND REACTION SHAFT SUPPORT	21-126,21-145
OIL PUMP OVERHAUL	21-237
OIL PUMP PRESSURE	9-16,9-57
OIL PUMP SEAL	21-204
OIL, REFRIGERANT	24-9
OIL SEAL REPLACEMENT, INNER AXLE SHAFT	3-26
OIL SEAL, TIMING CASE COVER	9-35,9-84
OIL SEALS, REAR MAIN	9-46,9-83
OIL SEALS, VALVE SPRINGS	9-31
ON-BOARD DIAGNOSTIC SYSTEM TEST	8C-6
ON-BOARD DIAGNOSTICS	25-1
ON-BOARD DIAGNOSTICS (OBD)	7-9
ON-BOARD DIAGNOSTICS TEST	8H-2
ONE–WAY CLUTCH OVERHAUL, SUN GEAR AND NO. 1	21-263
ONLY, BLOWER MOTOR—HEATER; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-1
ONLY, BLOWER MOTOR—HEATER; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-1
ONLY, TRANSMISSION CONTROL MODULE—4.0L ENGINE; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
ONLY, TRANSMISSION CONTROL MODULE—4.0L ENGINE; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
OPEN-CIRCUIT VOLTAGE TEST	8A-6
OPENER STORAGE BIN, GARAGE DOOR	8V-2
OPENING PANEL (GOP), GRILLE	23-19
OPERATION	3-68
OPERATION, AIR TESTING TRANSMISSION CLUTCH AND BAND	21-81
OPERATION AND APPLICATION CHARTS, GEARTRAIN	21-173
OPERATION, CHARGING SYSTEM	8C-1
OPERATION, CLUTCH	6-2
OPERATION, MODES OF	14-20
OPERATION, POWER MIRROR	8W-62-1
OPERATION, POWER SEAT	8W-63-1
OPERATION, POWER STEERING PUMP—INITIAL	19-6
OPERATION, POWER WINDOW	8W-60-1
OPERATION, RADIO	8W-47-1
OPERATION, TIRE PRESSURE FOR HIGH—SPEED	22-3
ORDER—2.5L 4-CYLINDER ENGINE, ENGINE FIRING	8D-22
ORDER—4.0L 6-CYLINDER ENGINE, ENGINE FIRING	8D-22
OUTER BELT SEAL, FRONT DOOR	23-37
OUTER SCUFF PLATES	23-51
OUTPUT, AIR CONDITIONING (A/C) CLUTCH RELAY—PCM	14-28
OUTPUT, AUTO SHUTDOWN (ASD) RELAY—PCM	14-28
OUTPUT, DATA LINK CONNECTOR—PCM INPUT	14-29
OUTPUT, DUTY CYCLE EVAP PURGE SOLENOID VALVE-PCM	14-29
OUTPUT, FUEL INJECTORS—PCM	14-29
OUTPUT, FUEL PUMP RELAY-PCM	14-29
OUTPUT, GENERATOR FIELD—PCM	14-28
OUTPUT, GENERATOR LAMP—PCM	14-28
OUTPUT, IDLE AIR CONTROL (IAC) MOTOR—PCM	14-29
OUTPUT, IGNITION COIL—PCM	14-30
OUTPUT, MALFUNCTION INDICATOR LAMP—PCM	14-30
OUTPUT, RADIATOR FAN RELAY—PCM	14-30
OUTPUT SHAFT	21-64
OUTPUT SHAFT AND CLUSTER GEAR	21-61
OUTPUT SHAFT REAR BEARING—TYPICAL	21-97
OUTPUT, SPEED CONTROL SOLENOIDS—PCM	14-30
OUTPUT, TACHOMETER—PCM	14-30
OUTPUT TEST, CURRENT	8C-3
OUTS, TAKE	8W-01-3
OUTSIDE HANDLE, FRONT DOOR	23-34
OUTSIDE HANDLE, LIFTGATE	23-61
OUTSIDE HANDLE, REAR DOOR	23-43
OVERDRIVE COMPONENTS, FORTH GEAR	21-172
OVERDRIVE PLANETARY GEAR AND CLUTCH OVERHAUL	21-241
OVERDRIVE SUPPORT OVERHAUL	21-248
OVERHAUL, DIRECT CLUTCH	21-251
OVERHAUL, FIRST/REVERSE BRAKE PISTON AND TRANSMISSION CASE	21-272
OVERHAUL, FORWARD CLUTCH	21-256
OVERHAUL, FRONT PLANETARY GEAR	21-261
OVERHAUL, MANUAL VALVE SHAFT	21-239
OVERHAUL, OIL PUMP	21-237
OVERHAUL OR FLUID/FILTER CHANGE, REFILLING AFTER	21-188
OVERHAUL, OVERDRIVE PLANETARY GEAR AND CLUTCH	21-241
OVERHAUL, OVERDRIVE SUPPORT	21-248
OVERHAUL, SECOND BRAKE	21-265
OVERHAUL, SECOND COAST BRAKE SERVO	21-198
OVERHAUL SERVICE TOOLS	21-287
OVERHAUL, SUN GEAR AND NO. 1 ONE–WAY CLUTCH	21-263
OVERHAUL, TRANSMISSION VALVE BODY	21-275
OVERHAUL—TRAC-LOC, DIFFERENTIAL	3-78
OVERHEAD CONSOLE	8V-6
OVERRUNNING CLUTCH/LOW-REVERSE DRUM	21-125
OVERRUNNING CLUTCH/LOW-REVERSE DRUM/REAR SUPPORT	21-144
OVERSIZE AND UNDERSIZE COMPONENT CODES	9-16,9-57
OVERVIEW; BATTERY	8A-1
OVERVIEW; CHARGING SYSTEM	8C-1
OVERVIEW; STARTING SYSTEMS	8B-1
OXYGEN (O2S) SENSORS, HEATED	14-35
OXYGEN SENSOR, DOWNSTREAM	14-41
OXYGEN SENSOR (O2S)—PCM INPUT, HEATED	14-26
OXYGEN SENSOR, UPSTREAM	14-40
OXYGEN SENSORS, HEATED; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
OXYGEN SENSORS, HEATED; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
PACK MEASUREMENT AND ADJUSTMENT, DIFFERENTIAL SHIM	3-33
PACK/OUTPUT SHAFT, PLANETARY/ BRAKE	21-268
PAINT	23-2
PAINT CODE	23-2
PAINT REPAIR PRODUCTS, AFTERMARKET	23-3
PAINTED SURFACE TOUCH-UP	23-2
PAN, OIL	9-43,9-81
PANEL, DASH PANEL INSULATOR	23-24
PANEL EXTENSION, QUARTER TRIM	23-49
PANEL, FRONT DOOR TRIM	23-30
PANEL (GOP), GRILLE OPENING	23-19
PANEL ILLUMINATION LAMPS, INSTRUMENT; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
PANEL ILLUMINATION LAMPS, INSTRUMENT; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
PANEL, INSTRUMENT	8E-18,8E-2
PANEL INSULATOR PANEL, DASH	23-24
PANEL, LIFTGATE TRIM	23-59
PANEL, REAR DOOR TRIM	23-41
PANELS, QUARTER AND WHEELHOUSE TRIM	23-50
PARK GEAR, GOVERNOR	21-104,21-139,21-98
PARK INTERLOCK CABLE ADJUSTMENT	21-147,21-279
PARK LOCK	21-98
PARK LOCK, EXTENSION HOUSING	21-140
PARK ROD AND PAWL SERVICE	21-199
PARKING BRAKE	5-5
PARKING BRAKE CABLE, REAR	5-21
PARKING BRAKE CABLE TENSIONER	5-29
PARKING BRAKE HANDLE COVER	23-54
PARKING BRAKE LEVER	5-22
PARKING LAMPS; 8W-50 FRONT LIGHTING (LH)	8W-50-1

Description	Group-Page
PARKING LAMPS; 8W-50 FRONT LIGHTING (RHD)	8W-50-1
PARK/NEUTRAL POSITION SWITCH; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
PARK/NEUTRAL POSITION SWITCH; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
PARK/NEUTRAL POSITION SWITCH; TRANSMISSION AND TRANSFER CASE	21-186, 21-190,21-76,21-95
PARK/NEUTRAL SWITCH—PCM INPUT, TRANSMISSION	14-27
PARK/TURN SIGNAL LAMP BULB, FRONT	8L-10
PARK/TURN SIGNAL LAMP, FRONT	8L-14
PARTS AND LUBRICANT RECOMMENDATIONS	0-1
PARTS CLEANING AND INSPECTION, TRANSMISSION	21-277
PARTS USAGE, INSTALLATION METHODS	6-2
PATTERN ANALYSIS, BACKLASH AND CONTACT	3-34,3-61
PATTERN ANALYSIS, RING GEAR TEETH CONTACT	3-87
PATTERN, SHIFT	21-1
PATTERN, TRANSMISSION SHIFT	21-37
PATTERNS, TIRE WEAR	22-3
PAWL SERVICE, PARK ROD	21-199
PEDAL, ACCELERATOR	14-17
PEDAL, BRAKE	5-14,5-2
PEDAL, CLUTCH	6-15
PERFORMANCE, A/C	24-10
PERFORMANCE, COOLANT	7-5
PERFORMANCE, ENGINE	9-2
PERFORMANCE, HEATER	24-12
PILLAR TRIM, LIFTGATE	23-51
PILOT BEARING	6-11
PIN, FRONT DOOR HINGE	23-33
PIN, REAR DOOR HINGE	23-42
PIN REPLACEMENT, CAMSHAFT	9-39,9-78
PINION DEPTH MEASUREMENT AND ADJUSTMENT	3-82
PINION GEAR	3-26,3-54
PINION GEAR DEPTH INFORMATION	3-15,3-57
PINION GEAR DEPTH VARIANCE	3-16,3-58,3-83
PINION GEAR SHAFT REMOVAL	3-75
PINION MEASUREMENT AND ASSEMBLY	3-59
PINION MEASUREMENT, DIFFERENTIAL	3-31
PINION SEAL REPLACEMENT	3-21,3-73
PINION SHAFT SEAL REPLACEMENT	3-50
PIPE, EXHAUST	11-3
PISTON AND TRANSMISSION CASE OVERHAUL, FIRST/REVERSE BRAKE	21-272
PISTON AND WORM SHAFT, RACK	19-17
PISTON FITTING	9-18,9-57
PISTON, FRONT SERVO	21-126
PISTON, REAR SERVO	21-126
PISTON RING FITTING	9-19,9-58
PISTONS AND CONNECTING RODS	9-44,9-82
PISTONS AND SPRINGS, ACCUMULATOR	21-196
PITMAN ARM	19-28
PITMAN SHAFT	19-13
PITMAN SHAFT SEALS AND BEARING	19-19
PITMAN SHAFT SEALS (IN VEHICLE)	19-12
PIVOTS, WIPER LINKAGE	8K-2,8K-8
PLANETARY GEAR AND CLUTCH OVERHAUL, OVERDRIVE	21-241
PLANETARY GEAR OVERHAUL, FRONT	21-261
PLANETARY GEAR TRAIN/OUTPUT SHAFT	21-134
PLANETARY GEARTRAIN	21-146
PLANETARY/BRAKE PACK/OUTPUT SHAFT	21-268
PLASTIGAGE, MEASURING WITH	9-3
PLATE, BODY CODE	0-2
PLATE, BRAKE SUPPORT	5-21
PLATE, FRONT INNER SCUFF	23-48
PLATE, FRONT SKID	13-6
PLATE, FUEL TANK SKID	13-6
PLATE LAMP BULB, LICENSE	8L-11
PLATE LAMP, LICENSE	8L-15
PLATE LAMPS, TAIL LAMPS AND REAR LICENSE; 8W-51 REAR LIGHTING (LH)	8W-51-1
PLATE LAMPS, TAIL LAMPS AND REAR LICENSE; 8W-51 REAR LIGHTING (RHD)	8W-51-1
PLATE, TRANSFER CASE SKID	13-6
PLATES, OUTER SCUFF	23-51
PLATFORM, BUCKET SEAT	23-13
PLUG ASSEMBLY, ADJUSTER	19-14
PLUG CABLE RESISTANCE, SPARK	8D-22
PLUG CABLES, SPARK	8D-12,8D-3,8D-9
PLUG CONDITIONS, SPARK	8D-10
PLUG, HOUSING END	19-14
PLUG LOCATIONS, TRANSMISSION SWITCH	21-37
PLUGS, SPARK	8D-12,8D-22,8D-2
PLUMBING, WASHER NOZZLES	8K-3
POLISHING, WET SANDING, BUFFING	23-2
POOR CONNECTIONS, INTERMITTENT	8W-01-5
POOR RETURN TO CENTER, INSUFFICIENT ASST. OR	19-4
PORTS, REFRIGERANT SYSTEM SERVICE	24-9
POSITION SENSOR, CAMSHAFT; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
POSITION SENSOR, CAMSHAFT; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
POSITION SENSOR, CAMSHAFT; FUEL SYSTEM	14-40
POSITION SENSOR, CAMSHAFT; IGNITION SYSTEM	8D-14,8D-3,8D-8
POSITION SENSOR, CRANKSHAFT; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
POSITION SENSOR, CRANKSHAFT; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
POSITION SENSOR, CRANKSHAFT; FUEL SYSTEM	14-40
POSITION SENSOR, CRANKSHAFT; IGNITION SYSTEM	8D-14,8D-3
POSITION SENSOR TEST, CRANKSHAFT	8D-7
POSITION SENSOR, THROTTLE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
POSITION SENSOR, THROTTLE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
POSITION SENSOR, THROTTLE; IGNITION SYSTEM	8D-15,8D-4
POSITION SENSOR (TPS) SERVICE, THROTTLE	21-201
POSITION SENSOR (TPS), THROTTLE	14-37, 14-38
POSITION SENSOR (TPS)—PCM INPUT, THROTTLE	14-27
POSITION SENSOR—PCM INPUT, CAMSHAFT	14-24
POSITION SENSOR—PCM INPUT, CRANKSHAFT	14-25
POSITION SENSORS, CAMSHAFT AND CRANKSHAFT	14-35
POSITION SWITCH, PARK/NEUTRAL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
POSITION SWITCH, PARK/NEUTRAL; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
POSITION SWITCH, PARK/NEUTRAL; TRANSMISSION AND TRANSFER CASE	21-186,21-190,21-76,21-95
POSITIONS, TRANSMISSION RANGES AND SHIFT LEVER	21-170
POWER BRAKE BOOSTER	5-15,5-3
POWER GROUND	14-28
POWER LOCK MOTOR	8P-10,8P-1,8P-8
POWER LOCK SWITCH	8P-1,8P-2,8P-9
POWER LOCK/REMOTE KEYLESS ENTRY SYSTEM	8P-2
POWER LOCK/UNLOCK RELAYS	8P-10,8P-1,8P-7
POWER MIRROR	8T-1,8T-4
POWER MIRROR OPERATION	8W-62-1
POWER MIRROR SWITCH	8T-1,8T-4
POWER MIRROR SYSTEM	8T-1
POWER MIRRORS	8W-62-1
POWER SEAT	8W-63-1
POWER SEAT ADJUSTER/MOTORS	8R-1,8R-2, 8R-3
POWER SEAT OPERATION	8W-63-1
POWER SEAT SWITCH	8R-1,8R-2,8R-3
POWER SEAT SYSTEM	8R-1
POWER STEERING	19-1
POWER STEERING GEAR	19-11,19-22
POWER STEERING GEAR LEAKAGE DIAGNOSIS	19-12
POWER STEERING PRESSURE SWITCH; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
POWER STEERING PRESSURE SWITCH; FUEL SYSTEM	14-36
POWER STEERING PRESSURE SWITCH—2.5L ENGINE	14-40
POWER STEERING PRESSURE SWITCH—PCM INPUT	14-27
POWER STEERING PUMP	19-10,19-5,19-7
POWER STEERING PUMP PRESSURE TEST	19-5
POWER STEERING PUMP—INITIAL OPERATION	19-6
POWER STEERING SYSTEM DIAGNOSIS CHARTS	19-4
POWER WINDOW MOTOR	8S-1,8S-7
POWER WINDOW OPERATION	8W-60-1
POWER WINDOW SWITCH	8S-1,8S-2,8S-7
POWER WINDOW SYSTEM	8S-1
POWER WINDOWS	8W-60-1
POWERTRAIN CONTROL MODULE; IGNITION SYSTEM	8D-2
POWERTRAIN CONTROL MODULE; VEHICLE SPEED CONTROL SYSTEM	8H-2,8H-8
POWERTRAIN CONTROL MODULE (PCM); FUEL SYSTEM	14-23,14-39
POWERTRAIN CONTROL MODULE (PCM); IGNITION SYSTEM	8D-19
POWERTRAIN CONTROL MODULE (PCM); VEHICLE SPEED CONTROL SYSTEM	8H-6
PRE-ALIGNMENT INSPECTION	2-1
PRECAUTIONS	3-2
PRECAUTIONS AND WARNINGS, SAFETY	23-1
PRECAUTIONS, SAFETY; BODY	23-4
PRECAUTIONS, SAFETY; CLUTCH	6-1
PRECAUTIONS, SAFETY; LAMPS	8L-1
PRECAUTIONS, SERVICE WARNINGS	24-3
PRELIMINARY CHECKS	7-10
PRELIMINARY DIAGNOSIS	21-75
PRELIMINARY INSPECTION AND ADJUSTMENT	21-180
PRELOAD AND RING GEAR BACKLASH ADJUSTMENT, DIFFERENTIAL BEARING	3-85
PREPARATION, HEADLAMP ALIGNMENT	8L-6
PRESSURE CAP, RADIATOR	7-39,7-6
PRESSURE CUT-OFF SWITCH, LOW/HIGH	24-19, 24-8
PRESSURE, ENGINE OIL	9-10
PRESSURE FOR HIGH—SPEED OPERATION, TIRE	22-3
PRESSURE, FUEL SYSTEM	14-18
PRESSURE GAUGE, OIL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
PRESSURE GAUGE, OIL; INSTRUMENT PANEL SYSTEMS	8E-3,8E-7
PRESSURE GAUGES	22-3
PRESSURE LEAKAGE TEST, CYLINDER COMBUSTION	9-9
PRESSURE (MAP) SENSOR, MANIFOLD ABSOLUTE; FUEL SYSTEM	14-38
PRESSURE (MAP) SENSOR, MANIFOLD ABSOLUTE; IGNITION SYSTEM	8D-15,8D-4
PRESSURE (MAP) SENSOR TEST, MANIFOLD ABSOLUTE	14-34
PRESSURE (MAP) SENSOR—PCM INPUT, MANIFOLD ABSOLUTE	14-27
PRESSURE, OIL PUMP	9-16,9-57
PRESSURE REGULATOR, FUEL	14-14,14-4
PRESSURE RELEASE PROCEDURE—2.5L ENGINE, FUEL SYSTEM	14-9
PRESSURE RELEASE PROCEDURE–4.0L ENGINE, FUEL SYSTEM	14-9
PRESSURE RELIEF VALVE, HIGH	24-8
PRESSURE SENSOR, MANIFOLD ABSOLUTE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
PRESSURE SENSOR, MANIFOLD ABSOLUTE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
PRESSURE SWITCH, POWER STEERING; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
PRESSURE SWITCH, POWER STEERING; FUEL SYSTEM	14-36
PRESSURE SWITCH—2.5L ENGINE, POWER STEERING	14-40
PRESSURE SWITCH—PCM INPUT, POWER STEERING	14-27
PRESSURE TEST ANALYSIS	21-181
PRESSURE TEST, CYLINDER COMPRESSION	9-8
PRESSURE TEST, HYDRAULIC	21-180,21-78

Description	Group-Page
PRESSURE TEST, POWER STEERING PUMP	19-5
PRESSURE TESTING RADIATOR CAPS	7-23
PRESSURE TEST—2.5L ENGINE, FUEL PUMP	14-6
PRESSURE TEST–4.0L ENGINE, FUEL PUMP	14-6
PRESSURE WARNING LAMP, LOW OIL	8E-12,8E-5
PRESSURE WARNING LAMP, OIL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
PRESSURE WARNING LAMP, OIL; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
PRESSURES, TIRE INFLATION	22-2
PRINTED CIRCUITS	8E-15,8E-6
PROBLEMS, TROUBLESHOOTING WIRING	8W-01-6
PROCEDURE—2.5L ENGINE, FUEL SYSTEM PRESSURE RELEASE	14-9
PROCEDURE–4.0L ENGINE, FUEL SYSTEM PRESSURE RELEASE	14-9
PRODUCTS, AFTERMARKET PAINT REPAIR	23-3
PROGRAMMING, KEYLESS ENTRY TRANSMITTER	8P-9
PROPELLER SHAFT	3-13
PROPELLER SHAFT ANGLE MEASUREMENT	3-5
PROPELLER SHAFT, FRONT	3-7
PROPELLER SHAFT, REAR	3-7
PROPELLER SHAFTS	3-1
PROPELLER SHAFTS AND U–JOINTS	3-13
PULLEY, PUMP	19-7
PUMP AND REACTION SHAFT SUPPORT, OIL	21-126,21-145
PUMP, FUEL	14-3
PUMP INLET STRAINER, FUEL	14-15
PUMP LEAKAGE DIAGNOSIS	19-6
PUMP MODULE, FUEL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
PUMP MODULE, FUEL; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
PUMP MODULE, FUEL; FUEL SYSTEM	14-14,14-3
PUMP MOTOR RELAY, ABS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
PUMP MOTOR RELAY, ABS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
PUMP, OIL; ENGINE	9-44,9-84
PUMP, OIL; TRANSMISSION AND TRANSFER CASE	21-174
PUMP OVERHAUL, OIL	21-237
PUMP, POWER STEERING	19-10,19-5,19-7
PUMP PRESSURE, OIL	9-16,9-57
PUMP PRESSURE TEST, POWER STEERING	19-5
PUMP PRESSURE TEST—2.5L ENGINE, FUEL	14-6
PUMP PRESSURE TEST–4.0L ENGINE, FUEL	14-6
PUMP PULLEY	19-7
PUMP RELAY, FUEL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
PUMP RELAY, FUEL; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
PUMP RELAY, FUEL; FUEL SYSTEM	14-14,14-37
PUMP RELAY-PCM OUTPUT, FUEL	14-29
PUMP RELAYS, ASD AND FUEL	14-33
PUMP RESERVOIR, TC-SERIES	19-8
PUMP SEAL, OIL	21-204
PUMP TESTS, WATER	7-10
PUMP—INITIAL OPERATION, POWER STEERING	19-6
PUMPS AND RESERVOIR, WASHER	8K-10
PUMPS, WASHER	8K-3
PUMPS, WATER	7-27,7-2,7-6
PURGE SOLENOID, DUTY CYCLE EVAP CANISTER; EMISSION CONTROL SYSTEMS	25-10
PURGE SOLENOID, DUTY CYCLE EVAP CANISTER; FUEL SYSTEM	14-39
PURGE SOLENOID, EVAP CANISTER	25-13
PURGE SOLENOID VALVE-PCM OUTPUT, DUTY CYCLE EVAP	14-29
PUSH RODS, ROCKER ARMS	9-30,9-48,9-70, 9-88

Description	Group-Page
QUARTER AND WHEELHOUSE TRIM PANELS	23-50
QUARTER TRIM PANEL EXTENSION	23-49
QUARTER VENT WINDOW	23-64
QUARTER WINDOW APPLIQUE	23-64
QUARTER WINDOW GLASS, REAR	23-8
QUICK-CONNECT FITTINGS	14-10,14-5
RACK, LUGGAGE	23-65
RACK PISTON AND WORM SHAFT	19-17
RADIAL-PLY TIRES	22-2
RADIATOR	7-31
RADIATOR CAPS, PRESSURE TESTING	7-23
RADIATOR CAP-TO-FILLER NECK SEAL—PRESSURE RELIEF CHECK	7-23
RADIATOR CLEANING	7-39
RADIATOR COOLANT FLOW CHECK	7-20
RADIATOR FAN RELAY AND MOTOR; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
RADIATOR FAN RELAY AND MOTOR; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
RADIATOR FAN RELAY—PCM OUTPUT	14-30
RADIATOR PRESSURE CAP	7-39,7-6
RADIATOR SUPPORT CROSSMEMBER	23-20
RADIATORS	7-2
RADIO; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
RADIO; AUDIO SYSTEMS	8F-4,8F-6
RADIO FREQUENCY INTERFERENCE	8F-6
RADIO ILLUMINATION; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
RADIO ILLUMINATION; 8W-47 AUDIO SYSTEM (RHD)	8W-47-1
RADIO ILLUMINATION RELAY	8F-1,8F-4,8F-7
RADIO MEMORY; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
RADIO MEMORY; 8W-47 AUDIO SYSTEM (RHD)	8W-47-1
RADIO NOISE SUPPRESSION	8F-2
RADIO OPERATION	8W-47-1
RADIOS	8F-1
RAIL AND FORK, SHIFT	21-54
RAIL, FUEL	14-5
RAIL, FUEL INJECTOR	14-15
RAIL MOLDING, DRIP	23-64
RANGES AND SHIFT LEVER POSITIONS, TRANSMISSION	21-170
RATINGS, BATTERY SIZE	8A-2
RATINGS, GENERATOR	8C-8
RATIOS, GEAR	21-1
RATIOS, TRANSMISSION GEAR	21-38,21-74
REACTION SHAFT SUPPORT, OIL PUMP	21-126,21-145
READING LAMP BULB, MAP	8L-12
READING LAMPS; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
READING LAMPS; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
READING/COURTESY LAMP BULBS	8V-8
READING/COURTESY LAMPS	8V-2
REAR AXLE ALIGNMENT	3-45
REAR BAND ADJUSTMENT	21-150
REAR BEARING—TYPICAL, OUTPUT SHAFT	21-97
REAR BUMPER	13-3,13-5
REAR CARPET/MAT	23-56
REAR CLUTCH	21-131,21-146
REAR DOOR	23-42
REAR DOOR GLASS EXTERIOR MOLDING	23-45
REAR DOOR GLASS RUN CHANNEL WEATHERSTRIP	23-45
REAR DOOR HINGE	23-42
REAR DOOR HINGE PIN	23-42
REAR DOOR INNER BELT SEAL	23-45
REAR DOOR INSIDE HANDLE ACTUATOR	23-44
REAR DOOR LATCH	23-43
REAR DOOR LATCH STRIKER	23-44
REAR DOOR OUTSIDE HANDLE	23-43
REAR DOOR RESTRAINT	23-42
REAR DOOR STATIONARY WINDOW GLASS	23-8
REAR DOOR TRIM PANEL	23-41
REAR DOOR WEATHERSTRIP	23-46
REAR DOOR WINDOW GLASS	23-46
REAR DOOR WINDOW REGULATOR	23-46
REAR DRUM BRAKE	5-27,5-28,5-5

Description	Group-Page
REAR LICENSE PLATE LAMPS, TAIL LAMPS; 8W-51 REAR LIGHTING (LH)	8W-51-1
REAR LICENSE PLATE LAMPS, TAIL LAMPS; 8W-51 REAR LIGHTING (RHD)	8W-51-1
REAR MAIN OIL SEALS	9-46,9-83
REAR PARKING BRAKE CABLE	5-21
REAR PROPELLER SHAFT	3-7
REAR QUARTER WINDOW GLASS	23-8
REAR SEAT CUSHION	23-54
REAR SEAT CUSHION COVER	23-13
REAR SEATBACK	23-55
REAR SEATBACK COVER	23-14
REAR SEATBACK LATCH STRIKER AND BUMPER	23-14
REAR SERVO	21-144
REAR SERVO PISTON	21-126
REAR SHOULDER/LAP BELT/BUCKLE	23-52
REAR SUSPENSION	2-13
REAR TOW HOOK	13-3
REAR WHEEL SPEED SENSOR	5-38
REAR WHEELHOUSE FLARES AND LINERS	23-63
REAR WINDOW DEFOGGER; 8W-48 REAR WINDOW DEFOGGER (LH)	8W-48-1
REAR WINDOW DEFOGGER; 8W-48 REAR WINDOW DEFOGGER (RHD)	8W-48-1
REAR WINDOW DEFOGGER SYSTEM	8N-1
REAR WIPER AND WASHER SYSTEM	8K-1
REAR WIPER SYSTEM; 8W-53 WIPERS (LH)	8W-53-1
REAR WIPER SYSTEM; 8W-53 WIPERS (RHD)	8W-53-1
REARVIEW MIRROR	23-57
REARVIEW MIRROR SUPPORT BRACKET	23-57
RECIRCULATION AIR DOOR VACUUM ACTUATOR	24-33
RECOMMENDATIONS, HOISTING	0-11
RECOMMENDATIONS, PARTS AND LUBRICANT	0-1
RECOMMENDATIONS, TOWING	0-9
RECOMMENDED FLUID	21-74
RECOMMENDED FLUID CAPACITY	21-170
RECOMMENDED LUBRICANT	21-1
RECOMMENDED LUBRICANT AND FILL LEVEL	21-289,21-314
RECOVERY, REFRIGERANT	24-20
RED BRAKE WARNING LAMP	5-2,5-9
REFERENCES, TORQUE	0-7
REFILLING AFTER OVERHAUL OR FLUID/FILTER CHANGE	21-188
REFRIGERANT	24-8
REFRIGERANT LINES	24-9
REFRIGERANT OIL	24-9
REFRIGERANT OIL LEVEL	24-21
REFRIGERANT RECOVERY	24-20
REFRIGERANT SYSTEM CHARGE	24-21
REFRIGERANT SYSTEM EVACUATE	24-21
REFRIGERANT SYSTEM LEAKS	24-20
REFRIGERANT SYSTEM SERVICE EQUIPMENT	24-9
REFRIGERANT SYSTEM SERVICE PORTS	24-9
REFRIGERANT SYSTEM SIGHT GLASS	24-10,24-19
REGULATOR, FRONT DOOR WINDOW	23-39
REGULATOR, FUEL PRESSURE	14-14,14-4
REGULATOR, REAR DOOR WINDOW	23-46
REGULATOR, VOLTAGE	8C-2
RELAY, ABS MAIN; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
RELAY, ABS MAIN; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
RELAY, ABS PUMP MOTOR; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
RELAY, ABS PUMP MOTOR; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
RELAY AND MOTOR, RADIATOR FAN; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
RELAY AND MOTOR, RADIATOR FAN; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
RELAY, AUTOMATIC SHUT DOWN (ASD); 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
RELAY, AUTOMATIC SHUT DOWN (ASD); 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2

Description	Group-Page
RELAY, AUTOMATIC SHUTDOWN (ASD); FUEL SYSTEM	14-37
RELAY, AUTOMATIC SHUTDOWN (ASD); IGNITION SYSTEM	8D-13,8D-3
RELAY CENTER	8E-3
RELAY, COMPRESSOR CLUTCH	24-18,24-7
RELAY, FUEL PUMP; 8W-30 FUEL/ IGNITION SYSTEMS (LH)	8W-30-2
RELAY, FUEL PUMP; 8W-30 FUEL/ IGNITION SYSTEMS (RHD)	8W-30-2
RELAY, FUEL PUMP; FUEL SYSTEM	14-14,14-37
RELAY, HORN	8G-1,8G-3
RELAY, LEFT TURN; 8W-54 TRAILER TOW (LH)	8W-54-1
RELAY, LEFT TURN; 8W-54 TRAILER TOW (RHD)	8W-54-1
RELAY, LOCK; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
RELAY, LOCK; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
RELAY, RADIO ILLUMINATION	8F-1,8F-4,8F-7
RELAY, RIGHT TURN; 8W-54 TRAILER TOW (LH)	8W-54-1
RELAY, RIGHT TURN; 8W-54 TRAILER TOW (RHD)	8W-54-1
RELAY, STARTER	8B-2,8B-8
RELAY, STOP LAMP; 8W-54 TRAILER TOW (LH)	8W-54-1
RELAY, STOP LAMP; 8W-54 TRAILER TOW (RHD)	8W-54-1
RELAY TEST, AUTOMATIC SHUTDOWN (ASD)	8D-4
RELAY, UNLOCK; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
RELAY, UNLOCK; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
RELAY—PCM INPUT, AUTOMATIC SHUTDOWN (ASD)	14-24
RELAY—PCM OUTPUT, AIR CONDITIONING (A/C) CLUTCH	14-28
RELAY—PCM OUTPUT, AUTO SHUTDOWN (ASD)	14-28
RELAY—PCM OUTPUT, RADIATOR FAN	14-30
RELAY-PCM OUTPUT, FUEL PUMP	14-29
RELAYS, ABS SYSTEM	5-35
RELAYS, ASD AND FUEL PUMP	14-33
RELAYS, POWER LOCK/ UNLOCK	8P-10,8P-1,8P-7
RELAY/TIMER, DEFOGGER	8N-1,8N-2,8N-4
RELEASE BEARING	6-11
RELEASE CABLE, HOOD	23-23
RELEASE PROCEDURE—2.5L ENGINE, FUEL SYSTEM PRESSURE	14-9
RELEASE PROCEDURE–4.0L ENGINE, FUEL SYSTEM PRESSURE	14-9
RELIEF CHECK, RADIATOR CAP-TO-FILLER NECK SEAL—PRESSURE	7-23
RELIEF VALVE, HIGH PRESSURE	24-8
REMINDER LAMP, SEAT BELT	8E-13,8E-5
REMOTE KEYLESS ENTRY MODULE; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
REMOTE KEYLESS ENTRY MODULE; OVERHEAD CONSOLE SYSTEMS	8V-2
REMOTE KEYLESS ENTRY MODULE; POWER LOCK SYSTEMS	8P-12,8P-2,8P-8
REMOTE KEYLESS ENTRY TRANSMITTER	8P-2,8P-8
REMOTE KEYLESS ENTRY TRANSMITTER BATTERY REPLACEMENT	8P-9
REMOVAL, DIFFERENTIAL	3-52
REMOVAL, PINION GEAR SHAFT	3-75
REMOVAL/INSTALLATION, VISCOUS FAN DRIVE	7-39
REPAIR, ALUMINUM THREAD	21-94
REPAIR DAMAGED OR WORN THREADS	9-4
REPAIR PRODUCTS, AFTERMARKET PAINT	23-3
REPAIR, WIRING	8W-01-7
REPAIRING LEAKS	22-7
REPAIR-MOLEX CONNECTORS, TERMINAL/CONNECTOR	8W-01-7
REPAIR—THOMAS AND BETTS CONNECTORS, TERMINAL/CONNECTOR	8W-01-8
REPAIRS, DEFOGGER GLASS GRID	8N-3
REPLACEMENT—2WD, YOKE SEAL	21-96
REPLACEMENT—XJ VEHICLES, DRIVE AXLE ASSEMBLY	3-49,3-71
REQUIREMENTS, FUEL	14-1
RESERVE TANK, COOLANT	7-27
RESERVE/OVERFLOW SYSTEM, COOLANT	7-3
RESERVOIR, MASTER CYLINDER	5-23
RESERVOIR, TC-SERIES PUMP	19-8
RESERVOIR, VACUUM	8H-2,8H-8
RESERVOIR, WASHER	8K-3
RESERVOIR, WASHER PUMPS	8K-10
RESISTANCE, SPARK PLUG CABLE	8D-22
RESISTANCE TESTS, CHARGING SYSTEM	8C-3
RESISTOR, BLOWER MOTOR	24-17,24-34,24-7
RESTRAINT, FRONT DOOR	23-34
RESTRAINT, HEAD	23-12
RESTRAINT, REAR DOOR	23-42
RETAINER, ADAPTER HOUSING AND FRONT BEARING	21-6
RETURN TO CENTER, INSUFFICIENT ASST. OR POOR	19-4
REVERSE FLUSHING	7-25
REVERSE FLUSHING MAIN AND AUXILIARY COOLERS AND COOLER LINES	21-189
REVERSE FLUSHING, TRANSMISSION COOLER	21-94
RIGHT TURN RELAY; 8W-54 TRAILER TOW (LH)	8W-54-1
RIGHT TURN RELAY; 8W-54 TRAILER TOW (RHD)	8W-54-1
RING FITTING, PISTON	9-19,9-58
RING GEAR	3-77
RING GEAR BACKLASH ADJUSTMENT, DIFFERENTIAL BEARING PRELOAD	3-85
RING GEAR TEETH CONTACT PATTERN ANALYSIS	3-87
ROAD TEST	8H-2
ROAD TEST, ANALYZING	21-78
ROAD TESTING	21-78
ROCKER ARMS AND PUSH RODS	9-30,9-48, 9-70,9-88
ROD AND PAWL SERVICE, PARK	21-199
ROD BALL STUD, LIFTGATE SUPPORT	23-61
ROD BEARINGS, FITTING CONNECTING	9-20, 9-60
ROD CYLINDER, LIFTGATE SUPPORT	23-61
ROD, TIE	19-27
RODS, PISTONS AND CONNECTING	9-44,9-82
RODS, ROCKER ARMS AND PUSH	9-30,9-48,9-70,9-88
ROLLOVER VALVE	25-10,25-14
ROTATION	22-6
ROTOR, DISC BRAKE	5-10,5-19
ROTOR, DISTRIBUTOR	8D-7
ROTOR MACHINING, DISC	5-12
ROTOR-SPEEDOMETER DRIVE GEAR, SPEED SENSOR	21-200
ROUTING, SYSTEM COOLANT	7-2
RUN CHANNEL WEATHERSTRIP, FRONT DOOR GLASS	23-37
RUN CHANNEL WEATHERSTRIP, REAR DOOR GLASS	23-45
RUNNING LAMP (DRL) MODULE, DAYTIME	8W-50-2
RUNNING LAMP MODULE, DAYTIME	8L-17,8L-1
RUNOUT	3-4
RUNOUT SPECIFICATIONS	3-4
RUNOUT, TIRE AND WHEEL	22-8
SAFETY CERTIFICATION LABEL, VEHICLE	0-1
SAFETY LATCH STRIKER	23-24
SAFETY PRECAUTIONS; BODY	23-4
SAFETY PRECAUTIONS; CLUTCH	6-1
SAFETY PRECAUTIONS; LAMPS	8L-1
SAFETY PRECAUTIONS AND WARNINGS	23-1
SANDING, BUFFING AND POLISHING, WET	23-2
SCAN TOOL, DRB	7-10
SCHEDULE—A	0-3
SCHEDULE—B	0-5
SCHEDULES, MAINTENANCE	0-3
SCHEMATICS, VACUUM	25-13
SCUFF PLATE, FRONT INNER	23-48
SCUFF PLATES, OUTER	23-51
SEAL AND BEARING, AXLE SHAFT	3-52
SEAL AND BEARING SERVICE, AXLE SHAFT	3-71
SEAL AND SPRING, VALVE STEM	9-71
SEAL, COWL WEATHERSTRIP	23-24
SEAL, FRONT DOOR INNER BELT	23-37
SEAL, FRONT DOOR OUTER BELT	23-37
SEAL, OIL PUMP	21-204
SEAL, REAR DOOR INNER BELT	23-45
SEAL REPLACEMENT, ADAPTER HOUSING	21-199
SEAL REPLACEMENT, INNER AXLE SHAFT OIL	3-26
SEAL REPLACEMENT, MANUAL VALVE SHAFT	21-195
SEAL REPLACEMENT, PINION	3-21,3-73
SEAL REPLACEMENT, PINION SHAFT	3-50
SEAL REPLACEMENT—2WD, YOKE	21-96
SEAL, SOLENOID HARNESS ADAPTER	21-192
SEAL, TIMING CASE COVER OIL	9-35,9-84
SEAL—PRESSURE RELIEF CHECK, RADIATOR CAP-TO-FILLER NECK	7-23
SEALS AND BEARING, PITMAN SHAFT	19-19
SEALS (IN VEHICLE), PITMAN SHAFT	19-12
SEALS, REAR MAIN OIL	9-46,9-83
SEALS, VALVE SPRINGS AND OIL	9-31
SEAT ADJUSTER/MOTORS, POWER	8R-1,8R-2,8R-3
SEAT BELT INDICATOR WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
SEAT BELT INDICATOR WARNING LAMP; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
SEAT BELT REMINDER LAMP	8E-13,8E-5
SEAT BELT SWITCH, DRIVER'S	8U-2,8U-3
SEAT, BUCKET	23-53
SEAT CUSHION AND COVER, BUCKET	23-12
SEAT CUSHION COVER, REAR	23-13
SEAT CUSHION, REAR	23-54
SEAT OPERATION, POWER	8W-63-1
SEAT PLATFORM, BUCKET	23-13
SEAT, POWER	8W-63-1
SEAT SWITCH, POWER	8R-1,8R-2,8R-3
SEAT SYSTEM, POWER	8R-1
SEATBACK COVER AND FRAME, BUCKET	23-13
SEATBACK COVER, REAR	23-14
SEATBACK LATCH STRIKER AND BUMPER, REAR	23-14
SEATBACK, REAR	23-55
SEATS	23-12
SECOND BRAKE OVERHAUL	21-265
SECOND COAST BRAKE SERVO OVERHAUL	21-198
SECTION IDENTIFICATION; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
SECTION IDENTIFICATION; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
SELECTION-ADDITIVES, COOLANT	7-6
SENDING UNIT, FUEL GAUGE	14-4,14-7
SENSE—PCM INPUT, IGNITION CIRCUIT	14-26
SENSING CYCLING CLUTCH SWITCH, FIN	24-19,24-29,24-8
SENSITIVE DEVICES, ELECTROSTATIC DISCHARGE (ESD)	8W-01-5
SENSOR, AMBIENT TEMPERATURE	8W-49-1
SENSOR, BATTERY TEMPERATURE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
SENSOR, BATTERY TEMPERATURE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
SENSOR, BATTERY TEMPERATURE; CHARGING SYSTEM	8C-2,8C-6,8C-8
SENSOR, CAMSHAFT POSITION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
SENSOR, CAMSHAFT POSITION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
SENSOR, CAMSHAFT POSITION; FUEL SYSTEM	14-40
SENSOR, CAMSHAFT POSITION; IGNITION SYSTEM	8D-14,8D-3,8D-8
SENSOR, CRANKSHAFT POSITION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
SENSOR, CRANKSHAFT POSITION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
SENSOR, CRANKSHAFT POSITION; FUEL SYSTEM	14-40
SENSOR, CRANKSHAFT POSITION; IGNITION SYSTEM	8D-14,8D-3
SENSOR, DOWNSTREAM OXYGEN	14-41
SENSOR, ENGINE COOLANT TEMPERATURE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3

Description	Group-Page
SENSOR, ENGINE COOLANT TEMPERATURE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
SENSOR, ENGINE COOLANT TEMPERATURE; FUEL SYSTEM	14-35,14-42
SENSOR, ENGINE COOLANT TEMPERATURE; IGNITION SYSTEM	8D-15,8D-4,8D-9
SENSOR, FRONT WHEEL	5-37
SENSOR, FUEL LEVEL	14-15
SENSOR, INTAKE AIR TEMPERATURE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
SENSOR, INTAKE AIR TEMPERATURE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
SENSOR, INTAKE MANIFOLD AIR TEMPERATURE; FUEL SYSTEM	14-36,14-42
SENSOR, INTAKE MANIFOLD AIR TEMPERATURE; IGNITION SYSTEM	8D-15,8D-4, 8D-9
SENSOR, MANIFOLD ABSOLUTE PRESSURE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
SENSOR, MANIFOLD ABSOLUTE PRESSURE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
SENSOR, MANIFOLD ABSOLUTE PRESSURE (MAP); FUEL SYSTEM	14-38
SENSOR, MANIFOLD ABSOLUTE PRESSURE (MAP); IGNITION SYSTEM	8D-15,8D-4
SENSOR, MAP	8D-7
SENSOR (O2S)—PCM INPUT, HEATED OXYGEN	14-26
SENSOR, REAR WHEEL SPEED	5-38
SENSOR REPLACEMENT, SPEED	21-200
SENSOR ROTOR-SPEEDOMETER DRIVE GEAR, SPEED	21-200
SENSOR SUPPLY—PRIMARY, FIVE VOLT	14-24
SENSOR SUPPLY—SECONDARY, FIVE VOLT	14-24
SENSOR, TEMPERATURE	8V-7
SENSOR TEST, CRANKSHAFT POSITION	8D-7
SENSOR TEST, MANIFOLD ABSOLUTE PRESSURE (MAP)	14-34
SENSOR TESTING, SPEED	21-186
SENSOR, THROTTLE POSITION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
SENSOR, THROTTLE POSITION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
SENSOR, THROTTLE POSITION; IGNITION SYSTEM	8D-15,8D-4
SENSOR (TPS) SERVICE, THROTTLE POSITION	21-201
SENSOR (TPS), THROTTLE POSITION	14-37,14-38
SENSOR (TPS)—PCM INPUT, THROTTLE POSITION	14-27
SENSOR, UPSTREAM OXYGEN	14-40
SENSOR, VEHICLE SPEED; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
SENSOR, VEHICLE SPEED; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
SENSOR, VEHICLE SPEED; FUEL SYSTEM	14-36,14-42
SENSOR, VEHICLE SPEED; VEHICLE SPEED CONTROL SYSTEM	8H-2,8H-5,8H-9
SENSOR/INFLATOR ASSEMBLY, IMPACT	8M-2
SENSOR—PCM INPUT, BATTERY TEMPERATURE	14-24
SENSOR—PCM INPUT, CAMSHAFT POSITION	14-24
SENSOR—PCM INPUT, CRANKSHAFT POSITION	14-25
SENSOR—PCM INPUT, ENGINE COOLANT TEMPERATURE	14-25
SENSOR—PCM INPUT, FUEL LEVEL	14-24
SENSOR—PCM INPUT, INTAKE MANIFOLD AIR TEMPERATURE	14-26
SENSOR—PCM INPUT, MANIFOLD ABSOLUTE PRESSURE (MAP)	14-27
SENSOR—PCM INPUT, VEHICLE SPEED AND DISTANCE	14-27
SENSORS	21-171
SENSORS AND TONE WHEEL, WHEEL SPEED	5-34
SENSORS, CAMSHAFT AND CRANKSHAFT POSITION	14-35
SENSORS, HEATED OXYGEN; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
SENSORS, HEATED OXYGEN; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
SENSORS, HEATED OXYGEN (O2S)	14-35
SENSORS, WHEEL SPEED; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
SENSORS, WHEEL SPEED; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
SENTINEL HEADLAMP DELAY MODULE	8L-17,8L-1
SERVO CABLE	8H-2,8H-8
SERVO, FRONT	21-144
SERVO OVERHAUL, SECOND COAST BRAKE	21-198
SERVO PISTON, FRONT	21-126
SERVO PISTON, REAR	21-126
SERVO, REAR	21-144
SERVO, SPEED CONTROL	8H-1,8H-6,8H-7
SHACKLE BUSHING, LEAF SPRING	2-15
SHAFT AND CLUSTER GEAR, OUTPUT	21-61
SHAFT ANGLE MEASUREMENT, PROPELLER	3-5
SHAFT, AXLE	3-51
SHAFT, FRONT PROPELLER	3-7
SHAFT, HUB BEARING AND AXLE	3-21
SHAFT OIL SEAL REPLACEMENT, INNER AXLE	3-26
SHAFT, OUTPUT	21-64
SHAFT OVERHAUL, MANUAL VALVE	21-239
SHAFT, PITMAN	19-13
SHAFT, PLANETARY GEAR TRAIN/ OUTPUT	21-134
SHAFT, PLANETARY/BRAKE PACK/ OUTPUT	21-268
SHAFT, PROPELLER	3-13
SHAFT, RACK PISTON AND WORM	19-17
SHAFT REAR BEARING—TYPICAL, OUTPUT	21-97
SHAFT, REAR PROPELLER	3-7
SHAFT REMOVAL, PINION GEAR	3-75
SHAFT SEAL AND BEARING, AXLE	3-52
SHAFT, SEAL AND BEARING SERVICE, AXLE	3-71
SHAFT SEAL REPLACEMENT, MANUAL VALVE	21-195
SHAFT SEAL REPLACEMENT, PINION	3-50
SHAFT SEALS AND BEARING, PITMAN	19-19
SHAFT SEALS (IN VEHICLE), PITMAN	19-12
SHAFT SUPPORT, OIL PUMP AND REACTION	21-126,21-145
SHAFT—CARDAN U-JOINT, AXLE	3-29
SHAFTS AND U-JOINTS, PROPELLER	3-13
SHAFTS, PROPELLER	3-1
SHIELDS, EXHAUST HEAT	11-2
SHIFT CABLE ADJUSTMENT	21-147,21-278
SHIFT INTERLOCK; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
SHIFT INTERLOCK; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
SHIFT LEVER	21-292,21-314
SHIFT LEVER POSITIONS, TRANSMISSION RANGES	21-170
SHIFT LINKAGE ADJUSTMENT	21-309,21-337
SHIFT MECHANISM	21-10
SHIFT PATTERN	21-1
SHIFT PATTERN, TRANSMISSION	21-37
SHIFT RAIL AND FORK	21-54
SHIFTER/IGNITION INTERLOCK	8D-21
SHIFTING, HARD	21-38,21-4
SHIFTING TEST, MANUAL	21-180
SHIM PACK MEASUREMENT AND ADJUSTMENT, DIFFERENTIAL	3-33
SHOCK ABSORBER	2-14,2-7
SHOCK ABSORBER DIAGNOSIS, SPRING	2-14
SHOCK DIAGNOSIS	2-6
SHOCK DIAGNOSIS, SPRING	2-13
SHOULDER BELT/BUCKLE, FRONT	23-51
SHOULDER/LAP BELT/BUCKLE, REAR	23-52
SHUT DOWN (ASD) RELAY, AUTOMATIC; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
SHUT DOWN (ASD) RELAY, AUTOMATIC; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
SHUTDOWN (ASD) RELAY, AUTOMATIC; FUEL SYSTEM	14-37
SHUTDOWN (ASD) RELAY, AUTOMATIC; IGNITION SYSTEM	8D-13,8D-3
SHUTDOWN (ASD) RELAY TEST, AUTOMATIC	8D-4
SHUTDOWN (ASD) RELAY—PCM INPUT, AUTOMATIC	14-24
SHUTDOWN (ASD) RELAY—PCM OUTPUT, AUTO	14-28
SIDE GEAR CLEARANCE MEASUREMENT AND ADJUSTMENT	3-86
SIDE MARKER LAMP	8L-15
SIDE MARKER LAMP BULB	8L-10
SIDE MOLDING/CLADDING, BODY	23-47
SIDE VIEW MIRRORS	23-28
SIGHT GLASS, REFRIGERANT SYSTEM	24-10,24-19
SIGNAL INDICATOR LAMPS, TURN; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
SIGNAL INDICATOR LAMPS, TURN; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
SIGNAL INDICATOR LAMPS, TURN; INSTRUMENT PANEL SYSTEMS	8E-13,8E-6
SIGNAL INDICATOR LAMPS, TURN; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-2
SIGNAL LAMP BULB, FRONT PARK/ TURN	8L-10
SIGNAL LAMP, FRONT PARK/TURN	8L-14
SIGNAL LAMPS, TURN	8J-2
SIGNAL SYSTEM, TURN	8J-1
SIGNAL, TACHOMETER; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
SIGNAL, TACHOMETER; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
SIGNAL/HAZARD WARNING SYSTEM, TURN	8J-2
SIGNALS, TURN; 8W-52 TURN SIGNALS (LH)	8W-52-1
SIGNALS, TURN; 8W-52 TURN SIGNALS (RHD)	8w52-1
SIGNAL/TAIL LAMP, BACK-UP/REAR TURN	8L-15
SIGNAL/TAIL LAMP BULB, BACK-UP/ REAR TURN	8L-11
SINGLE AND DOUBLE CARDAN JOINT	3-13
SINGLE CARDAN	3-8
SIZE AND RATINGS, BATTERY	8A-2
SKID PLATE, FRONT	13-6
SKID PLATE, FUEL TANK	13-6
SKID PLATE, TRANSFER CASE	13-6
SLIP DIFFERENTIAL, LIMITED	3-46
SNAP, DRIVELINE	3-17,3-45
SOLENOID, DUTY CYCLE EVAP CANISTER PURGE; EMISSION CONTROL SYSTEMS	25-10
SOLENOID, DUTY CYCLE EVAP CANISTER PURGE; FUEL SYSTEM	14-39
SOLENOID, DUTY CYCLE EVAP\PURGE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
SOLENOID, DUTY CYCLE EVAP\PURGE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
SOLENOID, EVAP CANISTER PURGE	25-13
SOLENOID HARNESS ADAPTER SEAL	21-192
SOLENOID, TORQUE CONVERTER CLUTCH (TCC); 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
SOLENOID, TORQUE CONVERTER CLUTCH (TCC); 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
SOLENOID VALVE-PCM OUTPUT, DUTY CYCLE EVAP PURGE	14-29
SOLENOIDS, TRANSMISSION VALVE BODY	21-171,21-191
SOLENOIDS—PCM OUTPUT, SPEED CONTROL	14-30
SOUND BAR	8F-8
SPACER BLOCKS—TWO-DOOR VEHICLES, FRONT DOOR	23-40
SPARE TIRE (TEMPORARY)	22-2
SPARK AT COIL, TESTING	8D-4
SPARK PLUG CABLE RESISTANCE	8D-22
SPARK PLUG CABLES	8D-12,8D-3,8D-9
SPARK PLUG CONDITIONS	8D-10
SPARK PLUGS	8D-12,8D-22,8D-2
SPEAKER	8F-5,8F-7

Description	Group-Page
SPEAKERS; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
SPEAKERS; 8W-47 AUDIO SYSTEM (RHD)	8W-47-1
SPEAKERS; AUDIO SYSTEMS	8F-2
SPECIAL TOOLS	14-44
SPECIAL TOOLS—BODY	23-68
SPECIAL TOOLS—SEATS	23-15
SPECIFICATIONS, 2.5L ENGINE	9-50
SPECIFICATIONS, 4.0L ENGINE	9-90
SPECIFICATIONS, FRAME TORQUE	13-10
SPECIFICATIONS, LUBRICANT	3-42,3-69
SPECIFICATIONS, LUBRICATION	3-14
SPECIFICATIONS, RUNOUT	3-4
SPECIFICATIONS, TORQUE; CHARGING SYSTEM	8C-8
SPECIFICATIONS, TORQUE; COOLING SYSTEM	7-40
SPECIFICATIONS, TORQUE; EMISSION CONTROL SYSTEMS	25-14
SPECIFICATIONS, TORQUE; EXHAUST SYSTEM AND INTAKE MANIFOLD	11-8
SPECIFICATIONS, TORQUE; FUEL SYSTEM	14-18,14-43
SPECIFICATIONS, TORQUE; IGNITION SYSTEM	8D-22
SPECIFICATIONS, TORQUE; INTRODUCTION	0-9
SPECIFICATIONS, TORQUE; VEHICLE SPEED CONTROL SYSTEM	8H-9
SPECIFICATIONS, VECI LABEL; FUEL SYSTEM	14-18,14-43
SPECIFICATIONS, VECI LABEL; IGNITION SYSTEM	8D-21
SPEED AND DISTANCE SENSOR—PCM INPUT, VEHICLE	14-27
SPEED CONTROL DIAGNOSTIC TROUBLE CODES	8H-5
SPEED CONTROL ELECTRICAL TEST	8H-5
SPEED CONTROL SERVO	8H-1,8H-6,8H-7
SPEED CONTROL SOLENOIDS—PCM OUTPUT	14-30
SPEED CONTROL SWITCH	8H-1,8H-5,8H-7
SPEED CONTROL SWITCH—PCM INPUT	14-27
SPEED CONTROL, VEHICLE; 8W-33 VEHICLE SPEED CONTROL (LH)	8W-33-1
SPEED CONTROL, VEHICLE; 8W-33 VEHICLE SPEED CONTROL (RHD)	8W-33-1
SPEED KNOCK, LOW	3-17,3-45
SPEED SENSOR, REAR WHEEL	5-38
SPEED SENSOR REPLACEMENT	21-200
SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR	21-200
SPEED SENSOR TESTING	21-186
SPEED SENSOR, VEHICLE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
SPEED SENSOR, VEHICLE; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
SPEED SENSOR, VEHICLE; FUEL SYSTEM	14-36,14-42
SPEED SENSOR, VEHICLE; VEHICLE SPEED CONTROL SYSTEM	8H-2,8H-5,8H-9
SPEED SENSORS AND TONE WHEEL, WHEEL	5-34
SPEED SENSORS, WHEEL; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
SPEED SENSORS, WHEEL; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
SPEED TEST ANALYSIS, STALL	21-182
SPEEDOMETER; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
SPEEDOMETER; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-1
SPEEDOMETER SERVICE	21-95
SPEEDOMETER/ODOMETER	8E-4,8E-8
SPLICE LOCATIONS; 8W-01 GENERAL INFORMATION (LH)	8W-01-2
SPLICE LOCATIONS; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
SPLICE LOCATIONS; 8W-95 SPLICE LOCATIONS (LH)	8W-95-1
SPLICE LOCATIONS; 8W-95 SPLICE LOCATIONS (RHD)	8W-95-1
SPOOL VALVE	19-16
SPRING AND SHACKLE BUSHING, LEAF	2-15
SPRING AND SHOCK ABSORBER DIAGNOSIS	2-14
SPRING AND SHOCK DIAGNOSIS	2-13
SPRING, COIL	2-7
SPRING, LEAF	2-14
SPRING, VALVE STEM SEAL	9-71
SPRINGS, ACCUMULATOR PISTONS	21-196
SPRINGS, ADJUSTMENT AT AXLE WITH LEAF	3-13
SPRINGS AND OIL SEALS, VALVE	9-31
SPRINGS, VALVES AND VALVE	9-34,9-73
SPROCKETS, TIMING CHAIN	9-37,9-75
STABILIZER BAR	2-14,2-9
STALL SPEED TEST ANALYSIS	21-182
STALL TEST ANALYSIS	21-81
STALL TEST, CONVERTER	21-80
STALL TEST, TORQUE CONVERTER	21-182
STANDARD DIFFERENTIAL	3-53
STANDARD SERVICE INFORMATION	9-1
START TEST, FAILURE TO	8D-5
STARTER	8B-2,8B-7
STARTER NOISE - 2.5L ENGINE	8B-7
STARTER RELAY	8B-2,8B-8
STARTING PROCEDURE, JUMP	0-8
STARTING SYSTEM; 8W-21 STARTING SYSTEM (RHD)	8W-21-1
STARTING SYSTEM; STARTING SYSTEMS	8B-1,8B-2,8B-9
STARTING SYSTEM—AUTOMATIC TRANSMISSIONS	8W-21-1
STARTING SYSTEM—MANUAL TRANSMISSION	8W-21-1
STARTING, TOWING AND HOISTING, JUMP	0-8
STATE DISPLAY TEST MODE	25-2
STATIONARY GLASS	23-11,23-4
STATIONARY WINDOW GLASS, REAR DOOR	23-8
STATOR CLUTCH INSPECTION, TORQUE CONVERTER	21-186
STEERING AND VEHICLE LEAD, LOOSE	19-4
STEERING COLUMN	19-23,19-24
STEERING DAMPER	19-29
STEERING GEAR	19-13,19-20
STEERING GEAR LEAKAGE DIAGNOSIS, POWER	19-12
STEERING GEAR, POWER	19-11,19-22
STEERING KNUCKLE	2-8
STEERING KNUCKLE AND BALL STUDS	3-22
STEERING LINKAGE	19-27,19-30
STEERING NOISE	19-2
STEERING, POWER	19-1
STEERING PRESSURE SWITCH, POWER; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
STEERING PRESSURE SWITCH, POWER; FUEL SYSTEM	14-36
STEERING PRESSURE SWITCH—2.5L ENGINE, POWER	14-40
STEERING PRESSURE SWITCH—PCM INPUT, POWER	14-27
STEERING PUMP, POWER	19-10,19-5,19-7
STEERING PUMP PRESSURE TEST, POWER	19-5
STEERING PUMP—INITIAL OPERATION, POWER	19-6
STEERING SYSTEM	19-1
STEERING SYSTEM DIAGNOSIS CHARTS, POWER	19-4
STEERING SYSTEM DIAGNOSIS, SUSPENSION	2-3
STEM SEAL AND SPRING, VALVE	9-71
STICKING, BINDING	19-4
STOP LAMP (CHMSL) BULB, CENTER HIGH MOUNTED	8L-12
STOP LAMP RELAY; 8W-54 TRAILER TOW (LH)	8W-54-1
STOP LAMP RELAY; 8W-54 TRAILER TOW (RHD)	8W-54-1
STOP LAMP SWITCH; BRAKES	5-14,5-27,5-2,5-9
STOP LAMP SWITCH; VEHICLE SPEED CONTROL SYSTEM	8H-1,8H-6,8H-8
STOP LAMP SWITCH INPUT; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
STOP LAMP SWITCH INPUT; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
STOP LAMP SWITCH INPUT; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
STOP LAMPS AND CHMSL LAMPS; 8W-51 REAR LIGHTING (LH)	8W-51-1
STOP LAMPS AND CHMSL LAMPS; 8W-51 REAR LIGHTING (RHD)	8W-51-1
STORAGE BIN, GARAGE DOOR OPENER	8V-2
STORAGE BIN, SUNGLASSES	8V-2,8V-7
STRAINER, FUEL PUMP INLET	14-15
STRENGTH, FASTENER	0-6
STRIKER AND BUMPER, REAR SEATBACK LATCH	23-14
STRIKER, FRONT DOOR LATCH	23-36
STRIKER, HOOD LATCH	23-23
STRIKER, LIFTGATE LATCH	23-63
STRIKER, REAR DOOR LATCH	23-44
STRIKER, SAFETY LATCH	23-24
STRIPES/DECALS, BODY	23-26
STUD, LIFTGATE SUPPORT ROD BALL	23-61
STUDS, STEERING KNUCKLE AND BALL	3-22
STUDS, WHEEL MOUNTING	2-10
SUN GEAR AND NO. 1 ONE–WAY CLUTCH OVERHAUL	21-263
SUNGLASSES STORAGE BIN	8V-2,8V-7
SUNVISORS	23-58
SUPPLY TEST, VACUUM	8H-6
SUPPLY—PRIMARY, FIVE VOLT SENSOR	14-24
SUPPLY—SECONDARY, FIVE VOLT SENSOR	14-24
SUPPORT BRACKET, REARVIEW MIRROR	23-57
SUPPORT CROSSMEMBER, RADIATOR	23-20
SUPPORT, OIL PUMP AND REACTION SHAFT	21-126,21-145
SUPPORT OVERHAUL, OVERDRIVE	21-248
SUPPORT, OVERRUNNING CLUTCH/LOW-REVERSE DRUM/REAR	21-144
SUPPORT PLATE, BRAKE	5-21
SUPPORT ROD BALL STUD, LIFTGATE	23-61
SUPPORT ROD CYLINDER, LIFTGATE	23-61
SUPPRESSION, RADIO NOISE	8F-2
SURFACE TOUCH-UP, PAINTED	23-2
SURFACE TOWING, FLAT	0-11
SUSPENSION AND STEERING SYSTEM DIAGNOSIS	2-3
SUSPENSION ARM, LOWER	2-8
SUSPENSION ARM, UPPER	2-8
SUSPENSION COMPONENT	2-13
SUSPENSION COMPONENTS	2-6
SUSPENSION, FRONT	2-12,2-6
SUSPENSION, REAR	2-13
SWITCH, ACCELERATION	5-34,5-39
SWITCH AND KEY CYLINDER, IGNITION	8D-19
SWITCH AND KEY LOCK CYLINDER, IGNITION	8D-4
SWITCH AND PLUG LOCATIONS, TRANSMISSION	21-37
SWITCH, BLOWER MOTOR	24-17,24-34,24-7
SWITCH, DEFOGGER	8N-1,8N-2,8N-4
SWITCH, DRIVER'S DOOR JAMB	8U-1,8U-2
SWITCH, DRIVER'S SEAT BELT	8U-2,8U-3
SWITCH, EXTENDED IDLE	8W-30-5
SWITCH, FIN SENSING CYCLING CLUTCH	24-19,24-29,24-8
SWITCH, FOUR-WHEEL DRIVE (4WD); 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
SWITCH, FOUR-WHEEL DRIVE (4WD); 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
SWITCH, FOUR-WHEEL DRIVE (4WD); 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
SWITCH, FOUR-WHEEL DRIVE (4WD); 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
SWITCH, HEADLAMP; CHIME/BUZZER WARNING SYSTEMS	8U-1,8U-3
SWITCH, HEADLAMP; INSTRUMENT PANEL SYSTEMS	8E-17
SWITCH, HORN	8G-1,8G-2,8G-3
SWITCH, IGNITION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-1
SWITCH, IGNITION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-1
SWITCH, IGNITION; STEERING	19-24
SWITCH, IGNITION KEY-IN	8U-1,8U-2
SWITCH INPUT, STOP LAMP; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
SWITCH INPUT, STOP LAMP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
SWITCH INPUT, STOP LAMP; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2

Description	Group-Page
SWITCH KEY-IN HALO LAMP, IGNITION; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
SWITCH KEY-IN HALO LAMP, IGNITION; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
SWITCH, LOW/HIGH PRESSURE CUT-OFF	24-19,24-8
SWITCH, MULTI-FUNCTION	8J-2,8J-3
SWITCH, PARK/NEUTRAL POSITION; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
SWITCH, PARK/NEUTRAL POSITION; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
SWITCH, PARK/NEUTRAL POSITION; TRANSMISSION AND TRANSFER CASE	21-186,21-190,21-76,21-95
SWITCH, POWER LOCK	8P-1,8P-2,8P-9
SWITCH, POWER MIRROR	8T-1,8T-4
SWITCH, POWER SEAT	8R-1,8R-2,8R-3
SWITCH, POWER STEERING PRESSURE; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
SWITCH, POWER STEERING PRESSURE; FUEL SYSTEM	14-36
SWITCH, POWER WINDOW	8S-1,8S-2,8S-7
SWITCH, SPEED CONTROL	8H-1,8H-5,8H-7
SWITCH, STOP LAMP; BRAKES	5-14,5-27,5-2,5-9
SWITCH, STOP LAMP; VEHICLE SPEED CONTROL SYSTEM	8H-1,8H-6,8H-8
SWITCH TEST, EXTENDED IDLE	14-36
SWITCHES, CHIME/BUZZER WARNING SYSTEM	8U-3
SWITCHES, WIPER AND WASHER	8K-2,8K-6,8K-9
SWITCH—2.5L ENGINE, POWER STEERING PRESSURE	14-40
SWITCH—PCM INPUT, BRAKE	14-24
SWITCH—PCM INPUT, EXTENDED IDLE	14-25
SWITCH—PCM INPUT, POWER STEERING PRESSURE	14-27
SWITCH—PCM INPUT, SPEED CONTROL	14-27
SWITCH—PCM INPUT, TRANSMISSION PARK/NEUTRAL	14-27
SYMBOLS	8W-01-3
SYMBOLS, INTERNATIONAL	0-1
SYMBOLS, INTERNATIONAL CONTROL AND DISPLAY	0-3
SYMBOLS, INTERNATIONAL VEHICLE CONTROL AND DISPLAY	0-3
SYNCHRO ASSEMBLY, FIFTH GEAR	21-48
SYSTEM, AIRBAG	8M-2
SYSTEM, AUDIO	8F-3
SYSTEM, BASE BRAKE	5-1,5-6
SYSTEM, BLEEDING ABS BRAKE	5-35
SYSTEM, BRAKE	5-2
SYSTEM CAPACITIES, COOLING	7-40
SYSTEM CHARGE, REFRIGERANT	24-21
SYSTEM, CHARGING; 8W-20 CHARGING SYSTEM (LH)	8W-20-1
SYSTEM, CHARGING; 8W-20 CHARGING SYSTEM (RHD)	8W-20-1
SYSTEM, CHARGING; CHARGING SYSTEM	8C-2
SYSTEM CLEANING, COOLING	7-39
SYSTEM COMPONENTS, COOLING	7-2
SYSTEM, COOLANT RESERVE/ OVERFLOW	7-3
SYSTEM COOLANT ROUTING	7-2
SYSTEM, COOLING	7-41,7-2
SYSTEM, CRANKCASE VENTILATION	25-12
SYSTEM DESCRIPTION	25-1
SYSTEM DIAGNOSIS	14-23
SYSTEM DIAGNOSIS CHARTS, POWER STEERING	19-4
SYSTEM DIAGNOSIS, COOLING	7-14
SYSTEM DIAGNOSIS, EXHAUST	11-2
SYSTEM DIAGNOSIS, SUSPENSION AND STEERING	2-3
SYSTEM, DRAINING AND FILLING COOLING	7-24
SYSTEM EVACUATE, REFRIGERANT	24-21
SYSTEM, EVAPORATION (EVAP) CONTROL	25-10
SYSTEM, EXHAUST	11-1
SYSTEM FANS, COOLING	7-38,7-3
SYSTEM FOR LEAKS, TESTING COOLING	7-20
SYSTEM, FUEL DELIVERY	14-3
SYSTEM, FUEL INJECTION	14-19
SYSTEM, HAZARD WARNING	8J-1
SYSTEM HOSES, COOLING	7-39,7-6
SYSTEM, HYDRAULIC	21-174
SYSTEM, HYDRAULIC CONTROL	21-74
SYSTEM, IGNITION	8D-1
SYSTEM INDICATOR LAMP, CHARGING	8W-40-3
SYSTEM LAMP, ANTI-LOCK BRAKE	8E-4,8E-9
SYSTEM LEAKS, REFRIGERANT	24-20
SYSTEM, LUBRICATION	9-16,9-55
SYSTEM, METRIC	0-7
SYSTEM OPERATION, CHARGING	8C-1
SYSTEM, POWER LOCK/REMOTE KEYLESS ENTRY	8P-2
SYSTEM, POWER MIRROR	8T-1
SYSTEM, POWER SEAT	8R-1
SYSTEM, POWER WINDOW	8S-1
SYSTEM PRESSURE, FUEL	14-18
SYSTEM PRESSURE RELEASE PROCEDURE—2.5L ENGINE, FUEL	14-9
SYSTEM PRESSURE RELEASE PROCEDURE–4.0L ENGINE, FUEL	14-9
SYSTEM, REAR WINDOW DEFOGGER	8N-1
SYSTEM, REAR WIPER; 8W-53 WIPERS (LH)	8W-53-1
SYSTEM, REAR WIPER; 8W-53 WIPERS (RHD)	8W-53-1
SYSTEM, REAR WIPER AND WASHER	8K-1
SYSTEM RELAYS, ABS	5-35
SYSTEM RESISTANCE TESTS, CHARGING	8C-3
SYSTEM SERVICE EQUIPMENT, REFRIGERANT	24-9
SYSTEM SERVICE PORTS, REFRIGERANT	24-9
SYSTEM SIGHT GLASS, REFRIGERANT	24-10,24-19
SYSTEM, STARTING; 8W-21 STARTING SYSTEM (RHD)	8W-21-1
SYSTEM, STARTING; STARTING SYSTEMS	8B-1,8B-2,8B-9
SYSTEM, STEERING	19-1
SYSTEM SWITCHES, CHIME/BUZZER WARNING	8U-3
SYSTEM TEST, ON-BOARD DIAGNOSTIC	8C-6
SYSTEM, TURN SIGNAL	8J-1
SYSTEM, TURN SIGNAL/HAZARD WARNING	8J-2
SYSTEM, VACUUM	24-16
SYSTEM WARNING LAMP, CHARGING	8W-40-2
SYSTEM, WINDSHIELD WASHER	8K-1
SYSTEM, WINDSHIELD WIPER	8K-1
SYSTEM—AUTOMATIC TRANSMISSIONS, STARTING	8W-21-1
SYSTEM—MANUAL TRANSMISSION, STARTING	8W-21-1
SYSTEMS, LAMP	8L-17
SYSTEMS, MONITORED	25-7
SYSTEMS, WASHER	8K-5
SYSTEMS, WIPER	8K-4
TORQUE CHART	5-39
TABLE CONTINUED, DIAGNOSIS	21-185
TABLE, DIAGNOSIS	21-184
TACHOMETER; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
TACHOMETER; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-1
TACHOMETER; INSTRUMENT PANEL SYSTEMS	8E-4,8E-8
TACHOMETER SIGNAL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
TACHOMETER SIGNAL; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
TACHOMETER—PCM OUTPUT	14-30
TAIL LAMPS AND REAR LICENSE PLATE LAMPS; 8W-51 REAR LIGHTING (LH)	8W-51-1
TAIL LAMPS AND REAR LICENSE PLATE LAMPS; 8W-51 REAR LIGHTING (RHD)	8W-51-1
TAILPIPE, MUFFLER AND EXHAUST	11-4
TAKE OUTS	8W-01-3
TANK CAPACITY, FUEL	14-18
TANK, COOLANT RESERVE	7-27
TANK FILLER TUBE CAP, FUEL; EMISSION CONTROL SYSTEMS	25-11,25-14
TANK FILLER TUBE CAP, FUEL; FUEL SYSTEM	14-5
TANK, FUEL	14-16,14-5
TANK SKID PLATE, FUEL	13-6
TAPPETS, HYDRAULIC	9-34,9-74,9-88
TC-SERIES PUMP RESERVOIR	19-8
TEETH CONTACT PATTERN ANALYSIS, RING GEAR	3-87
TEMPERATURE CONTROL CABLE	24-33
TEMPERATURE GAUGE, COOLANT	8E-3,8E-7
TEMPERATURE GAUGE, ENGINE COOLANT	8W-40-2
TEMPERATURE SENSOR	8V-7
TEMPERATURE SENSOR, AMBIENT	8W-49-1
TEMPERATURE SENSOR, BATTERY; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
TEMPERATURE SENSOR, BATTERY; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
TEMPERATURE SENSOR, BATTERY; CHARGING SYSTEM	8C-2,8C-6,8C-8
TEMPERATURE SENSOR, ENGINE COOLANT; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-3
TEMPERATURE SENSOR, ENGINE COOLANT; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-3
TEMPERATURE SENSOR, ENGINE COOLANT; FUEL SYSTEM	14-35,14-42
TEMPERATURE SENSOR, ENGINE COOLANT; IGNITION SYSTEM	8D-15,8D-4,8D-9
TEMPERATURE SENSOR, INTAKE AIR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
TEMPERATURE SENSOR, INTAKE AIR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
TEMPERATURE SENSOR, INTAKE MANIFOLD AIR; FUEL SYSTEM	14-36,14-42
TEMPERATURE SENSOR, INTAKE MANIFOLD AIR; IGNITION SYSTEM	8D-15,8D-4,8D-9
TEMPERATURE SENSOR—PCM INPUT, BATTERY	14-24
TEMPERATURE SENSOR—PCM INPUT, ENGINE COOLANT	14-25
TEMPERATURE SENSOR—PCM INPUT, INTAKE MANIFOLD AIR	14-26
TEMPERATURE WARNING LAMP, COOLANT	8E-10,8E-4
TEMPERATURE WARNING LAMP, ENGINE COOLANT; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
TEMPERATURE WARNING LAMP, ENGINE COOLANT; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
TENSION, BELT	7-40,7-2,7-4
TENSIONER, PARKING BRAKE CABLE	5-29
TERMINAL REPLACEMENT	8W-01-9
TERMINAL REPLACEMENT, CONNECTOR	8W-01-9
TERMINAL/CONNECTOR REPAIR-MOLEX CONNECTORS	8W-01-7
TERMINAL/CONNECTOR REPAIR—THOMAS AND BETTS CONNECTORS	8W-01-8
TEST ANALYSIS, PRESSURE	21-181
TEST ANALYSIS, STALL	21-81
TEST ANALYSIS, STALL SPEED	21-182
TEST ANALYSIS, TIME LAG	21-183
TEST, ANALYZING ROAD	21-78
TEST, AUTOMATIC SHUTDOWN (ASD) RELAY	8D-4
TEST, CHECK COIL	8D-5
TEST, COLD CRANKING	8B-4
TEST, CONVERTER STALL	21-80
TEST, CRANKSHAFT POSITION SENSOR	8D-7
TEST, CURRENT OUTPUT	8C-3
TEST, CYLINDER COMBUSTION PRESSURE LEAKAGE	9-9
TEST, CYLINDER COMPRESSION PRESSURE	9-8
TEST, EXTENDED IDLE SWITCH	14-36
TEST, FAILURE TO START	8D-5
TEST, FUEL INJECTOR	14-7
TEST, HYDRAULIC PRESSURE	21-180,21-78
TEST, HYDROMETER	8A-5
TEST, IGNITION-OFF DRAW	8A-8
TEST INDICATOR, BUILT-IN	8A-5
TEST, LOAD	8A-7
TEST, MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR	14-34
TEST, MANUAL SHIFTING	21-180
TEST, MASTER CYLINDER/POWER BOOSTER	5-9
TEST MODE, CIRCUIT ACTUATION	25-2
TEST MODE, STATE DISPLAY	25-2
TEST, ON-BOARD DIAGNOSTIC SYSTEM	8C-6
TEST, ON-BOARD DIAGNOSTICS	8H-2

Description	Group-Page
TEST, OPEN-CIRCUIT VOLTAGE	8A-6
TEST, POWER STEERING PUMP PRESSURE	19-5
TEST PROCEDURE	21-182
TEST, ROAD	8H-2
TEST, SPEED CONTROL ELECTRICAL	8H-5
TEST, TIME LAG	21-182
TEST, TORQUE CONVERTER STALL	21-182
TEST, VACUUM SUPPLY	8H-6
TESTING COOLING SYSTEM FOR LEAKS	7-20
TESTING FOR SPARK AT COIL	8D-4
TESTING RADIATOR CAPS, PRESSURE	7-23
TESTING, ROAD	21-78
TESTING, SPEED SENSOR	21-186
TESTING TRANSMISSION CLUTCH AND BAND OPERATION, AIR	21-81
TESTING TRANSMISSION MAIN COOLER, FLOW	21-186
TEST—2.5L ENGINE, FUEL PUMP PRESSURE	14-6
TEST–4.0L ENGINE, FUEL PUMP PRESSURE	14-6
TESTS, CHARGING SYSTEM RESISTANCE	8C-3
TESTS, CONTROL CIRCUIT	8B-5
TESTS, FEED CIRCUIT	8B-4
TESTS, TROUBLESHOOTING	8W-01-6
TESTS, WATER PUMP	7-10
THERMOMETER	8V-1,8V-3
THERMOSTAT	7-29,7-5
THIS GROUP, HOW TO USE; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
THIS GROUP, HOW TO USE; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
THREAD REPAIR, ALUMINUM	21-94
THREADS, REPAIR DAMAGED OR WORN	9-4
THROTTLE BODY	14-30,14-37
THROTTLE CABLE	14-18
THROTTLE CABLE REPLACEMENT, TRANSMISSION	21-201,21-277
THROTTLE POSITION SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-4
THROTTLE POSITION SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-4
THROTTLE POSITION SENSOR; IGNITION SYSTEM	8D-15,8D-4
THROTTLE POSITION SENSOR (TPS)	14-37,14-38
THROTTLE POSITION SENSOR (TPS) SERVICE	21-201
THROTTLE POSITION SENSOR (TPS)—PCM INPUT	14-27
THROTTLE VALVE CABLE ADJUSTMENT	21-149
TIE ROD	19-27
TIME LAG TEST	21-182
TIME LAG TEST ANALYSIS	21-183
TIMING CASE COVER	9-36,9-75
TIMING CASE COVER OIL SEAL	9-35,9-84
TIMING CHAIN AND SPROCKETS	9-37,9-75
TIMING, IGNITION	8D-21,8D-7
TIMING, VALVE	9-16,9-57
TIRE AND WHEEL BALANCE	22-10
TIRE AND WHEEL RUNOUT	22-8
TIRE INFLATION PRESSURES	22-2
TIRE INFORMATION	22-1
TIRE NOISE OR VIBRATION	22-4
TIRE PRESSURE FOR HIGH—SPEED OPERATION	22-3
TIRE (TEMPORARY), SPARE	22-2
TIRE WEAR PATTERNS	22-3
TIRES	22-1
TIRES, CLEANING OF	22-7
TIRES, RADIAL-PLY	22-2
TIRES, REPLACEMENT	22-3
TO CENTER, INSUFFICIENT ASST. OR POOR RETURN	19-4
TO START TEST, FAILURE	8D-5
TO USE THIS GROUP, HOW; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
TO USE THIS GROUP, HOW; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
TONE WHEEL, WHEEL SPEED SENSORS	5-34
TOOL, DRB SCAN	7-10
TOOLS, OVERHAUL SERVICE	21-287
TOOLS, SPECIAL	14-44
TOOLS, TROUBLESHOOTING	8W-01-5
TOOLS—BODY, SPECIAL	23-68
TOOLS—SEATS, SPECIAL	23-15
TORQUE; CLUTCH	6-15
TORQUE; TRANSMISSION AND TRANSFER CASE	21-310,21-337
TORQUE, AX4/5 MANUAL TRANSMISSION	21-35
TORQUE CHART; BRAKES	5-30
TORQUE CHART; STEERING	19-22,19-26,19-29,19-9
TORQUE CHART; SUSPENSION	2-11,2-16
TORQUE CONVERTER	21-102,21-171,21-74
TORQUE CONVERTER CLUTCH (TCC) SOLENOID; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
TORQUE CONVERTER CLUTCH (TCC) SOLENOID; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
TORQUE CONVERTER STALL TEST	21-182
TORQUE CONVERTER STATOR CLUTCH INSPECTION	21-186
TORQUE CONVERTER, TRANSMISSION	21-202
TORQUE REFERENCES	0-7
TORQUE SPECIFICATIONS; CHARGING SYSTEM	8C-8
TORQUE SPECIFICATIONS; COOLING SYSTEM	7-40
TORQUE SPECIFICATIONS; EMISSION CONTROL SYSTEMS	25-14
TORQUE SPECIFICATIONS; EXHAUST SYSTEM AND INTAKE MANIFOLD	11-8
TORQUE SPECIFICATIONS; FUEL SYSTEM	14-18,14-43
TORQUE SPECIFICATIONS; IGNITION SYSTEM	8D-22
TORQUE SPECIFICATIONS; INTRODUCTION	0-9
TORQUE SPECIFICATIONS; VEHICLE SPEED CONTROL SYSTEM	8H-9
TORQUE SPECIFICATIONS, FRAME	13-10
TORQUE—MODEL 30 AXLE	3-37
TOUCH-UP, PAINTED SURFACE	23-2
TOW HOOK, REAR	13-3
TOW HOOKS, EMERGENCY	0-11
TOW HOOKS, FRONT	13-1
TOW, TRAILER; 8W-54 TRAILER TOW (LH)	8W-54-1
TOW, TRAILER; 8W-54 TRAILER TOW (RHD)	8W-54-1
TOWING AND HOISTING, JUMP STARTING	0-8
TOWING, FLAT SURFACE	0-11
TOWING, FOUR-WHEEL-DRIVE VEHICLE	0-10
TOWING RECOMMENDATIONS	0-9
TOWING, TWO-WHEEL-DRIVE VEHICLE	0-9
(TPS)—PCM INPUT, THROTTLE POSITION SENSOR	14-27
TRACK BAR	2-10
TRAC-LOC DIFFERENTIAL	3-82
TRAILER HITCH	13-7
TRAILER TOW; 8W-54 TRAILER TOW (LH)	8W-54-1
TRAILER TOW; 8W-54 TRAILER TOW (RHD)	8W-54-1
TRAIN/OUTPUT SHAFT, PLANETARY GEAR	21-134
TRAMSMISSION IDENTIFICATION	21-1
TRANSFER CASE DIAGNOSIS, NV242	21-313
TRANSFER CASE IDENTIFICATION	21-289,21-312
TRANSFER CASE, NV231	21-289,21-292,21-293, 21-306,21-314
TRANSFER CASE, NV242	21-312,21-315,21-336
TRANSFER CASE SKID PLATE	13-6
TRANSMISSION	21-100,21-112,21-144,21-205, 21-38,21-72,21-4
TRANSMISSION, 30RH AUTOMATIC	21-164,21-165
TRANSMISSION AND TORQUE CONVERTER	21-202
TRANSMISSION ASSEMBLY INFORMATION	21-38,21-2
TRANSMISSION, AW-4 AUTOMATIC	21-279
TRANSMISSION, AX15	21-67
TRANSMISSION, AX15 MANUAL	21-36,21-69
TRANSMISSION, AX4/5 MANUAL	21-1
TRANSMISSION CASE OVERHAUL, FIRST/REVERSE BRAKE PISTON	21-272
TRANSMISSION CLUTCH AND BAND OPERATION, AIR TESTING	21-81
TRANSMISSION COMPONENTS, AX 4/5 MANUAL	21-33
TRANSMISSION CONTROL MODULE	21-191
TRANSMISSION CONTROL MODULE (TCM)	21-170
TRANSMISSION CONTROL MODULE (TCM) SERVICE	21-188
TRANSMISSION CONTROL MODULE—4.0L ENGINE ONLY; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
TRANSMISSION CONTROL MODULE—4.0L ENGINE ONLY; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
TRANSMISSION COOLER	21-188
TRANSMISSION COOLER LINE AND FITTINGS	21-100
TRANSMISSION COOLER LINE FITTINGS	21-189
TRANSMISSION COOLER REVERSE FLUSHING	21-94
TRANSMISSION COOLER—AUXILLARY	21-100
TRANSMISSION DESCRIPTION	21-170
TRANSMISSION DIAGNOSIS, AUTOMATIC	21-75
TRANSMISSION FILL PROCEDURE	21-93
TRANSMISSION GEAR RATIOS	21-38,21-74
TRANSMISSION IDENTIFICATION	21-170,21-37,21-74
TRANSMISSION LUBRICANT	21-37
TRANSMISSION MAIN COOLER, FLOW TESTING	21-186
TRANSMISSION NOISE	21-38,21-4
TRANSMISSION OIL COOLER, AUTOMATIC	7-2
TRANSMISSION OIL COOLERS	7-26
TRANSMISSION PARK/NEUTRAL SWITCH—PCM INPUT	14-27
TRANSMISSION PARTS CLEANING AND INSPECTION	21-277
TRANSMISSION RANGES AND SHIFT LEVER POSITIONS	21-170
TRANSMISSION SHIFT PATTERN	21-37
TRANSMISSION, STARTING SYSTEM—MANUAL	8W-21-1
TRANSMISSION SWITCH AND PLUG LOCATIONS	21-37
TRANSMISSION THROTTLE CABLE REPLACEMENT	21-201,21-277
TRANSMISSION TORQUE, AX4/5 MANUAL	21-35
TRANSMISSION UP-SHIFT LAMP, MANUAL; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
TRANSMISSION UP-SHIFT LAMP, MANUAL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
TRANSMISSION VALVE BODY	21-193
TRANSMISSION VALVE BODY COMPONENTS	21-174
TRANSMISSION VALVE BODY OVERHAUL	21-275
TRANSMISSION VALVE BODY SOLENOIDS	21-171,21-191
TRANSMISSION—30RH, AUTOMATIC	21-72
TRANSMISSION—AW4, AUTOMATIC	21-169
TRANSMISSIONS, STARTING SYSTEM—AUTOMATIC	8W-21-1
TRANSMITTER BATTERY REPLACEMENT, REMOTE KEYLESS ENTRY	8P-9
TRANSMITTER PROGRAMMING, KEYLESS ENTRY	8P-9
TRANSMITTER, REMOTE KEYLESS ENTRY	8P-2,8P-8
TREAD WEAR INDICATORS	22-3
TRIM, A-PILLAR	23-47
TRIM, B-PILLAR	23-48
TRIM, C-PILLAR	23-49
TRIM, LIFTGATE PILLAR	23-51
TRIM, LOWER A-PILLAR COWL	23-48
TRIM PANEL EXTENSION, QUARTER	23-49
TRIM PANEL, FRONT DOOR	23-30
TRIM PANEL, LIFTGATE	23-59
TRIM PANEL, REAR DOOR	23-41
TRIM PANELS, QUARTER AND WHEELHOUSE	23-50
TRIP DEFINITION	25-8
TRIP ODOMETER	8E-4,8E-8

Description	Group-Page
TROUBLE CODES, DIAGNOSTIC	25-2
TROUBLE CODES, SPEED CONTROL DIAGNOSTIC	8H-5
TROUBLESHOOTING TESTS	8W-01-6
TROUBLESHOOTING TOOLS	8W-01-5
TROUBLESHOOTING WIRING PROBLEMS	8W-01-6
TUBE CAP, FUEL TANK FILLER; EMISSION CONTROL SYSTEMS	25-11,25-14
TUBE CAP, FUEL TANK FILLER; FUEL SYSTEM	14-5
TUBES/LINES/HOSES AND CLAMPS, FUEL	14-9
TURN RELAY, LEFT; 8W-54 TRAILER TOW (LH)	8W-54-1
TURN RELAY, LEFT; 8W-54 TRAILER TOW (RHD)	8W-54-1
TURN RELAY, RIGHT; 8W-54 TRAILER TOW (LH)	8W-54-1
TURN RELAY, RIGHT; 8W-54 TRAILER TOW (RHD)	8W-54-1
TURN SIGNAL INDICATOR LAMPS; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
TURN SIGNAL INDICATOR LAMPS; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
TURN SIGNAL INDICATOR LAMPS; INSTRUMENT PANEL SYSTEMS	8E-13,8E-6
TURN SIGNAL INDICATOR LAMPS; TURN SIGNAL AND HAZARD WARNING SYSTEMS	8J-2
TURN SIGNAL LAMPS	8J-2
TURN SIGNAL SYSTEM	8J-1
TURN SIGNAL/HAZARD WARNING SYSTEM	8J-2
TURN SIGNALS; 8W-52 TURN SIGNALS (LH)	8W-52-1
TURN SIGNALS; 8W-52 TURN SIGNALS (RHD)	8w52-1
TURN SIGNAL/TAIL LAMP, BACK-UP/ REAR	8L-15
TURN SIGNAL/TAIL LAMP BULB, BACK-UP/REAR	8L-11
TWO-WHEEL-DRIVE VEHICLE TOWING	0-9
U-JOINT, AXLE SHAFT—CARDAN	3-29
U-JOINT, CARDAN	3-37
UNBALANCE	3-3
UNDERHOOD LAMP; 8W-44 INTERIOR LIGHTING (LH)	8W-44-1
UNDERHOOD LAMP; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-1
UNDERHOOD LAMP; LAMPS	8L-15
UNDERHOOD LAMP BULB	8L-12
UNDERSIZE COMPONENT CODES, OVERSIZE	9-16,9-57
UNIT, FUEL GAUGE SENDING	14-4,14-7
UNIT (HCU), HYDRAULIC CONTROL	5-32
UNIT, HYDRAULIC CONTROL; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
UNIT, HYDRAULIC CONTROL; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
UNIT, HYDRAULIC CONTROL; BRAKES	5-36
UNIVERSAL JOINT ANGLE	3-5
UNIVERSAL JOINTS	3-2
U–JOINTS, PROPELLER SHAFTS	3-13
UNLOCK RELAY; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
UNLOCK RELAY; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
UNSCHEDULED INSPECTION	0-3
UPPER SUSPENSION ARM	2-8
UPSHIFT INDICATOR LAMP	8E-14,8E-6
UP-SHIFT LAMP, MANUAL TRANSMISSION; 8W-30 FUEL/ IGNITION SYSTEMS (LH)	8W-30-5
UP-SHIFT LAMP, MANUAL TRANSMISSION; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
UPSTREAM OXYGEN SENSOR	14-40
USAGE, INSTALLATION METHODS AND PARTS	6-2
USE THIS GROUP, HOW TO; 8W-01 GENERAL INFORMATION (LH)	8W-01-1
USE THIS GROUP, HOW TO; 8W-01 GENERAL INFORMATION (RHD)	8W-01-1
VACUUM ACTUATOR, RECIRCULATION AIR DOOR	24-33
VACUUM RESERVOIR	8H-2,8H-8
VACUUM SCHEMATICS	25-13
VACUUM SUPPLY TEST	8H-6
VACUUM SYSTEM	24-16
VALUE, LOAD	25-9
VALUES, CONVERSION FORMULAS AND EQUIVALENT	0-7
VALVE BODY	21-105,21-140,21-150,21-99
VALVE BODY COMPONENTS, TRANSMISSION	21-174
VALVE BODY OVERHAUL, TRANSMISSION	21-275
VALVE BODY SOLENOIDS, TRANSMISSION	21-171,21-191
VALVE BODY, TRANSMISSION	21-193
VALVE CABLE ADJUSTMENT, THROTTLE	21-149
VALVE, COMBINATION	5-15,5-34,5-4,5-9
VALVE, CONVERTER DRAINBACK	21-75
VALVE, EXPANSION	24-19,24-26,24-8
VALVE, FLOW CONTROL	19-9
VALVE, HIGH PRESSURE RELIEF	24-8
VALVE, ROLLOVER	25-10,25-14
VALVE SERVICE	9-46,9-85
VALVE SERVICE, CONVERTER DRAINBACK CHECK	21-94
VALVE SHAFT OVERHAUL, MANUAL	21-239
VALVE SHAFT SEAL REPLACEMENT, MANUAL	21-195
VALVE, SPOOL	19-16
VALVE SPRINGS AND OIL SEALS	9-31
VALVE SPRINGS, VALVES	9-34,9-73
VALVE STEM SEAL AND SPRING	9-71
VALVE TIMING	9-16,9-57
VALVE, WATER	24-10
VALVE-PCM OUTPUT, DUTY CYCLE EVAP PURGE SOLENOID	14-29
VALVES AND VALVE SPRINGS	9-34,9-73
VANITY LAMP BULB, VISOR	8L-13
VANITY LAMP, VISOR	8L-16
VANITY MIRROR LAMPS, VISOR	8W-44-2
VARIANCE, PINION GEAR DEPTH	3-16,3-58,3-83
VARIATION ADJUSTMENT, COMPASS	8V-4
VECI LABEL SPECIFICATIONS; FUEL SYSTEM	14-18,14-43
VECI LABEL SPECIFICATIONS; IGNITION SYSTEM	8D-21
VEHICLE CONTROL AND DISPLAY SYMBOLS, INTERNATIONAL	0-3
VEHICLE DIMENSIONS	0-2
VEHICLE EMISSION CONTROL INFORMATION (VECI) LABEL	25-12
VEHICLE EXTERIOR DIMENSIONS	0-3
VEHICLE IDENTIFICATION NUMBER	0-1
VEHICLE IDENTIFICATION NUMBER DECODING CHART	0-1
VEHICLE INTERIOR DIMENSIONS	0-3
VEHICLE LEAD, LOOSE STEERING	19-4
VEHICLE SAFETY CERTIFICATION LABEL	0-1
VEHICLE SPEED AND DISTANCE SENSOR—PCM INPUT	14-27
VEHICLE SPEED CONTROL; 8W-33 VEHICLE SPEED CONTROL (LH)	8W-33-1
VEHICLE SPEED CONTROL; 8W-33 VEHICLE SPEED CONTROL (RHD)	8W-33-1
VEHICLE SPEED SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-2
VEHICLE SPEED SENSOR; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-2
VEHICLE SPEED SENSOR; FUEL SYSTEM	14-36, 14-42
VEHICLE SPEED SENSOR; VEHICLE SPEED CONTROL SYSTEM	8H-2,8H-5,8H-9
VEHICLE TOWING, FOUR-WHEEL-DRIVE	0-10
VEHICLE TOWING, TWO-WHEEL-DRIVE	0-9
VENT WINDOW, QUARTER	23-64
VENTILATION SYSTEM, CRANKCASE	25-12
VIBRATION	3-17,3-45,3-3
VIBRATION DAMPER	9-35,9-74
VIBRATION, DRIVELINE	3-3
VIBRATION, TIRE NOISE OR	22-4
VIEW MIRRORS, SIDE	23-28
VISCOUS FAN DRIVE	7-22,7-7
VISCOUS FAN DRIVE REMOVAL/ INSTALLATION	7-39
VISOR VANITY LAMP	8L-16
VISOR VANITY LAMP BULB	8L-13
VISOR VANITY MIRROR LAMPS	8W-44-2
VISUAL INSPECTION	14-31
VOLT SENSOR SUPPLY—PRIMARY, FIVE	14-24
VOLT SENSOR SUPPLY—SECONDARY, FIVE	14-24
VOLTAGE REGULATOR	8C-2
VOLTAGE TEST, OPEN-CIRCUIT	8A-6
VOLTAGE—PCM INPUT, BATTERY	14-24
VOLTMETER	8E-4,8E-8
WARNING LAMP, ABS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
WARNING LAMP, ABS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
WARNING LAMP, ABS; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
WARNING LAMP, ABS; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
WARNING LAMP, ABS; BRAKES	5-35
WARNING LAMP, BRAKE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
WARNING LAMP, BRAKE; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
WARNING LAMP, BRAKE; INSTRUMENT PANEL SYSTEMS	8E-4,8E-9
WARNING LAMP, CHARGING SYSTEM	8W-40-2
WARNING LAMP, COOLANT TEMPERATURE	8E-10,8E-4
WARNING LAMP, ENGINE COOLANT TEMPERATURE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
WARNING LAMP, ENGINE COOLANT TEMPERATURE; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
WARNING LAMP, GENERATOR	8E-11,8E-5
WARNING LAMP, LOW FUEL; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-1
WARNING LAMP, LOW FUEL; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
WARNING LAMP, LOW FUEL; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
WARNING LAMP, LOW OIL PRESSURE	8E-12,8E-5
WARNING LAMP, LOW WASHER FLUID; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
WARNING LAMP, LOW WASHER FLUID; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
WARNING LAMP, LOW WASHER FLUID; 8W-53 WIPERS (LH)	8W-53-1
WARNING LAMP, LOW WASHER FLUID; 8W-53 WIPERS (RHD)	8W-53-1
WARNING LAMP, LOW WASHER FLUID; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
WARNING LAMP, OIL PRESSURE; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
WARNING LAMP, OIL PRESSURE; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-2
WARNING LAMP, RED BRAKE	5-2,5-9
WARNING LAMP, SEAT BELT INDICATOR; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
WARNING LAMP, SEAT BELT INDICATOR; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
WARNING SYSTEM, HAZARD	8J-1
WARNING SYSTEM SWITCHES, CHIME/BUZZER	8U-3
WARNING SYSTEM, TURN SIGNAL/ HAZARD	8J-2
WARNINGS & CAUTIONS, SERVICE	5-2
WARNINGS AND PRECAUTIONS, SERVICE	24-3
WARNINGS, NOTES, CAUTIONS	8W-01-2
WARNINGS, SAFETY PRECAUTIONS	23-1
WASHER FLUID WARNING LAMP, LOW; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-2
WASHER FLUID WARNING LAMP, LOW; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-3
WASHER FLUID WARNING LAMP, LOW; 8W-53 WIPERS (LH)	8W-53-1
WASHER FLUID WARNING LAMP, LOW; 8W-53 WIPERS (RHD)	8W-53-1
WASHER FLUID WARNING LAMP, LOW; INSTRUMENT PANEL SYSTEMS	8E-12,8E-5
WASHER NOZZLES AND PLUMBING	8K-3
WASHER PUMPS	8K-3
WASHER PUMPS AND RESERVOIR	8K-10
WASHER RESERVOIR	8K-3
WASHER SWITCHES, WIPER	8K-2,8K-6,8K-9
WASHER SYSTEM, REAR WIPER	8K-1
WASHER SYSTEM, WINDSHIELD	8K-1
WASHER SYSTEMS	8K-5
WATER LEAKS	23-17

Description	Group-Page
WATER PUMP TESTS	7-10
WATER PUMPS	7-27,7-2,7-6
WATER VALVE	24-10
WEAR INDICATORS, TREAD	22-3
WEAR PATTERNS, TIRE	22-3
WEATHERSTRIP, FRONT DOOR	23-38
WEATHERSTRIP, FRONT DOOR GLASS RUN CHANNEL	23-37
WEATHERSTRIP, LIFTGATE	23-63
WEATHERSTRIP, REAR DOOR	23-46
WEATHERSTRIP, REAR DOOR GLASS RUN CHANNEL	23-45
WEATHERSTRIP SEAL, COWL	23-24
WET SANDING, BUFFING AND POLISHING	23-2
WHEEL	22-8
WHEEL ALIGNMENT	2-1,2-4
WHEEL BALANCE, TIRE	22-10
WHEEL CYLINDER	5-20,5-25,5-27
WHEEL INSPECTION	22-8
WHEEL INSTALLATION	22-9
WHEEL LUG NUT	22-11
WHEEL MOUNTING STUDS	2-10
WHEEL RUNOUT, TIRE	22-8
WHEEL SENSOR, FRONT	5-37
WHEEL SPEED SENSOR, REAR	5-38
WHEEL SPEED SENSORS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-1
WHEEL SPEED SENSORS; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-1
WHEEL SPEED SENSORS AND TONE WHEEL	5-34
WHEEL, WHEEL SPEED SENSORS AND TONE	5-34
WHEELHOUSE FLARES AND LINERS, REAR	23-63
WHEELHOUSE TRIM PANELS, QUARTER	23-50
WHEELS	22-8
WIND NOISE	23-18
WINDOW APPLIQUE, QUARTER	23-64
WINDOW DEFOGGER, REAR; 8W-48 REAR WINDOW DEFOGGER (LH)	8W-48-1
WINDOW DEFOGGER, REAR; 8W-48 REAR WINDOW DEFOGGER (RHD)	8W-48-1
WINDOW DEFOGGER SYSTEM, REAR	8N-1
WINDOW GLASS, LIFTGATE	23-9
WINDOW GLASS, REAR DOOR	23-46
WINDOW GLASS, REAR DOOR STATIONARY	23-8
WINDOW GLASS, REAR QUARTER	23-8
WINDOW MOTOR, POWER	8S-1,8S-7
WINDOW OPERATION, POWER	8W-60-1
WINDOW, QUARTER VENT	23-64
WINDOW REGULATOR, FRONT DOOR	23-39
WINDOW REGULATOR, REAR DOOR	23-46
WINDOW SWITCH, POWER	8S-1,8S-2,8S-7
WINDOW SYSTEM, POWER	8S-1
WINDOWS, POWER	8W-60-1
WINDSHIELD	23-4
WINDSHIELD WASHER SYSTEM	8K-1
WINDSHIELD WIPER SYSTEM	8K-1
WIPE MODULE, INTERMITTENT	8K-3,8K-8
WIPER AND WASHER SWITCHES	8K-2,8K-6,8K-9
WIPER AND WASHER SYSTEM, REAR	8K-1
WIPER ARMS	8K-7
WIPER ARMS AND BLADES	8K-2
WIPER LINKAGE AND PIVOTS	8K-2,8K-8
WIPER MOTOR	8K-8
WIPER MOTORS	8K-2
WIPER SYSTEM, REAR; 8W-53 WIPERS (LH)	8W-53-1
WIPER SYSTEM, REAR; 8W-53 WIPERS (RHD)	8W-53-1
WIPER SYSTEM, WINDSHIELD	8K-1
WIPER SYSTEMS	8K-4
WIPERS, INTERMITTENT; 8W-53 WIPERS (LH)	8W-53-1
WIPERS, INTERMITTENT; 8W-53 WIPERS (RHD)	8W-53-1
WIRE CODE IDENTIFICATION	8W-01-2
WIRING DIAGRAM INDEX; 8W-20 CHARGING SYSTEM (LH)	8W-20-1
WIRING DIAGRAM INDEX; 8W-20 CHARGING SYSTEM (RHD)	8W-20-1
WIRING DIAGRAM INDEX; 8W-21 STARTING SYSTEM (LH)	8W-21-1
WIRING DIAGRAM INDEX; 8W-21 STARTING SYSTEM (RHD)	8W-21-1
WIRING DIAGRAM INDEX; 8W-30 FUEL/IGNITION SYSTEMS (LH)	8W-30-5
WIRING DIAGRAM INDEX; 8W-30 FUEL/IGNITION SYSTEMS (RHD)	8W-30-5
WIRING DIAGRAM INDEX; 8W-31 TRANSMISSION CONTROL SYSTEM (LH)	8W-31-1
WIRING DIAGRAM INDEX; 8W-31 TRANSMISSION CONTROL SYSTEM (RHD)	8W-31-1
WIRING DIAGRAM INDEX; 8W-33 VEHICLE SPEED CONTROL (LH)	8W-33-1
WIRING DIAGRAM INDEX; 8W-33 VEHICLE SPEED CONTROL (RHD)	8W-33-1
WIRING DIAGRAM INDEX; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (LH)	8W-35-2
WIRING DIAGRAM INDEX; 8W-35 ALL-WHEEL ANTI-LOCK BRAKES (RHD)	8W-35-2
WIRING DIAGRAM INDEX; 8W-40 INSTRUMENT CLUSTER (LH)	8W-40-3
WIRING DIAGRAM INDEX; 8W-40 INSTRUMENT CLUSTER (RHD)	8W-40-4
WIRING DIAGRAM INDEX; 8W-41 HORN/CIGAR LIGHTER (LH)	8W-41-1
WIRING DIAGRAM INDEX; 8W-41 HORN/CIGAR LIGHTER (RHD)	8W-41-1
WIRING DIAGRAM INDEX; 8W-42 AIR CONDITIONING/HEATER (LH)	8W-42-2
WIRING DIAGRAM INDEX; 8W-42 AIR CONDITIONING/HEATER (RHD)	8W-42-2
WIRING DIAGRAM INDEX; 8W-44 INTERIOR LIGHTING (LH)	8W-44-2
WIRING DIAGRAM INDEX; 8W-44 INTERIOR LIGHTING (RHD)	8W-44-2
WIRING DIAGRAM INDEX; 8W-47 AUDIO SYSTEM (LH)	8W-47-1
WIRING DIAGRAM INDEX; 8W-47 AUDIO SYSTEM (RHD)	8W-47-2
WIRING DIAGRAM INDEX; 8W-48 REAR WINDOW DEFOGGER (LH)	8W-48-1
WIRING DIAGRAM INDEX; 8W-48 REAR WINDOW DEFOGGER (RHD)	8W-48-1
WIRING DIAGRAM INDEX; 8W-49 OVERHEAD CONSOLE (LH)	8W-49-1
WIRING DIAGRAM INDEX; 8W-50 FRONT LIGHTING (LH)	8W-50-2
WIRING DIAGRAM INDEX; 8W-50 FRONT LIGHTING (RHD)	8W-50-2
WIRING DIAGRAM INDEX; 8W-51 REAR LIGHTING (LH)	8W-51-1
WIRING DIAGRAM INDEX; 8W-51 REAR LIGHTING (RHD)	8W-51-1
WIRING DIAGRAM INDEX; 8W-52 TURN SIGNALS (LH)	8W-52-1
WIRING DIAGRAM INDEX; 8W-52 TURN SIGNALS (RHD)	8w52-1
WIRING DIAGRAM INDEX; 8W-53 WIPERS (LH)	8W-53-1
WIRING DIAGRAM INDEX; 8W-53 WIPERS (RHD)	8W-53-1
WIRING DIAGRAM INDEX; 8W-54 TRAILER TOW (LH)	8W-54-1
WIRING DIAGRAM INDEX; 8W-54 TRAILER TOW (RHD)	8W-54-1
WIRING DIAGRAM INDEX; 8W-60 POWER WINDOWS (LH)	8W-60-2
WIRING DIAGRAM INDEX; 8W-60 POWER WINDOWS (RHD)	8W-60-2
WIRING DIAGRAM INDEX; 8W-61 POWER DOOR LOCKS (LH)	8W-61-1
WIRING DIAGRAM INDEX; 8W-61 POWER DOOR LOCKS (RHD)	8W-61-1
WIRING DIAGRAM INDEX; 8W-62 POWER MIRRORS (LH)	8W-62-1
WIRING DIAGRAM INDEX; 8W-62 POWER MIRRORS (RHD)	8W-62-1
WIRING DIAGRAM INDEX; 8W-63 POWER SEAT (LH)	8W-63-1
WIRING DIAGRAM INDEX; 8W-63 POWER SEAT (RHD)	8W-63-1
WIRING PROBLEMS, TROUBLESHOOTING	8W-01-6
WIRING REPAIR	8W-01-7
WIRING/TERMINAL	8W-01-11
WORM SHAFT, RACK PISTON	19-17
WORN THREADS, REPAIR DAMAGED OR	9-4
YOKE SEAL REPLACEMENT—2WD	21-96

1996 SERVICE MANUAL COMMENTS

What features do you find most useful?

What errors have you found? Please include page number.

What topics are hard to locate, confusing, or not covered completely?

What comments or suggestions do you have?

Your Name: _____ Dealership: _____

Address: _____

_____

Manual Name and Model Year: _____

Note: All comments become the property of Chrysler Corporation.

CustomerOne™

Fold Here

Place
Stamp
Here

Chrysler Corporation
CIMS 424-81-55
25999 Lawrence Ave.
Center Line, MI 48015

Fold Here

1996 SERVICE MANUAL COMMENTS

What features do you find most useful?

What errors have you found? Please include page number.

What topics are hard to locate, confusing, or not covered completely?

What comments or suggestions do you have?

Your Name: _____ Dealership: _____

Address: _____

_____

Manual Name and Model Year: _____

Note: All comments become the property of Chrysler Corporation.

CustomerOne™

Fold Here

Place
Stamp
Here

Chrysler Corporation
CIMS 424-81-55
25999 Lawrence Ave.
Center Line, MI 48015

Fold Here

1996 SERVICE MANUAL COMMENTS

What features do you find most useful?

What errors have you found? Please include page number.

What topics are hard to locate, confusing, or not covered completely?

What comments or suggestions do you have?

Your Name: _____ Dealership: _____

Address: _____

_____

Manual Name and Model Year: _____

Note: All comments become the property of Chrysler Corporation.

CustomerOne™

Fold Here

Place
Stamp
Here

Chrysler Corporation
CIMS 424-81-55
25999 Lawrence Ave.
Center Line, MI 48015

Fold Here